U.S. Department
of Transportation

**Federal Aviation
Administration**

AERONAUTICAL INFORMATION MANUAL

Change 1

May 26, 2016

DO NOT DESTROY
BASIC DATED
DECEMBER 10, 2015

Aeronautical Information Manual

Explanation of Changes

Effective: May 26, 2016

a. 1−2−3. Use of Suitable Area Navigation (RNAV) Systems on Conventional Procedures and Routes

This change allows for the use of a suitable RNAV system as a means to navigate on the final approach segment of an instrument approach procedure (IAP) based on a VOR, TACAN, or NDB signal. The underlying NAVAID must be operational and monitored for the final segment course alignment.

b. 3−2−3. Class B Airspace

This change adds an RNAV Receiver as an option for instrument flight rule (IFR) navigation requirement IAW 91.131 (c)(1).

c. 3−2−5. Class D Airspace

This change clarifies the status of part-time Class D airspace areas and associated Class E arrival extensions during periods when a control tower is not operating. This change closes out Aeronautical Charting Forum (ACF) recommendation 07-01-195 and is consistent with the revised information previously incorporated in all volumes of the Chart Supplement U.S.

d. 3−2−6. Class E Airspace

This change updates the definition, vertical limits, and types of Class E airspace. The change more accurately reflects Class E airspace regulatory information in 14 CFR Part 71 and more clearly states that Class E arrival extensions have the same effective times as the airport surface area airspace. This change also closes out ACF recommendation 07-01-195 and is consistent with the revised information previously incorporated in all volumes of the Chart Supplement U.S.

e. 3−5−1. Airport Advisory/Information Services
4−1−3. Flight Service Stations
4−1−9. Traffic Advisory Practices at Airports Without Operating Control Towers

Flight Service Stations have discontinued Airport Advisory services within the Continental U.S., Puerto Rico, and Hawaii, due to declining demand and pilot requests. Therefore, we have removed references to Remote Airport Advisory service and Local Airport Advisory service from FAA directives. Airport Advisory services in Alaska remain unchanged.

f. 4−1−21. Hazardous Area Reporting Service

This service was reviewed for relevance in the Flight Service NAS Initiative as was requested so few times that it was deemed obsolete. Therefore, this change deletes the Flight Service requirement to publish this service.

g. 4−2−6. Ground Station Call Signs
4−2−14. Communications for VFR Flights
7−1−1. National Weather Service Aviation Products
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7−1−11. Flight Information Services (FIS)
7−1−20. Pilot Weather Reports (PIREPS)
7−1−29. Thunderstorm Flying

This change reflects the migration of En Route Flight Advisory Service responsibilities into the Inflight position and the discontinued use of the term “Flight Watch” within the Continental U.S. and Puerto Rico. The paragraphs within chapter 7 have also been updated due to changes in Advisory Circular 00−45H, Aviation Weather Services.

h. 4−3−8. Braking Action Reports and Advisories
4−3−9. Runway Friction Reports and Advisories

As a result of the Southwest Airlines runway overrun accident in December 2005, the FAA chartered the Takeoff and Landing Performance Assessment (TALPA) Work Group to develop a more accurate way of assessing and reporting runway conditions, standardize terminology, incorporate airplane performance capability, and provide the pilot with better information for landing distance assessment. This change, to take effect on October 1, 2016, updates language to better align with TALPA.

i. 4−3−22. Option Approach

This changes adds verbiage advising pilots to inform air traffic control (ATC) as soon as possible of any delay clearing the runway during their stop−and−go or full stop landing.

j. 4−6−4. Flight Planning Into RVSM Airspace

This change clarifies the filing procedures for Non−RVSM flight plans so that ATC will be properly alerted on their radar display.

k. 4−7−1. Introduction and Background
4−7−2. Gulf of Mexico 50 NM Lateral Separation Initiative Web Page: Policy, Procedures and Guidance for Operators and Regulators
4−7−5. Provisions for Accommodation of NonRNP10 Aircraft (Aircraft Not Authorized RNP 10 or RNP 4)
4−7−7. RNP 10 or RNP 4 Authorization: Policy and Procedures for Aircraft and Operators
4−7−8. Flight Planning Requirements
4−7−9. Pilot and Dispatcher Procedures: Basic and In−Flight Contingency Procedures

This change updates outdated material and removes obsolete information. The content has also been rearranged to allow for better clarity where appropriate.

l. 5−2−8. Instrument Departure Procedures (DP) − Obstacle Departure Procedures (ODP) and Standard Instrument Departures (SID)

This change adds language advising pilots what to expect when vectored or cleared to deviate off of an SID.

m. 5−4−1. Standard Terminal Arrival (STAR) Procedures

This change adds language advising pilots what to expect when vectored or cleared to deviate off of a STAR. Pilots should consider the STAR cancelled. If the clearance included crossing restrictions, controllers will issue an altitude to maintain. It also adds language advising pilots when to be prepared to resume the procedure. Since all clearances on STARS will not include Descend Via clearances, the word “will” was replaced with “may.”

n. 5−4−6. Approach Clearance

This change contains editorial revisions that account for changes made concerning RNAV (RNP) approaches with radius−to−fix (RF) legs. In addition, due to comments received by industry stakeholders, specific guidance concerning clearing aircraft to the fix beginning or within an RF leg was moved from a note to procedural direction, and corrected the associated graphic. Content was added to convey to controllers not to assign speeds in excess of charted speed restrictions at fixes and waypoints.

o. 5−4−7. Instrument Approach Procedures

This change adds a note to provide guidance to pilots regarding what to expect when clearances are issued by ATC to altitudes below those published on IAPs.

p. 6−2−4. Emergency Locator Transmitter (ELT)
6−3−1. Distress and Urgency Communications

This change deletes direction for aircraft to contact the Flight Service Station during urgent situations and allows pilots direct contact with Terminal Radar Approach Controls or Air Route Traffic Control Centers.

q. 6−3−1. Distress and Urgency Communications

This change reflects the U.S. Coast Guard’s termination of its radio guard of the international voice distress, safety and calling frequency 2182 kHz.

r. 7−1−21. PIREPS Relating to Airframe Icing

This change updates the definition of *severe icing*.

s. 7−1−26. Microbursts

This change adds a new figure and a listing of Terminal Weather Information for Pilots System (TWIP)−equipped airports.

t. 9−1−4. General Description of Each Chart Series

FIG 9−1−1 has been updated to more fully describe chart coverage and better identify the coverage and availability of the Grand Canyon VFR Aeronautical Chart. FIG 9−1−2 has also been updated to better depict chart coverage.

u. Pilot/Controller Glossary

Terms have been added, deleted, or modified within this glossary. Please refer to page PCG−1 for more details.

v. Entire publication.

A global search and replace was conducted on the term “A/FD − Airport Facility Directory.” This term is now being referred to as “Chart Supplement U.S.”

Editorial/format changes were made where necessary. Revision bars were not used when changes are insignificant in nature.

AIM Change 1

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Federal Aviation Administration (FAA)

The Federal Aviation Administration is responsible for insuring the safe, efficient, and secure use of the Nation's airspace, by military as well as civil aviation, for promoting safety in air commerce, for encouraging and developing civil aeronautics, including new aviation technology, and for supporting the requirements of national defense.

The activities required to carry out these responsibilities include: safety regulations; airspace management and the establishment, operation, and maintenance of a civil−military common system of air traffic control (ATC) and navigation facilities; research and development in support of the fostering of a national system of airports, promulgation of standards and specifications for civil airports, and administration of Federal grants−in−aid for developing public airports; various joint and cooperative activities with the Department of Defense; and technical assistance (under State Department auspices) to other countries.

Aeronautical Information Manual (AIM)
Basic Flight Information and ATC Procedures

This manual is designed to provide the aviation community with basic flight information and ATC procedures for use in the National Airspace System (NAS) of the United States. An international version called the Aeronautical Information Publication contains parallel information, as well as specific information on the international airports for use by the international community.

This manual contains the fundamentals required in order to fly in the United States NAS. It also contains items of interest to pilots concerning health and medical facts, factors affecting flight safety, a pilot/controller glossary of terms used in the ATC System, and information on safety, accident, and hazard reporting.

This manual is complemented by other operational publications which are available via separate subscriptions. These publications are:

Notices to Airmen publication - A publication containing current Notices to Airmen (NOTAMs) which are considered essential to the safety of flight as well as supplemental data affecting the other operational publications listed here. It also includes current Flight Data Center NOTAMs, which are regulatory in nature, issued to establish restrictions to flight or to amend charts or published Instrument Approach Procedures. This publication is issued every four weeks and is available through subscription from the Superintendent of Documents.

The Chart Supplement U.S., the Chart Supplement Alaska, and the Chart Supplement Pacific − These publications contain information on airports, communications, navigation aids, instrument landing systems, VOR receiver check points, preferred routes, Flight Service Station/Weather Service telephone numbers, Air Route Traffic Control Center (ARTCC) frequencies, part−time surface areas, and various other pertinent special notices essential to air navigation. These publications are available through a network of FAA chart agents primarily located at or near major civil airports. A listing of products, dates of latest editions and agents is available on the AeroNav website at: http://www.faa.gov/air_traffic/flight_info/aeronav.

Publication Schedule

Basic or Change	Cutoff Date for Submission	Effective Date of Publication
Basic Manual	6/25/15	12/10/15
Change 1	12/10/15	5/26/16
Change 2	5/26/16	11/10/16
Change 3	11/10/16	4/27/17
Basic Manual	4/27/17	10/12/17

Flight Information Publication Policy

The following is in essence, the statement issued by the FAA Administrator and published in the December 10, 1964, issue of the Federal Register, concerning the FAA policy as pertaining to the type of information that will be published as NOTAMs and in the Aeronautical Information Manual.

a. It is a pilot's inherent responsibility to be alert at all times for and in anticipation of all circumstances, situations, and conditions affecting the safe operation of the aircraft. For example, a pilot should expect to find air traffic at any time or place. At or near both civil and military airports and in the vicinity of known training areas, a pilot should expect concentrated air traffic and realize concentrations of air traffic are not limited to these places.

b. It is the general practice of the agency to advertise by NOTAM or other flight information publications such information it may deem appropriate; information which the agency may from time to time make available to pilots is solely for the purpose of assisting them in executing their regulatory responsibilities. Such information serves the aviation community as a whole and not pilots individually.

c. The fact that the agency under one particular situation or another may or may not furnish information does not serve as a precedent of the agency's responsibility to the aviation community; neither does it give assurance that other information of the same or similar nature will be advertised, nor, does it guarantee that any and all information known to the agency will be advertised.

d. This publication, while not regulatory, provides information which reflects examples of operating techniques and procedures which may be requirements in other federal publications or regulations. It is made available solely to assist pilots in executing their responsibilities required by other publications.

Consistent with the foregoing, it is the policy of the Federal Aviation Administration to furnish information only when, in the opinion of the agency, a unique situation should be advertised and not to furnish routine information such as concentrations of air traffic, either civil or military. The Aeronautical Information Manual will not contain informative items concerning everyday circumstances that pilots should, either by good practices or regulation, expect to encounter or avoid.

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Chapter 1. Air Navigation

Section 1. Navigation Aids

1−1−1. General

a. Various types of air navigation aids are in use today, each serving a special purpose. These aids have varied owners and operators, namely: the Federal Aviation Administration (FAA), the military services, private organizations, individual states and foreign governments. The FAA has the statutory authority to establish, operate, maintain air navigation facilities and to prescribe standards for the operation of any of these aids which are used for instrument flight in federally controlled airspace. These aids are tabulated in the Chart Supplement U.S.

b. Pilots should be aware of the possibility of momentary erroneous indications on cockpit displays when the primary signal generator for a ground−based navigational transmitter (for example, a glideslope, VOR, or nondirectional beacon) is inoperative. Pilots should disregard any navigation indication, regardless of its apparent validity, if the particular transmitter was identified by NOTAM or otherwise as unusable or inoperative.

1−1−2. Nondirectional Radio Beacon (NDB)

a. A low or medium frequency radio beacon transmits nondirectional signals whereby the pilot of an aircraft properly equipped can determine bearings and "home" on the station. These facilities normally operate in a frequency band of 190 to 535 kilohertz (kHz), according to ICAO Annex 10 the frequency range for NDBs is between 190 and 1750 kHz, and transmit a continuous carrier with either 400 or 1020 hertz (Hz) modulation. All radio beacons except the compass locators transmit a continuous three−letter identification in code except during voice transmissions.

b. When a radio beacon is used in conjunction with the Instrument Landing System markers, it is called a Compass Locator.

c. Voice transmissions are made on radio beacons unless the letter "W" (without voice) is included in the class designator (HW).

d. Radio beacons are subject to disturbances that may result in erroneous bearing information. Such disturbances result from such factors as lightning, precipitation static, etc. At night, radio beacons are vulnerable to interference from distant stations. Nearly all disturbances which affect the Automatic Direction Finder (ADF) bearing also affect the facility's identification. Noisy identification usually occurs when the ADF needle is erratic. Voice, music or erroneous identification may be heard when a steady false bearing is being displayed. Since ADF receivers do not have a "flag" to warn the pilot when erroneous bearing information is being displayed, the pilot should continuously monitor the NDB's identification.

1−1−3. VHF Omni−directional Range (VOR)

a. VORs operate within the 108.0 to 117.95 MHz frequency band and have a power output necessary to provide coverage within their assigned operational service volume. They are subject to line−of−sight restrictions, and the range varies proportionally to the altitude of the receiving equipment.

NOTE−
Normal service ranges for the various classes of VORs are given in Navigational Aid (NAVAID) Service Volumes, Paragraph 1−1−8.

b. Most VORs are equipped for voice transmission on the VOR frequency. VORs without voice capability are indicated by the letter "W" (without voice) included in the class designator (VORW).

c. The only positive method of identifying a VOR is by its Morse Code identification or by the recorded automatic voice identification which is always indicated by use of the word "VOR" following the range's name. Reliance on determining the identification of an omnirange should never be placed on listening to voice transmissions by the Flight Service Station (FSS) (or approach control facility) involved. Many FSSs remotely operate several omniranges with different names. In some cases, none of the VORs have the name of the "parent" FSS. During periods of maintenance, the facility may radiate a T−E−S−T code (– ● ●●● –) or the code may be removed. Some VOR equipment decodes the identifier and displays it to the pilot for verification to charts, while other equipment simply displays the expected identifier from a database to aid in verification to the audio tones. You should be familiar with your equipment and use it appropriately. If your equipment automatically decodes the identifier, it is not necessary to listen to the audio identification.

d. Voice identification has been added to numerous VORs. The transmission consists of a voice announcement, "AIRVILLE VOR" alternating with the usual Morse Code identification.

e. The effectiveness of the VOR depends upon proper use and adjustment of both ground and airborne equipment.

1. Accuracy. The accuracy of course alignment of the VOR is excellent, being generally plus or minus 1 degree.

2. Roughness. On some VORs, minor course roughness may be observed, evidenced by course needle or brief flag alarm activity (some receivers are more susceptible to these irregularities than others). At a few stations, usually in mountainous terrain, the pilot may occasionally observe a brief course needle oscillation, similar to the indication of "approaching station." Pilots flying over unfamiliar routes are cautioned to be on the alert for these vagaries, and in particular, to use the "to/from" indicator to determine positive station passage.

(a) Certain propeller revolutions per minute (RPM) settings or helicopter rotor speeds can cause the VOR Course Deviation Indicator to fluctuate as much as plus or minus six degrees. Slight changes to the RPM setting will normally smooth out this roughness. Pilots are urged to check for this modulation phenomenon prior to reporting a VOR station or aircraft equipment for unsatisfactory operation.

1−1−4. VOR Receiver Check

a. The FAA VOR test facility (VOT) transmits a test signal which provides users a convenient means to determine the operational status and accuracy of a VOR receiver while on the ground where a VOT is located. The airborne use of VOT is permitted; however, its use is strictly limited to those areas/altitudes specifically authorized in the Chart Supplement U.S. or appropriate supplement.

b. To use the VOT service, tune in the VOT frequency on your VOR receiver. With the Course Deviation Indicator (CDI) centered, the omni−bearing selector should read 0 degrees with the to/from indication showing "from" or the omni−bearing selector should read 180 degrees with the to/from indication showing "to." Should the VOR receiver operate an RMI (Radio Magnetic Indicator), it will indicate 180 degrees on any omni−bearing selector (OBS) setting. Two means of identification are used. One is a series of dots and the other is a continuous tone. Information concerning an individual test signal can be obtained from the local FSS.

c. Periodic VOR receiver calibration is most important. If a receiver's Automatic Gain Control or modulation circuit deteriorates, it is possible for it to display acceptable accuracy and sensitivity close into the VOR or VOT and display out−of−tolerance readings when located at greater distances where weaker signal areas exist. The likelihood of this deterioration varies between receivers, and is generally considered a function of time. The best assurance of having an accurate receiver is periodic calibration. Yearly intervals are recommended at which time an authorized repair facility should recalibrate the receiver to the manufacturer's specifications.

d. Federal Aviation Regulations (14 CFR Section 91.171) provides for certain VOR equipment accuracy checks prior to flight under instrument flight rules. To comply with this requirement and to ensure satisfactory operation of the airborne system, the FAA has provided pilots with the following means of checking VOR receiver accuracy:

1. VOT or a radiated test signal from an appropriately rated radio repair station.

2. Certified airborne check points.

3. Certified check points on the airport surface.

e. A radiated VOT from an appropriately rated radio repair station serves the same purpose as an FAA VOR signal and the check is made in much the same manner as a VOT with the following differences:

1. The frequency normally approved by the Federal Communications Commission is 108.0 MHz.

2. Repair stations are not permitted to radiate the VOR test signal continuously; consequently, the owner or operator must make arrangements with the repair station to have the test signal transmitted. This service is not provided by all radio repair stations. The aircraft owner or operator must determine which repair station in the local area provides this service. A representative of the repair station must make an entry into the aircraft logbook or other permanent record certifying to the radial accuracy and the date of transmission. The owner, operator or representative of the repair station may accomplish the necessary checks in the aircraft and make a logbook entry stating the results. It is necessary to verify which test radial is being transmitted and whether you should get a "to" or "from" indication.

f. Airborne and ground check points consist of certified radials that should be received at specific points on the airport surface or over specific landmarks while airborne in the immediate vicinity of the airport.

1. Should an error in excess of plus or minus 4 degrees be indicated through use of a ground check, or plus or minus 6 degrees using the airborne check, Instrument Flight Rules (IFR) flight must not be attempted without first correcting the source of the error.

CAUTION−
No correction other than the correction card figures supplied by the manufacturer should be applied in making these VOR receiver checks.

2. Locations of airborne check points, ground check points and VOTs are published in the Chart Supplement U.S.

3. If a dual system VOR (units independent of each other except for the antenna) is installed in the aircraft, one system may be checked against the other. Turn both systems to the same VOR ground facility and note the indicated bearing to that station. The maximum permissible variations between the two indicated bearings is 4 degrees.

1−1−5. Tactical Air Navigation (TACAN)

a. For reasons peculiar to military or naval operations (unusual siting conditions, the pitching and rolling of a naval vessel, etc.) the civil VOR/Distance Measuring Equipment (DME) system of air navigation was considered unsuitable for military or naval use. A new navigational system, TACAN, was therefore developed by the military and naval forces to more readily lend itself to military and naval requirements. As a result, the FAA has integrated TACAN facilities with the civil VOR/DME program. Although the theoretical, or technical principles of operation of TACAN equipment are quite different from those of VOR/DME facilities, the end result, as far as the navigating pilot is concerned, is the same. These integrated facilities are called VORTACs.

b. TACAN ground equipment consists of either a fixed or mobile transmitting unit. The airborne unit in conjunction with the ground unit reduces the transmitted signal to a visual presentation of both azimuth and distance information. TACAN is a pulse system and operates in the Ultrahigh Frequency (UHF) band of frequencies. Its use requires TACAN airborne equipment and does not operate through conventional VOR equipment.

1−1−6. VHF Omni−directional Range/Tactical Air Navigation (VORTAC)

a. A VORTAC is a facility consisting of two components, VOR and TACAN, which provides three individual services: VOR azimuth, TACAN azimuth and TACAN distance (DME) at one site. Although consisting of more than one component, incorporating more than one operating frequency, and using more than one antenna system, a VORTAC is considered to be a unified navigational aid. Both components of a VORTAC are envisioned as operating simultaneously and providing the three services at all times.

b. Transmitted signals of VOR and TACAN are each identified by three−letter code transmission and are interlocked so that pilots using VOR azimuth with TACAN distance can be assured that both signals being received are definitely from the same ground station. The frequency channels of the VOR and the TACAN at each VORTAC facility are "paired" in accordance with a national plan to simplify airborne operation.

1−1−7. Distance Measuring Equipment (DME)

a. In the operation of DME, paired pulses at a specific spacing are sent out from the aircraft (this is the interrogation) and are received at the ground station. The ground station (transponder) then transmits paired pulses back to the aircraft at the same pulse spacing but on a different frequency. The time required for the round trip of this signal exchange is measured in the airborne DME unit and is translated into distance (nautical miles) from the aircraft to the ground station.

b. Operating on the line−of−sight principle, DME furnishes distance information with a very high degree of accuracy. Reliable signals may be received at distances up to 199 NM at line−of−sight altitude with an accuracy of better than $^{1}/_{2}$ mile or 3 percent of the distance, whichever is greater. Distance information received from DME equipment is SLANT RANGE distance and not actual horizontal distance.

c. Operating frequency range of a DME according to ICAO Annex 10 is from 960 MHz to 1215 MHz. Aircraft equipped with TACAN equipment will receive distance information from a VORTAC automatically, while aircraft equipped with VOR must have a separate DME airborne unit.

d. VOR/DME, VORTAC, Instrument Landing System (ILS)/DME, and localizer (LOC)/DME navigation facilities established by the FAA provide course and distance information from collocated components under a frequency pairing plan. Aircraft receiving equipment which provides for automatic DME selection assures reception of azimuth and distance information from a common source when designated VOR/DME, VORTAC, ILS/DME, and LOC/DME are selected.

e. Due to the limited number of available frequencies, assignment of paired frequencies is required for certain military noncollocated VOR and TACAN facilities which serve the same area but which may be separated by distances up to a few miles.

f. VOR/DME, VORTAC, ILS/DME, and LOC/DME facilities are identified by synchronized identifications which are transmitted on a time share basis. The VOR or localizer portion of the facility is identified by a coded tone modulated at 1020 Hz or a combination of code and voice. The TACAN or DME is identified by a coded tone modulated at 1350 Hz. The DME or TACAN coded identification is transmitted one time for each three or four times that the VOR or localizer coded identification is transmitted. When either the VOR or the DME is inoperative, it is important to recognize which identifier is retained for the operative facility. A single coded identification with a repetition interval of approximately 30 seconds indicates that the DME is operative.

g. Aircraft equipment which provides for automatic DME selection assures reception of azimuth and distance information from a common source when designated VOR/DME, VORTAC and ILS/DME navigation facilities are selected. Pilots are cautioned to disregard any distance displays from automatically selected DME equipment when VOR or ILS facilities, which do not have the DME feature installed, are being used for position determination.

1−1−8. Navigational Aid (NAVAID) Service Volumes

a. Most air navigation radio aids which provide positive course guidance have a designated standard service volume (SSV). The SSV defines the reception limits of unrestricted NAVAIDs which are usable for random/unpublished route navigation.

b. A NAVAID will be classified as restricted if it does not conform to flight inspection signal strength and course quality standards throughout the published SSV. However, the NAVAID should not be considered usable at altitudes below that which could be flown while operating under random route IFR conditions (14 CFR Section 91.177), even though these altitudes may lie within the designated SSV. Service volume restrictions are first published in Notices to Airmen (NOTAMs) and then with the alphabetical listing of the NAVAIDs in the Chart Supplement U.S.

c. Standard Service Volume limitations do not apply to published IFR routes or procedures.

d. VOR/DME/TACAN Standard Service Volumes (SSV).

1. Standard service volumes (SSVs) are graphically shown in FIG 1−1−1, FIG 1−1−2, FIG 1−1−3, FIG 1−1−4, and FIG 1−1−5. The SSV of a station is indicated by using the class designator as a prefix to the station type designation.

EXAMPLE−
TVOR, LDME, and HVORTAC.

FIG 1−1−1

Standard High Altitude Service Volume

(See FIG 1−1−5 for altitudes below 1,000 feet).

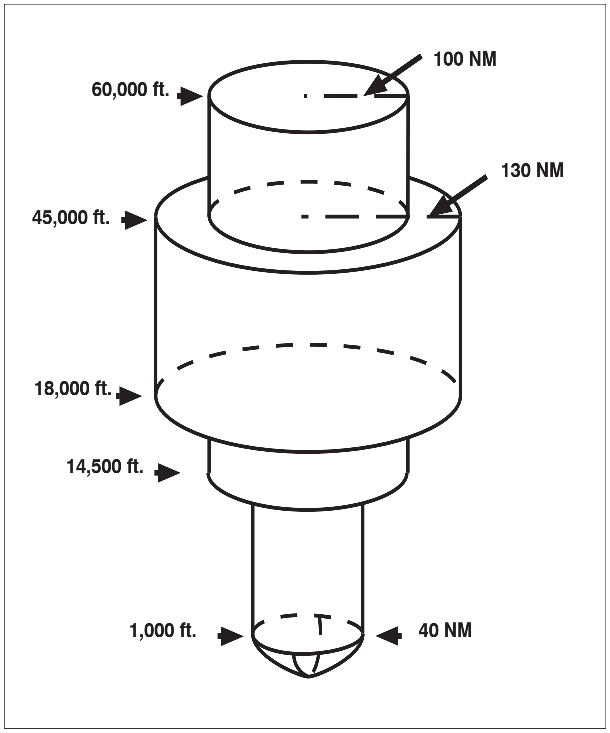


FIG 1−1−2

Standard Low Altitude Service Volume

(See FIG 1−1−5 for altitudes below 1,000 feet).

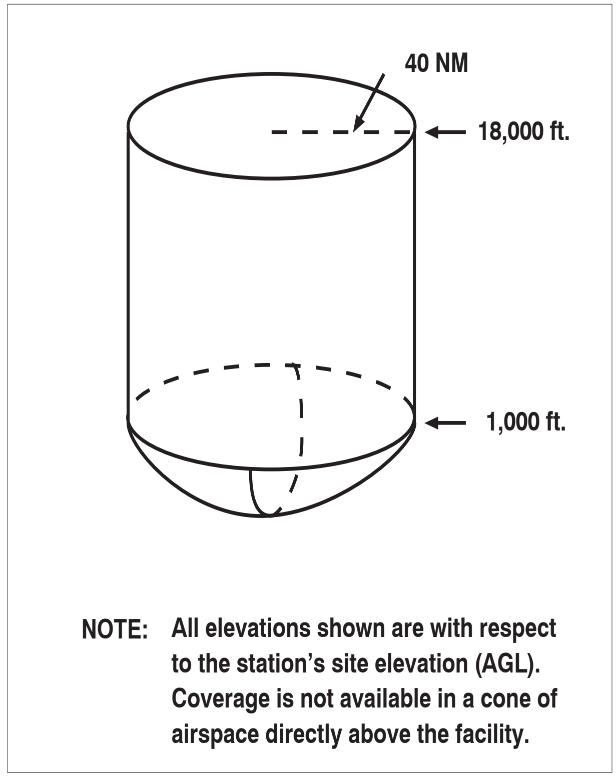
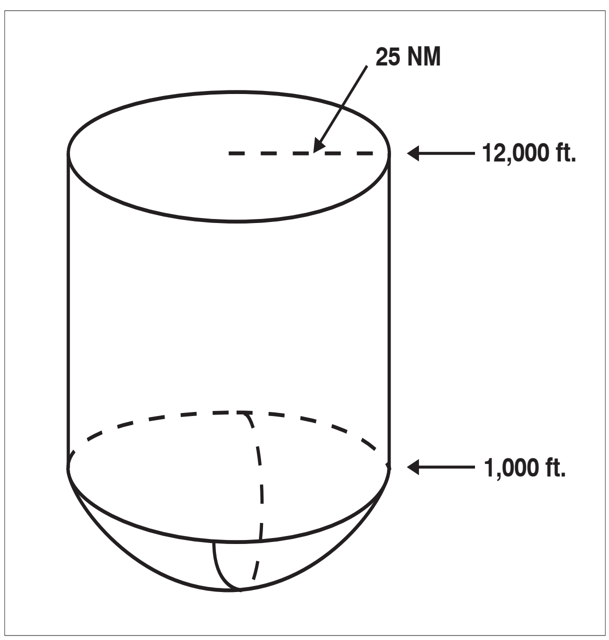


FIG 1−1−3

Standard Terminal Service Volume

(See FIG 1−1−4 for altitudes below 1,000 feet).



2. Within 25 NM, the bottom of the T service volume is defined by the curve in FIG 1−1−4. Within 40 NM, the bottoms of the L and H service volumes are defined by the curve in FIG 1−1−5. (See TBL 1−1−1.)

e. Nondirectional Radio Beacon (NDB)

1. NDBs are classified according to their intended use.

2. The ranges of NDB service volumes are shown in TBL 1−1−2. The distances (radius) are the same at all altitudes.

TBL 1−1−1
VOR/DME/TACAN Standard Service Volumes

SSV Class Designator	Altitude and Range Boundaries
T (Terminal)	From 1,000 feet above ground level (AGL) up to and including 12,000 feet AGL at radial distances out to 25 NM.
L (Low Altitude)	From 1,000 feet AGL up to and including 18,000 feet AGL at radial distances out to 40 NM.
H (High Altitude)	From 1,000 feet AGL up to and including 14,500 feet AGL at radial distances out to 40 NM. From 14,500 AGL up to and including 60,000 feet at radial distances out to 100 NM. From 18,000 feet AGL up to and including 45,000 feet AGL at radial distances out to 130 NM.

TBL 1−1−2
NDB Service Volumes

Class	Distance (Radius)
Compass Locator	15 NM
MH	25 NM
H	50 NM*
HH	75 NM
**Service ranges of individual facilities may be less than 50 nautical miles (NM). Restrictions to service volumes are first published as a Notice to Airmen and then with the alphabetical listing of the NAVAID in the Chart Supplement U.S.*	

FIG 1−1−4
Service Volume Lower Edge Terminal

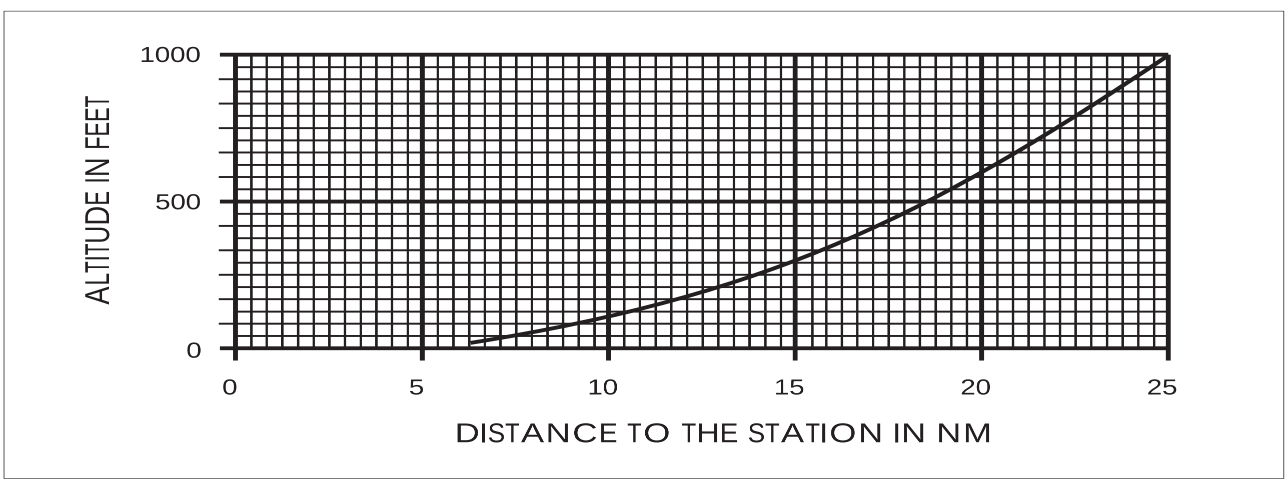
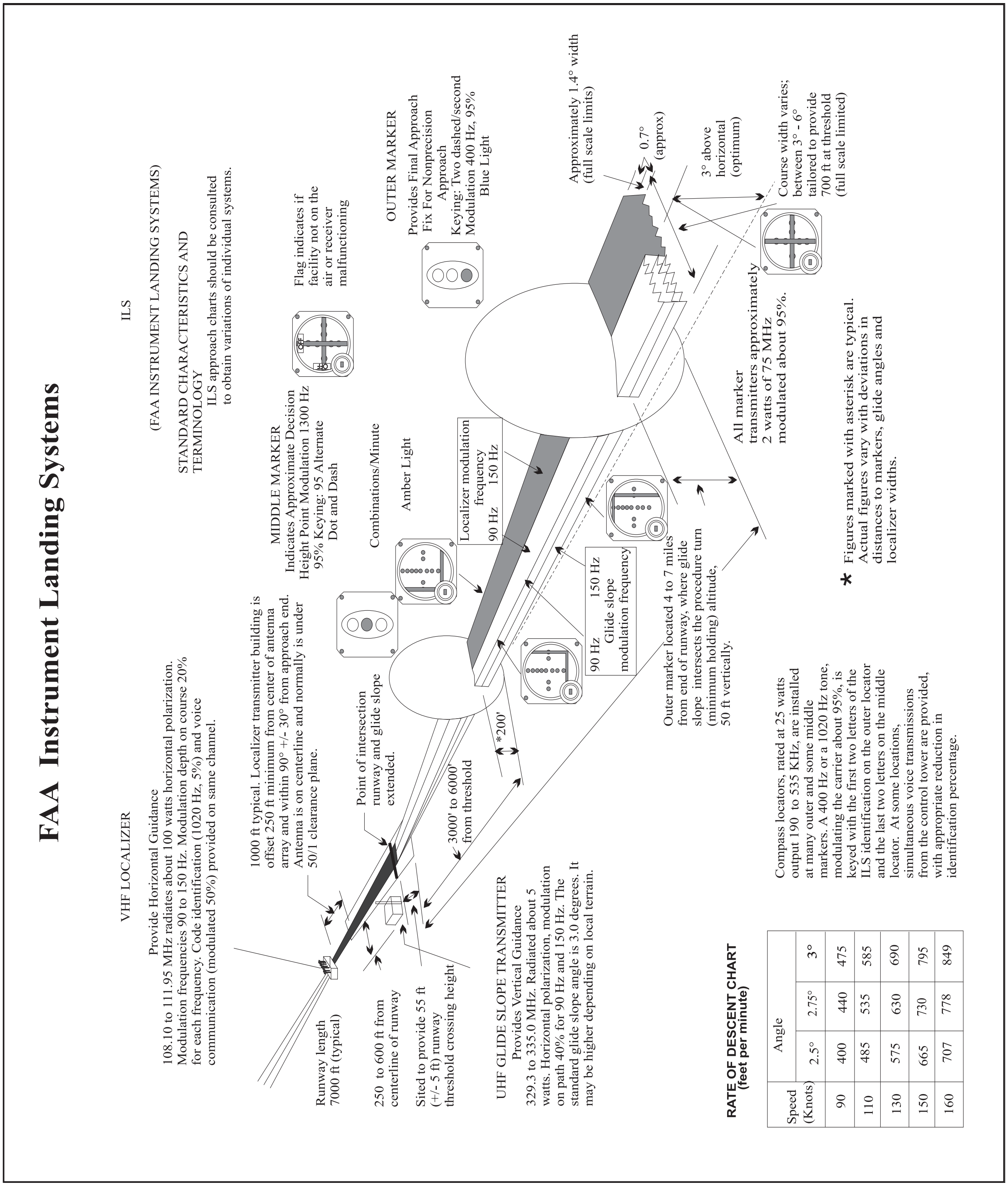


FIG 1-1-7
FAA Instrument Landing Systems



1−1−11. NAVAID Identifier Removal During Maintenance

During periods of routine or emergency maintenance, coded identification (or code and voice, where applicable) is removed from certain FAA NAVAIDs. Removal of identification serves as a warning to pilots that the facility is officially off the air for tune−up or repair and may be unreliable even though intermittent or constant signals are received.

NOTE−
During periods of maintenance VHF ranges may radiate a T−E−S−T code (− ● ●●● −).

NOTE−
DO NOT attempt to fly a procedure that is NOTAMed out of service even if the identification is present. In certain cases, the identification may be transmitted for short periods as part of the testing.

1−1−12. NAVAIDs with Voice

a. Voice equipped en route radio navigational aids are under the operational control of either a Flight Service Station (FSS) or an approach control facility. The voice communication is available on some facilities. Hazardous Inflight Weather Advisory Service (HIWAS) broadcast capability is available on selected VOR sites throughout the conterminous U.S. and does not provide two-way voice communication. The availability of two-way voice communication and HIWAS is indicated in the Chart Supplement U.S. and aeronautical charts.

b. Unless otherwise noted on the chart, all radio navigation aids operate continuously except during shutdowns for maintenance. Hours of operation of facilities not operating continuously are annotated on charts and in the Chart Supplement U.S.

1−1−13. User Reports Requested on NAVAID or Global Navigation Satellite System (GNSS) Performance or Interference

a. Users of the National Airspace System (NAS) can render valuable assistance in the early correction of NAVAID malfunctions or GNSS problems and are encouraged to report their observations of undesirable performance. Although NAVAIDs are monitored by electronic detectors, adverse effects of electronic interference, new obstructions, or changes in terrain near the NAVAID can exist without detection by the ground monitors. Some of the characteristics of malfunction or deteriorating performance which should be reported are: erratic course or bearing indications; intermittent, or full, flag alarm; garbled, missing or obviously improper coded identification; poor quality communications reception; or, in the case of frequency interference, an audible hum or tone accompanying radio communications or NAVAID identification. GNSS problems are often characterized by navigation degradation or service loss indications.

b. Reporters should identify the NAVAID (for example, VOR) malfunction or GNSS problem, location of the aircraft (i.e., latitude, longitude or bearing/distance from a NAVAID), magnetic heading, altitude, date and time of the observation, type of aircraft (make/model/call sign), and description of the condition observed, and the type of receivers in use (i.e., make/model/software revision). For GNSS problems, if possible, please note the number of satellites being tracked at the time of the anomaly. Reports can be made in any of the following ways:

1. Immediately, by radio communication to the controlling Air Route Traffic Control Center (ARTCC), Control Tower, or FSS.

2. By telephone to the nearest FAA facility.

3. For GNSS problems, by internet via the GPS Anomaly Reporting Form at **http://www.faa.gov/air_traffic/nas/gps_reports/**.

c. In aircraft that have more than one receiver, there are many combinations of possible interference between units. This can cause either erroneous navigation indications or, complete or partial blanking out of the communications. Pilots should be familiar enough with the radio installation of the particular airplanes they fly to recognize this type of interference.

1−1−14. LORAN

NOTE−
In accordance with the 2010 DHS Appropriations Act, the U.S. Coast Guard (USCG) terminated the transmission of all U.S. LORAN−C signals on 08 Feb 2010. The USCG also terminated the transmission of the Russian American signals on 01 Aug 2010, and the Canadian LORAN−C signals on 03 Aug 2010. For more information, visit http://www.navcen.uscg.gov. Operators should also note that TSO−C60b, AIRBORNE AREA NAVIGATION

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 U.S., 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, and enhanced navigation around Special Use Airspace. 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 may be found in the appropriate regional Chart Supplement U.S.

(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 7−5−2, VFR in Congested Areas, for more information.

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 TBL 5−1−3 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 following systems qualify as a suitable RNAV system:

1. An RNAV system with TSO−C129/−C145/−C146 equipment, installed in accordance with AC 20−138, Airworthiness Approval of Global Positioning System (GPS) Navigation Equipment for Use as a VFR and IFR Supplemental Navigation System, or AC 20−130A, Airworthiness Approval of Navigation or Flight Management Systems Integrating Multiple Navigation Sensors, and authorized for instrument flight rules (IFR) en route and terminal operations (including those systems previously qualified for "GPS in lieu of ADF or DME" operations), or

2. An RNAV system with DME/DME/IRU inputs that is compliant with the equipment provisions of AC 90−100A, U.S. Terminal and En Route Area Navigation (RNAV) Operations, for RNAV routes. A table of compliant equipment is available at the following website: **http://www.faa.gov/about/office_org/headquarters_offices/avs/offices/afs/afs400/afs470/policy_guidance/**

NOTE−
Approved RNAV systems using DME/DME/IRU, without GPS/WAAS position input, may only be used as a substitute means of navigation when specifically authorized by a Notice to Airmen (NOTAM) or other FAA guidance for a specific procedure. The NOTAM or other FAA guidance authorizing the use of DME/DME/IRU systems will also identify any required DME facilities based on an FAA assessment of the DME navigation infrastructure.

c. Uses of Suitable RNAV Systems. Subject to the operating requirements, operators may use a suitable RNAV system in the following ways.

1. Determine aircraft position relative to, or distance from a VOR (see NOTE 5 below), TACAN, NDB, compass locator, DME fix; or a named fix defined by a VOR radial, TACAN course, NDB bearing, or compass locator bearing intersecting a VOR or localizer course.

2. Navigate to or from a VOR, TACAN, NDB, or compass locator.

3. Hold over a VOR, TACAN, NDB, compass locator, or DME fix.

4. Fly an arc based upon DME.

NOTE−
1. *The allowances described in this section apply even when a facility is identified as required on a procedure (for example, "Note ADF required").*

2. *These operations do not include lateral navigation on localizer−based courses (including localizer back−course guidance) without reference to raw localizer data.*

3. *Unless otherwise specified, a suitable RNAV system cannot be used for navigation on procedures that are identified as not authorized ("NA") without exception by a NOTAM. For example, an operator may not use a RNAV system to navigate on a procedure affected by an expired or unsatisfactory flight inspection, or a procedure that is based upon a recently decommissioned NAVAID.*

4. *Pilots may not substitute for the NAVAID (for example, a VOR or NDB) providing lateral guidance for the final approach segment. This restriction does not refer to instrument approach procedures with "or GPS" in the title when using GPS or WAAS. These allowances do not apply to procedures that are identified as not authorized (NA) without exception by a NOTAM, as other conditions may still exist and result in a procedure not being available. For example, these allowances do not apply to a procedure associated with an expired or unsatisfactory flight inspection, or is based upon a recently decommissioned NAVAID.*

5. *Use of a suitable RNAV system as a means to navigate on the final approach segment of an instrument approach procedure based on a VOR, TACAN or NDB signal, is allowable. The underlying NAVAID must be operational and the NAVAID monitored for final segment course alignment.*

6. *For the purpose of paragraph c, "VOR" includes VOR, VOR/DME, and VORTAC facilities and "compass locator" includes locator outer marker and locator middle marker.*

d. Alternate Airport Considerations. For the purposes of flight planning, any required alternate airport must have an available instrument approach procedure that does not require the use of GPS. This restriction includes conducting a conventional approach at the alternate airport using a substitute means of navigation that is based upon the use of GPS. For example, these restrictions would apply when planning to use GPS equipment as a substitute means of navigation for an out−of−service VOR that supports an ILS missed approach procedure at an alternate airport. In this case, some other approach not reliant upon the use of GPS must be available. This restriction does not apply to RNAV systems using TSO−C145/−C146 WAAS equipment. For further WAAS guidance, see paragraph 1−1−18.

1. 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 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 applicable alternate airport weather minimums using:

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

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

(c) 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.

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

3. This restriction does not apply to TSO-C145() and TSO-C146() equipped users (WAAS users). For further WAAS guidance, see paragraph 1−1−18.

Chapter 2. Aeronautical Lighting and Other Airport Visual Aids

Section 1. Airport Lighting Aids

2-1-1. Approach Light Systems (ALS)

a. ALS provide the basic means to transition from instrument flight to visual flight for landing. Operational requirements dictate the sophistication and configuration of the approach light system for a particular runway.

b. ALS are a configuration of signal lights starting at the landing threshold and extending into the approach area a distance of 2400-3000 feet for precision instrument runways and 1400-1500 feet for nonprecision instrument runways. Some systems include sequenced flashing lights which appear to the pilot as a ball of light traveling towards the runway at high speed (twice a second). (See FIG 2-1-1.)

2-1-2. Visual Glideslope Indicators

a. Visual Approach Slope Indicator (VASI)

1. VASI installations may consist of either 2, 4, 6, 12, or 16 light units arranged in bars referred to as near, middle, and far bars. Most VASI installations consist of 2 bars, near and far, and may consist of 2, 4, or 12 light units. Some VASIs consist of three bars, near, middle, and far, which provide an additional visual glide path to accommodate high cockpit aircraft. This installation may consist of either 6 or 16 light units. VASI installations consisting of 2, 4, or 6 light units are located on one side of the runway, usually the left. Where the installation consists of 12 or 16 light units, the units are located on both sides of the runway.

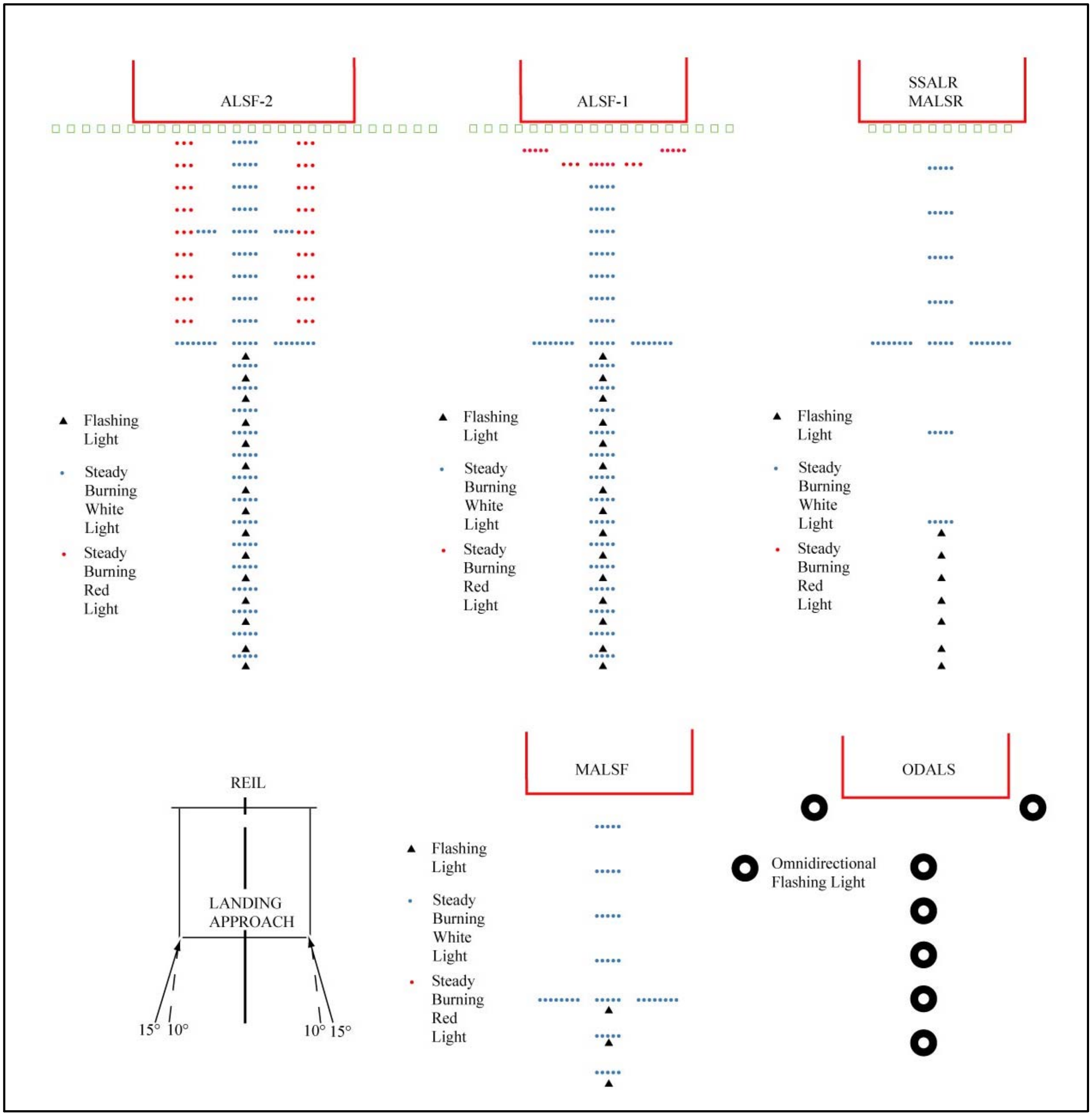
2. Two-bar VASI installations provide one visual glide path which is normally set at 3 degrees. Three-bar VASI installations provide two visual glide paths. The lower glide path is provided by the near and middle bars and is normally set at 3 degrees while the upper glide path, provided by the middle and far bars, is normally $^{1}/_{4}$ degree higher. This higher glide path is intended for use only by high cockpit aircraft to provide a sufficient threshold crossing height. Although normal glide path angles are three degrees, angles at some locations may be as high as 4.5 degrees to give proper obstacle clearance. Pilots of high performance aircraft are cautioned that use of VASI angles in excess of 3.5 degrees may cause an increase in runway length required for landing and rollout.

3. The basic principle of the VASI is that of color differentiation between red and white. Each light unit projects a beam of light having a white segment in the upper part of the beam and red segment in the lower part of the beam. The light units are arranged so that the pilot using the VASIs during an approach will see the combination of lights shown below.

4. The VASI is a system of lights so arranged to provide visual descent guidance information during the approach to a runway. These lights are visible from 3-5 miles during the day and up to 20 miles or more at night. The visual glide path of the VASI provides safe obstruction clearance within plus or minus 10 degrees of the extended runway centerline and to 4 NM from the runway threshold. Descent, using the VASI, should not be initiated until the aircraft is visually aligned with the runway. Lateral course guidance is provided by the runway or runway lights. In certain circumstances, the safe obstruction clearance area may be reduced by narrowing the beam width or shortening the usable distance due to local limitations, or the VASI may be offset from the extended runway centerline. This will be noted in the Chart Supplement U.S. and/or applicable notices to airmen (NOTAM).

FIG 2−1−1

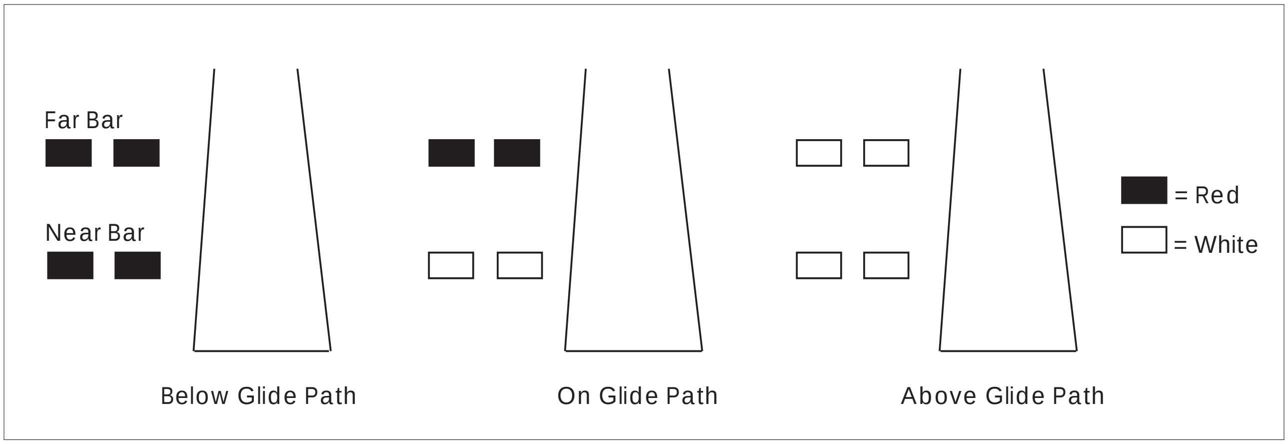
Precision & Nonprecision Configurations



NOTE−
Civil ALSF−2 may be operated as SSALR during favorable weather conditions.

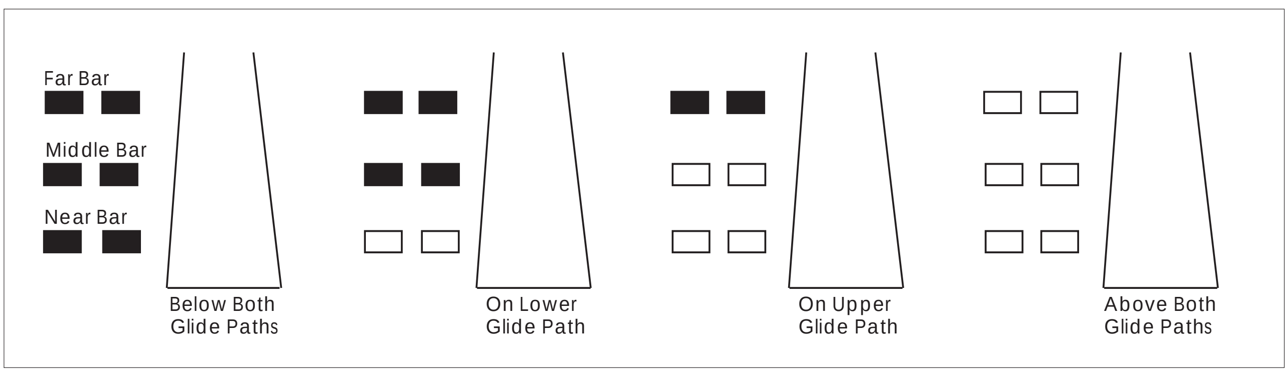
5. For 2−bar VASI (4 light units) see FIG 2−1−2.

FIG 2−1−2
2−Bar VASI



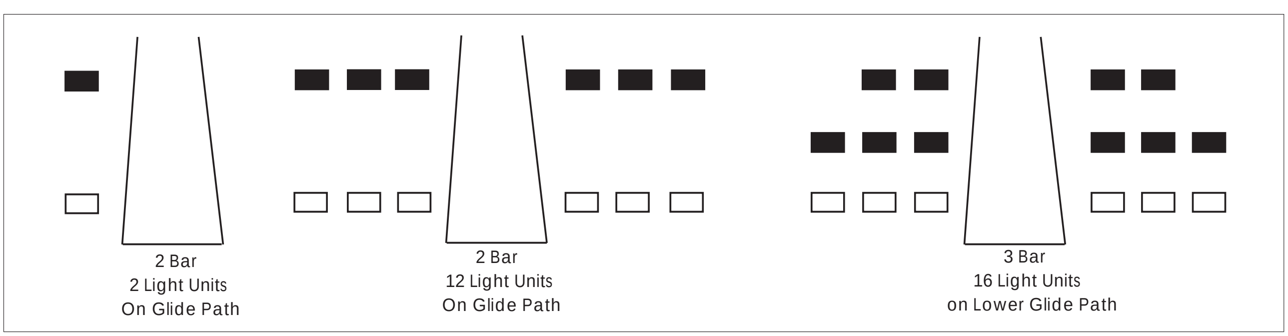
6. For 3−bar VASI (6 light units) see FIG 2−1−3.

FIG 2−1−3
3−Bar VASI



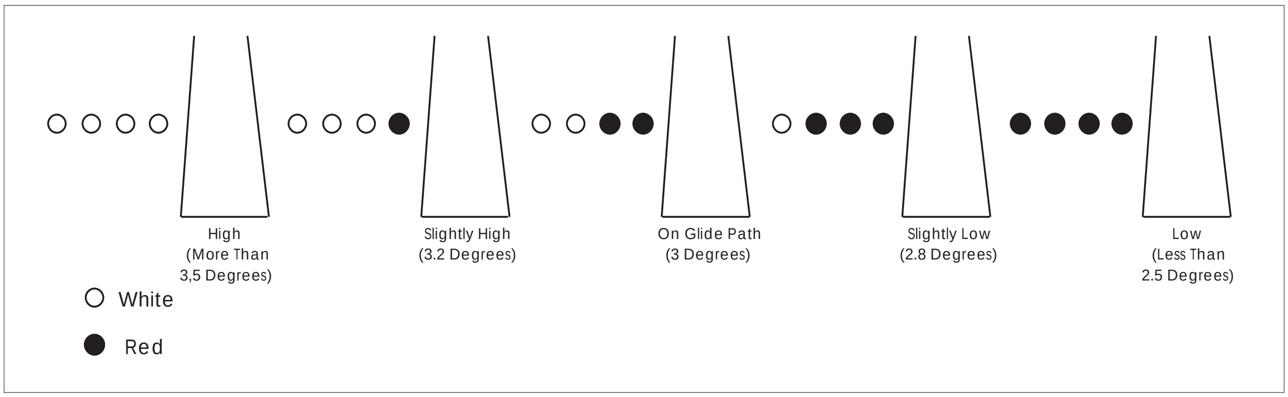
7. For other VASI configurations see FIG 2−1−4.

FIG 2−1−4
VASI Variations



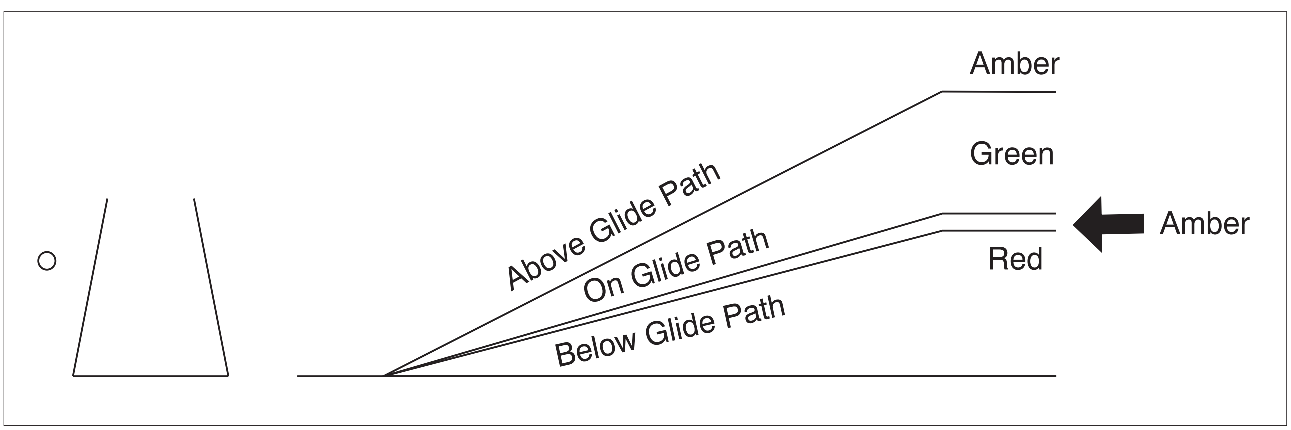
b. Precision Approach Path Indicator (PAPI). The precision approach path indicator (PAPI) uses light units similar to the VASI but are installed in a single row of either two or four light units. These lights are visible from about 5 miles during the day and up to 20 miles at night. The visual glide path of the PAPI typically provides safe obstruction clearance within plus or minus 10 degrees of the extended runway centerline and to 4 SM from the runway threshold. Descent, using the PAPI, should not be initiated until the aircraft is visually aligned with the runway. The row of light units is normally installed on the left side of the runway and the glide path indications are as depicted. Lateral course guidance is provided by the runway or runway lights. In certain circumstances, the safe obstruction clearance area may be reduced by narrowing the beam width or shortening the usable distance due to local limitations, or the PAPI may be offset from the extended runway centerline. This will be noted in the Chart Supplement U.S. and/or applicable NOTAMs. (See FIG 2−1−5.)

FIG 2−1−5
Precision Approach Path Indicator (PAPI)



c. Tri−color Systems. Tri−color visual approach slope indicators normally consist of a single light unit projecting a three−color visual approach path into the final approach area of the runway upon which the indicator is installed. The below glide path indication is red, the above glide path indication is amber, and the on glide path indication is green. These types of indicators have a useful range of approximately one−half to one mile during the day and up to five miles at night depending upon the visibility conditions. (See FIG 2−1−6.)

FIG 2−1−6
Tri−Color Visual Approach Slope Indicator



NOTE−
1. *Since the tri−color VASI consists of a single light source which could possibly be confused with other light sources, pilots should exercise care to properly locate and identify the light signal.*

FIG 2−1−14

Taxiway Lead−On Light Configuration

TBL 2−1−1

Runways With Approach Lights

Lighting System	No. of Int. Steps	Status During Nonuse Period	Intensity Step Selected Per No. of Mike Clicks		
			3 Clicks	5 Clicks	7 Clicks
Approach Lights (Med. Int.)	2	Off	Low	Low	High
Approach Lights (Med. Int.)	3	Off	Low	Med	High
MIRL	3	Off or Low	◆	◆	◆
HIRL	5	Off or Low	◆	◆	◆
VASI	2	Off	✯	✯	✯

NOTES: ◆ *Predetermined intensity step.*
✯ *Low intensity for night use. High intensity for day use as determined by photocell control.*

TBL 2−1−2

Runways Without Approach Lights

Lighting System	No. of Int. Steps	Status During Nonuse Period	Intensity Step Selected Per No. of Mike Clicks		
			3 Clicks	5 Clicks	7 Clicks
MIRL	3	Off or Low	Low	Med.	High
HIRL	5	Off or Low	Step 1 or 2	Step 3	Step 5
LIRL	1	Off	On	On	On
VASI✯	2	Off	◆	◆	◆
REIL✯	1	Off	Off	On/Off	On
REIL✯	3	Off	Low	Med.	High

NOTES: ◆ Low intensity for night use. High intensity for day use as determined by photocell control.
✯ The control of VASI and/or REIL may be independent of other lighting systems.

a. With FAA approved systems, various combinations of medium intensity approach lights, runway lights, taxiway lights, VASI and/or REIL may be activated by radio control. On runways with both approach lighting and runway lighting (runway edge lights, taxiway lights, etc.) systems, the approach lighting system takes precedence for air−to−ground radio control over the runway lighting system which is set at a predetermined intensity step, based on expected visibility conditions. Runways without approach lighting may provide radio controlled intensity adjustments of runway edge lights. Other lighting systems, including VASI, REIL, and taxiway lights may be either controlled with the runway edge lights or controlled independently of the runway edge lights.

b. The control system consists of a 3−step control responsive to 7, 5, and/or 3 microphone clicks. This 3−step control will turn on lighting facilities capable of either 3−step, 2−step or 1−step operation. The 3−step and 2−step lighting facilities can be altered in intensity, while the 1−step cannot. All lighting is illuminated for a period of 15 minutes from the most recent time of activation and may not be extinguished prior to end of the 15 minute period (except for 1−step and 2−step REILs which may be turned off when desired by keying the mike 5 or 3 times respectively).

c. Suggested use is to always initially key the mike 7 times; this assures that all controlled lights are turned on to the maximum available intensity. If desired, adjustment can then be made, where the capability is provided, to a lower intensity (or the REIL turned off) by keying 5 and/or 3 times. Due to the close proximity of airports using the same frequency, radio controlled lighting receivers may be set at a low sensitivity requiring the aircraft to be relatively close to activate the system. Consequently, even when lights are on, always key mike as directed when overflying an airport of intended landing or just prior to entering the final segment of an approach. This will assure the aircraft is close enough to activate the system and a full 15 minutes lighting duration is available. Approved lighting systems may be activated by keying the mike (within 5 seconds) as indicated in TBL 2−1−3.

TBL 2−1−3
Radio Control System

Key Mike	Function
7 times within 5 seconds	Highest intensity available
5 times within 5 seconds	Medium or lower intensity (Lower REIL or REIL−off)
3 times within 5 seconds	Lowest intensity available (Lower REIL or REIL−off)

d. For all public use airports with FAA standard systems the Chart Supplement U.S. contains the types of lighting, runway and the frequency that is used to activate the system. Airports with IAPs include data on the approach chart identifying the light system, the runway on which they are installed, and the frequency that is used to activate the system.

NOTE−
Although the CTAF is used to activate the lights at many airports, other frequencies may also be used. The appropriate frequency for activating the lights on the airport is provided in the Chart Supplement U.S. and the standard instrument approach procedures publications. It is not identified on the sectional charts.

e. Where the airport is not served by an IAP, it may have either the standard FAA approved control system or an independent type system of different specification installed by the airport sponsor. The Chart Supplement U.S. contains descriptions of pilot controlled lighting systems for each airport having other than FAA approved systems, and explains the type lights, method of control, and operating frequency in clear text.

2−1−10. Airport/Heliport Beacons

a. Airport and heliport beacons have a vertical light distribution to make them most effective from one to ten degrees above the horizon; however, they can be seen well above and below this peak spread. The beacon may be an omnidirectional capacitor−discharge device, or it may rotate at a constant speed which produces the visual effect of flashes at regular intervals. Flashes may be one or two colors alternately. The total number of flashes are:

1. 24 to 30 per minute for beacons marking airports, landmarks, and points on Federal airways.

2. 30 to 45 per minute for beacons marking heliports.

(b) The aircraft is operated by a student pilot or recreational pilot who seeks private pilot certification and has met the requirements of 14 CFR Section 61.95.

4. Unless otherwise authorized by ATC, each person operating a large turbine engine-powered airplane to or from a primary airport must operate at or above the designated floors while within the lateral limits of Class B airspace.

5. Unless otherwise authorized by ATC, each aircraft must be equipped as follows:

(a) For IFR operations, an operable VOR or TACAN receiver or an operable and suitable RNAV system; and

(b) For all operations, a two-way radio capable of communications with ATC on appropriate frequencies for that area; and

(c) Unless otherwise authorized by ATC, an operable radar beacon transponder with automatic altitude reporting equipment.

NOTE–
ATC may, upon notification, immediately authorize a deviation from the altitude reporting equipment requirement; however, a request for a deviation from the 4096 transponder equipment requirement must be submitted to the controlling ATC facility at least one hour before the proposed operation.

REFERENCE–
AIM, Paragraph 4–1–20 , Transponder Operation

6. Mode C Veil. The airspace within 30 nautical miles of an airport listed in Appendix D, Section 1 of 14 CFR Part 91 (generally primary airports within Class B airspace areas), from the surface upward to 10,000 feet MSL. Unless otherwise authorized by ATC, aircraft operating within this airspace must be equipped with automatic pressure altitude reporting equipment having Mode C capability.

However, an aircraft that was not originally certificated with an engine–driven electrical system or which has not subsequently been certified with a system installed may conduct operations within a Mode C veil provided the aircraft remains outside Class A, B or C airspace; and 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.

c. Charts. Class B airspace is charted on Sectional Charts, IFR En Route Low Altitude, and Terminal Area Charts.

d. Flight Procedures.

1. Flights. Aircraft within Class B airspace are required to operate in accordance with current IFR procedures. A clearance for a visual approach to a primary airport is not authorization for turbine–powered airplanes to operate below the designated floors of the Class B airspace.

2. VFR Flights.

(a) Arriving aircraft must obtain an ATC clearance prior to entering Class B airspace and must contact ATC on the appropriate frequency, and in relation to geographical fixes shown on local charts. Although a pilot may be operating beneath the floor of the Class B airspace on initial contact, communications with ATC should be established in relation to the points indicated for spacing and sequencing purposes.

(b) Departing aircraft require a clearance to depart Class B airspace and should advise the clearance delivery position of their intended altitude and route of flight. ATC will normally advise VFR aircraft when leaving the geographical limits of the Class B airspace. Radar service is not automatically terminated with this advisory unless specifically stated by the controller.

(c) Aircraft not landing or departing the primary airport may obtain an ATC clearance to transit the Class B airspace when traffic conditions permit and provided the requirements of 14 CFR Section 91.131 are met. Such VFR aircraft are encouraged, to the extent possible, to operate at altitudes above or below the Class B airspace or transit through established VFR corridors. Pilots operating in VFR corridors are urged to use frequency 122.750 MHz for the exchange of aircraft position information.

e. ATC Clearances and Separation. An ATC clearance is required to enter and operate within Class B airspace. VFR pilots are provided sequencing and separation from other aircraft while operating within Class B airspace.

REFERENCE–
AIM, Paragraph 4–1–18 , Terminal Radar Services for VFR Aircraft

NOTE–
1. *Separation and sequencing of VFR aircraft will be suspended in the event of a radar outage as this service is dependent on radar. The pilot will be advised that the service is not available and issued wind, runway information and the time or place to contact the tower.*

2. *Separation of VFR aircraft will be suspended during CENRAP operations. Traffic advisories and sequencing to the primary airport will be provided on a workload permitting basis. The pilot will be advised when center radar presentation (CENRAP) is in use.*

1. VFR aircraft are separated from all VFR/IFR aircraft which weigh 19,000 pounds or less by a minimum of:

(a) Target resolution, or

(b) 500 feet vertical separation, or

(c) Visual separation.

2. VFR aircraft are separated from all VFR/IFR aircraft which weigh more than 19,000 and turbojets by no less than:

(a) 1 $^{1}/_{2}$ miles lateral separation, or

(b) 500 feet vertical separation, or

(c) Visual separation.

3. This program is not to be interpreted as relieving pilots of their responsibilities to see and avoid other traffic operating in basic VFR weather conditions, to adjust their operations and flight path as necessary to preclude serious wake encounters, to maintain appropriate terrain and obstruction clearance or to remain in weather conditions equal to or better than the minimums required by 14 CFR Section 91.155. Approach control should be advised and a revised clearance or instruction obtained when compliance with an assigned route, heading and/or altitude is likely to compromise pilot responsibility with respect to terrain and obstruction clearance, vortex exposure, and weather minimums.

4. ATC may assign altitudes to VFR aircraft that do not conform to 14 CFR Section 91.159. **"RESUME APPROPRIATE VFR ALTITUDES"** will be broadcast when the altitude assignment is no longer needed for separation or when leaving Class B airspace. Pilots must return to an altitude that conforms to 14 CFR Section 91.159.

f. Proximity operations. VFR aircraft operating in proximity to Class B airspace are cautioned against operating too closely to the boundaries, especially where the floor of the Class B airspace is 3,000 feet or less above the surface or where VFR cruise altitudes are at or near the floor of higher levels. Observance of this precaution will reduce the potential for encountering an aircraft operating at the altitudes of Class B floors. Additionally, VFR aircraft are encouraged to utilize the VFR Planning Chart as a tool for planning flight in proximity to Class B airspace. Charted VFR Flyway Planning Charts are published on the back of the existing VFR Terminal Area Charts.

3–2–4. Class C Airspace

a. Definition. Generally, that airspace from the surface to 4,000 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower, are serviced by a radar approach control, and that have a certain number of IFR operations or passenger enplanements. Although the configuration of each Class C airspace area is individually tailored, the airspace usually consists of a 5 NM radius core surface area that extends from the surface up to 4,000 feet above the airport elevation, and a 10 NM radius shelf area that extends no lower than 1,200 feet up to 4,000 feet above the airport elevation.

b. Charts. Class C airspace is charted on Sectional Charts, IFR En Route Low Altitude, and Terminal Area Charts where appropriate.

c. Operating Rules and Pilot/Equipment Requirements:

1. Pilot Certification. No specific certification required.

2. Equipment.

(a) Two-way radio; and

(b) Unless otherwise authorized by ATC, an operable radar beacon transponder with automatic altitude reporting equipment.

NOTE–
See paragraph 4–1–20, Transponder Operation, subparagraph f2(c) for Mode C transponder requirements for operating above Class C airspace.

3. Arrival or Through Flight Entry Requirements. Two-way radio communication must be established with the ATC facility providing ATC services prior to entry and thereafter maintain those communications while in Class C airspace. Pilots of

State/City	Airport
Chicago	Midway International
Moline	Quad City International
Peoria	Greater Peoria Regional
Springfield	Abraham Lincoln Capital
INDIANA	
Evansville	Regional
Fort Wayne	International
Indianapolis	International
South Bend	Regional
IOWA	
Cedar Rapids	The Eastern Iowa
Des Moines	International
KANSAS	
Wichita	Mid−Continent
KENTUCKY	
Lexington	Blue Grass
Louisville	International−Standiford Field
LOUISIANA	
Baton Rouge	Metropolitan, Ryan Field
Lafayette	Regional
Shreveport	Barksdale AFB
Shreveport	Regional
MAINE	
Bangor	International
Portland	International Jetport
MICHIGAN	
Flint	Bishop International
Grand Rapids	Gerald R. Ford International
Lansing	Capital City
MISSISSIPPI	
Columbus	AFB
Jackson	Jackson−Evers International
MISSOURI	
Springfield	Springfield−Branson National
MONTANA	
Billings	Logan International
NEBRASKA	
Lincoln	Lincoln
Omaha	Eppley Airfield
Offutt	AFB
NEVADA	
Reno	Reno/Tahoe International
NEW HAMPSHIRE	
Manchester	Manchester
NEW JERSEY	
Atlantic City	International
NEW MEXICO	
Albuquerque	International Sunport
NEW YORK	
Albany	International
Buffalo	Niagara International
Islip	Long Island MacArthur
Rochester	Greater Rochester International
Syracuse	Hancock International

State/City	Airport
NORTH CAROLINA	
Asheville	Regional
Fayetteville	Regional/Grannis Field
Greensboro	Piedmont Triad International
Pope	AFB
Raleigh	Raleigh−Durham International
OHIO	
Akron	Akron−Canton Regional
Columbus	Port Columbus International
Dayton	James M. Cox International
Toledo	Express
OKLAHOMA	
Oklahoma City	Will Rogers World
Tinker	AFB
Tulsa	International
OREGON	
Portland	International
PENNSYLVANIA	
Allentown	Lehigh Valley International
PUERTO RICO	
San Juan	Luis Munoz Marin International
RHODE ISLAND	
Providence	Theodore Francis Green State
SOUTH CAROLINA	
Charleston	AFB/International
Columbia	Metropolitan
Greer	Greenville−Spartanburg International
Myrtle Beach	Myrtle Beach International
Shaw	AFB
TENNESSEE	
Chattanooga	Lovell Field
Knoxville	McGhee Tyson
Nashville	International
TEXAS	
Abilene	Regional
Amarillo	Rick Husband International
Austin	Austin−Bergstrom International
Corpus Christi	International
Dyess	AFB
El Paso	International
Harlingen	Valley International
Laughlin	AFB
Lubbock	Preston Smith International
Midland	International
San Antonio	International
VERMONT	
Burlington	International
VIRGIN ISLANDS	
St. Thomas	Charlotte Amalie Cyril E. King
VIRGINIA	
Richmond	International
Norfolk	International

State/City	Airport
Roanoke	Regional/Woodrum Field
WASHINGTON	
Point Roberts	Vancouver International
Spokane	Fairchild AFB
Spokane	International
Whidbey Island	NAS, Ault Field
WEST VIRGINIA	
Charleston	Yeager
WISCONSIN	
Green Bay	Austin Straubel International
Madison	Dane County Regional−Traux Field
Milwaukee	General Mitchell International

3−2−5. Class D Airspace

a. Definition. Generally, Class D airspace extends upward from the surface to 2,500 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower. The configuration of each Class D airspace area is individually tailored and when instrument procedures are published, the airspace will normally be designed to contain the procedures.

1. Class D surface areas may be designated as full-time (24 hour tower operations) or part-time. Part-time Class D effective times are published in the Chart Supplement U.S.

2. Where a Class D surface area is part-time, the airspace may revert to either a Class E surface area (see paragraph 3−2−6e1) or Class G airspace. When a part–time Class D surface area changes to Class G, the surface area becomes Class G airspace up to, but not including, the overlying controlled airspace.

NOTE−
1. *The airport listing in the Chart Supplement U.S. will state the part–time surface area status (for example, "other times CLASS E" or "other times CLASS G").*

2. *Normally, the overlying controlled airspace is the Class E transition area airspace that begins at either 700 feet AGL (charted as magenta vignette) or 1200 feet AGL (charted as blue vignette). This may be determined by consulting the applicable VFR Sectional or Terminal Area Charts.*

b. Operating Rules and Pilot/Equipment Requirements:

1. Pilot Certification. No specific certification required.

2. Equipment. Unless otherwise authorized by ATC, an operable two−way radio is required.

3. Arrival or Through Flight Entry Requirements. Two−way radio communication must be established with the ATC facility providing ATC services prior to entry and thereafter maintain those communications while in the Class D airspace. Pilots of arriving aircraft should contact the control tower on the publicized frequency and give their position, altitude, destination, and any request(s). Radio contact should be initiated far enough from the Class D airspace boundary to preclude entering the Class D airspace before two−way radio communications are established.

NOTE−
1. *If the controller responds to a radio call with, "[aircraft callsign] standby," radio communications have been established and the pilot can enter the Class D airspace.*

2. *If workload or traffic conditions prevent immediate entry into Class D airspace, the controller will inform the pilot to remain outside the Class D airspace until conditions permit entry.*

EXAMPLE−
1. *"[Aircraft callsign] remain outside the Class Delta airspace and standby."*
It is important to understand that if the controller responds to the initial radio call without using the aircraft callsign, radio communications have not been established and the pilot may not enter the Class D airspace.

2. *"Aircraft calling Manassas tower standby."*
At those airports where the control tower does not operate 24 hours a day, the operating hours of the tower will be listed on the appropriate charts and in the Chart Supplement U.S. During the hours the tower is not in operation, the Class E surface area rules or a combination of Class E rules to 700 feet above ground level and Class G rules to the surface will become applicable. Check the Chart Supplement U.S. for specifics.

4. Departures from:

(a) A primary or satellite airport with an operating control tower. Two-way radio communications must be established and maintained with the control tower, and thereafter as instructed by ATC while operating in the Class D airspace.

(b) A satellite airport without an operating control tower. Two-way radio communications must be established as soon as practicable after departing with the ATC facility having jurisdiction over the Class D airspace as soon as practicable after departing.

5. Aircraft Speed. Unless otherwise authorized or required by ATC, no person may operate an aircraft at or below 2,500 feet above the surface within 4 nautical miles of the primary airport of a Class D airspace area at an indicated airspeed of more than 200 knots (230 mph).

c. Class D airspace areas are depicted on Sectional and Terminal charts with blue segmented lines, and on IFR En Route Lows with a boxed [D].

d. Surface area arrival extensions:

1. Class D surface area arrival extensions for instrument approach procedures may be Class D or Class E airspace. As a general rule, if all extensions are 2 miles or less, they remain part of the Class D surface area. However, if any one extension is greater than 2 miles, then all extensions will be Class E airspace.

2. Surface area arrival extensions are effective during the published times of the surface area. For part–time Class D surface areas that revert to Class E airspace, the arrival extensions will remain in effect as Class E airspace. For part–time Class D surface areas that change to Class G airspace, the arrival extensions will become Class G at the same time.

e. Separation for VFR Aircraft. No separation services are provided to VFR aircraft.

3–2–6. Class E Airspace

a. Definition. Class E airspace is controlled airspace that is designated to serve a variety of terminal or en route purposes as described in this paragraph.

b. Operating Rules and Pilot/Equipment Requirements:

1. Pilot Certification. No specific certification required.

2. Equipment. No specific equipment required by the airspace.

3. Arrival or Through Flight Entry Requirements. No specific requirements.

c. Charts. Class E airspace below 14,500 feet MSL is charted on Sectional, Terminal, and IFR Enroute Low Altitude charts.

d. Vertical limits. Except where designated at a lower altitude (see paragraph 3–2–6e, below, for specifics), Class E airspace in the United States consists of:

1. The airspace extending upward from 14,500 feet MSL to, but not including, 18,000 feet MSL overlying the 48 contiguous states, the District of Columbia and Alaska, including the waters within nautical 12 miles from the coast of the 48 contiguous states and Alaska; excluding:

(a) The Alaska peninsula west of longitude 160°00'00"W.; and

(b) The airspace below 1,500 feet above the surface of the earth unless specifically designated lower (for example, in mountainous terrain higher than 13,000 feet MSL).

2. The airspace above FL 600 is Class E airspace.

e. Functions of Class E Airspace. Class E airspace may be designated for the following purposes:

1. Surface area designated for an airport where a control tower is not in operation. Class E surface areas extend upward from the surface to a designated altitude, or to the adjacent or overlying controlled airspace. The airspace will be configured to contain all instrument procedures.

(a) To qualify for a Class E surface area, the airport must have weather observation and reporting capability, and communications capability must exist with aircraft down to the runway surface.

(b) A Class E surface area may also be designated to accommodate part-time operations at a Class C or Class D airspace location (for example, those periods when the control tower is not in operation).

(c) Pilots should refer to the airport page in the applicable Chart Supplement U.S. for surface area status information.

2. Extension to a surface area. Class E airspace may be designated as extensions to Class B, Class C, Class D, and Class E surface areas. Class E airspace extensions begin at the surface and extend up to the overlying controlled airspace. The extensions provide controlled airspace to contain standard instrument approach procedures without imposing a communications requirement on pilots operating under VFR. Surface area arrival extensions become part of the surface area and are in effect during the same times as the surface area.

NOTE−
When a Class C or Class D surface area is not in effect continuously (for example, where a control tower only operates part-time), the surface area airspace will change to either a Class E surface area or Class G airspace. In such cases, the "Airspace" entry for the airport in the Chart Supplement U.S. will state "other times Class E" or "other times Class G." When a part-time surface area changes to Class E airspace, the Class E arrival extensions will remain in effect as Class E airspace. If a part–time Class C, Class D, or Class E surface area becomes Class G airspace, the arrival extensions will change to Class G at the same time.

3. Airspace used for transition. Class E airspace areas may be designated for transitioning aircraft to/from the terminal or en route environment.

(a) Class E transition areas extend upward from either 700 feet AGL (shown as magenta vignette on sectional charts) or 1,200 feet AGL (blue vignette) and are designated for airports with an approved instrument procedure.

(b) The 700-foot/1200-foot AGL Class E airspace transition areas remain in effect continuously, regardless of airport operating hours or surface area status.

NOTE−
Do not confuse the 700-foot and 1200-foot Class E transition areas with surface areas or surface area extensions.

4. En Route Domestic Areas. There are Class E airspace areas that extend upward from a specified altitude and are en route domestic airspace areas that provide controlled airspace in those areas where there is a requirement to provide IFR en route ATC services but the Federal airway system is inadequate.

5. Federal Airways and Low-Altitude RNAV Routes. Federal airways and low-altitude RNAV routes are Class E airspace areas and, unless otherwise specified, extend upward from 1,200 feet AGL to, but not including,18,000 feet MSL.

(a) Federal airways consist of Low/Medium Frequency (L/MF) airways (colored Federal airways) and VOR Federal airways.

(1) L/MF airways are based on non−directional beacons (NDB) and are identified as green, red, amber, or blue.

(2) VOR Federal airways are based on VOR/VORTAC facilities and are identified by a "V" prefix.

(b) Low-altitude RNAV routes consist of T-routes and helicopter RNAV routes (TK-routes).

NOTE−
See AIM Paragraph 5-3-4, Airways and Route Systems, for more details and charting information.

6. Offshore Airspace Areas. There are Class E airspace areas that extend upward from a specified altitude to, but not including, 18,000 feet MSL and are designated as offshore airspace areas. These areas provide controlled airspace beyond 12 miles from the coast of the U.S. in those areas where there is a requirement to provide IFR en route ATC services and within which the U.S. is applying domestic procedures.

f. Separation for VFR Aircraft. No separation services are provided to VFR aircraft.

Section 5. Other Airspace Areas

3−5−1. Airport Advisory/Information Services

a. There are three advisory type services available at selected airports.

1. Local Airport Advisory (LAA) service is available only in Alaska and is operated within 10 statute miles of an airport where a control tower is not operating but where a FSS is located on the airport. At such locations, the FSS provides a complete local airport advisory service to arriving and departing aircraft. During periods of fast changing weather the FSS will automatically provide Final Guard as part of the service from the time the aircraft reports "on−final" or "taking−the−active−runway" until the aircraft reports "on−the−ground" or "airborne."

NOTE−
Current policy, when requesting remote ATC services, requires that a pilot monitor the automated weather broadcast at the landing airport prior to requesting ATC services. The FSS automatically provides Final Guard, when appropriate, during LAA/Remote Airport Advisory (RAA) operations. Final Guard is a value added wind/altimeter monitoring service, which provides an automatic wind and altimeter check during active weather situations when the pilot reports on−final or taking the active runway. During the landing or take−off operation when the winds or altimeter are actively changing the FSS will blind broadcast significant changes when the specialist believes the change might affect the operation. Pilots should acknowledge the first wind/altimeter check but due to cockpit activity no acknowledgement is expected for the blind broadcasts. It is prudent for a pilot to report on−the−ground or airborne to end the service.

2. Remote Airport Information Service (RAIS) is provided in support of short term special events like small to medium fly−ins. The service is advertised by NOTAM D only. The FSS will not have access to a continuous readout of the current winds and altimeter; therefore, RAIS does not include weather and/or Final Guard service. However, known traffic, special event instructions, and all other services are provided.

NOTE−
The airport authority and/or manager should request RAIS support on official letterhead directly with the manager of the FSS that will provide the service at least 60 days in advance. Approval authority rests with the FSS manager and is based on workload and resource availability.

REFERENCE−
AIM, Paragraph 4−1−9, Traffic Advisory Practices at Airports Without Operating Control Towers

b. It is not mandatory that pilots participate in the Airport Advisory programs. Participation enhances safety for everyone operating around busy GA airports; therefore, everyone is encouraged to participate and provide feedback that will help improve the program.

3−5−2. Military Training Routes

a. National security depends largely on the deterrent effect of our airborne military forces. To be proficient, the military services must train in a wide range of airborne tactics. One phase of this training involves "low level" combat tactics. The required maneuvers and high speeds are such that they may occasionally make the see-and-avoid aspect of VFR flight more difficult without increased vigilance in areas containing such operations. In an effort to ensure the greatest practical level of safety for all flight operations, the Military Training Route (MTR) program was conceived.

b. The MTR program is a joint venture by the FAA and the Department of Defense (DOD). MTRs are mutually developed for use by the military for the purpose of conducting low-altitude, high-speed training. The routes above 1,500 feet AGL are developed to be flown, to the maximum extent possible, under IFR. The routes at 1,500 feet AGL and below are generally developed to be flown under VFR.

c. Generally, MTRs are established below 10,000 feet MSL for operations at speeds in excess of 250 knots. However, route segments may be defined at higher altitudes for purposes of route continuity. For example, route segments may be defined for descent, climbout, and mountainous terrain. There are IFR and VFR routes as follows:

1. IFR Military Training Routes−(IR). Operations on these routes are conducted in accordance with IFR regardless of weather conditions.

2. VFR Military Training Routes−(VR). Operations on these routes are conducted in accordance with VFR except flight visibility must be

5 miles or more; and flights must not be conducted below a ceiling of less than 3,000 feet AGL.

d. Military training routes will be identified and charted as follows:

1. Route identification.

(a) MTRs with no segment above 1,500 feet AGL must be identified by four number characters; e.g., IR1206, VR1207.

(b) MTRs that include one or more segments above 1,500 feet AGL must be identified by three number characters; e.g., IR206, VR207.

(c) Alternate IR/VR routes or route segments are identified by using the basic/principal route designation followed by a letter suffix, e.g., IR008A, VR1007B, etc.

2. Route charting.

(a) IFR Enroute Low Altitude Chart. This chart will depict all IR routes and all VR routes that accommodate operations above 1,500 feet AGL.

(b) VFR Sectional Aeronautical Charts. These charts will depict military training activities such as IR, VR, MOA, Restricted Area, Warning Area, and Alert Area information.

(c) Area Planning (AP/1B) Chart (DOD Flight Information Publication−FLIP). This chart is published by the National Geospatial−Intelligence Agency (NGA) primarily for military users and contains detailed information on both IR and VR routes.

REFERENCE−
AIM, Paragraph 9−1−5 , Subparagraph a, National Geospatial−Intelligence Agency (NGA) Products

e. The FLIP contains charts and narrative descriptions of these routes. To obtain this publication contact:

Defense Logistics Agency for Aviation
Mapping Customer Operations (DLA AVN/QAM)
8000 Jefferson Davis Highway
Richmond, VA 23297−5339
Toll free phone: 1−800−826−0342
Commercial: 804−279−6500

This NGA FLIP is available for pilot briefings at FSS and many airports.

f. Nonparticipating aircraft are not prohibited from flying within an MTR; however, extreme vigilance should be exercised when conducting flight through or near these routes. Pilots should contact FSSs within 100 NM of a particular MTR to obtain current information or route usage in their vicinity. Information available includes times of scheduled activity, altitudes in use on each route segment, and actual route width. Route width varies for each MTR and can extend several miles on either side of the charted MTR centerline. Route width information for IR and VR MTRs is also available in the FLIP AP/1B along with additional MTR (slow routes/air refueling routes) information. When requesting MTR information, pilots should give the FSS their position, route of flight, and destination in order to reduce frequency congestion and permit the FSS specialist to identify the MTR which could be a factor.

3−5−3. Temporary Flight Restrictions

a. General. This paragraph describes the types of conditions under which the FAA may impose temporary flight restrictions. It also explains which FAA elements have been delegated authority to issue a temporary flight restrictions NOTAM and lists the types of responsible agencies/offices from which the FAA will accept requests to establish temporary flight restrictions. The 14 CFR is explicit as to what operations are prohibited, restricted, or allowed in a temporary flight restrictions area. Pilots are responsible to comply with 14 CFR Sections 91.137, 91.138, 91.141 and 91.143 when conducting flight in an area where a temporary flight restrictions area is in effect, and should check appropriate NOTAMs during flight planning.

b. The purpose for establishing a temporary flight restrictions area is to:

1. 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));

2. Provide a safe environment for the operation of disaster relief aircraft (14 CFR Section 91.137(a)(2)); or

3. Prevent an unsafe congestion of sightseeing aircraft above an incident or event which may generate a high degree of public interest (14 CFR Section 91.137(a)(3)).

4. Protect declared national disasters for humanitarian reasons in the State of Hawaii (14 CFR Section 91.138).

5. Protect the President, Vice President, or other public figures (14 CFR Section 91.141).

6. Provide a safe environment for space agency operations (14 CFR Section 91.143).

c. Except for hijacking situations, when the provisions of 14 CFR Section 91.137(a)(1) or (a)(2) are necessary, a temporary flight restrictions area will only be established by or through the area manager at the Air Route Traffic Control Center (ARTCC) having jurisdiction over the area concerned. A temporary flight restrictions NOTAM involving the conditions of 14 CFR Section 91.137(a)(3) will be issued at the direction of the service area office director having oversight of the airspace concerned. When hijacking situations are involved, a temporary flight restrictions area will be implemented through the TSA Aviation Command Center. The appropriate FAA air traffic element, upon receipt of such a request, will establish a temporary flight restrictions area under 14 CFR Section 91.137(a)(1).

d. The FAA accepts recommendations for the establishment of a temporary flight restrictions area under 14 CFR Section 91.137(a)(1) from military major command headquarters, regional directors of the Office of Emergency Planning, Civil Defense State Directors, State Governors, or other similar authority. For the situations involving 14 CFR Section 91.137(a)(2), the FAA accepts recommendations from military commanders serving as regional, subregional, or Search and Rescue (SAR) coordinators; by military commanders directing or coordinating air operations associated with disaster relief; or by civil authorities directing or coordinating organized relief air operations (includes representatives of the Office of Emergency Planning, U.S. Forest Service, and State aeronautical agencies). Appropriate authorities for a temporary flight restrictions establishment under 14 CFR Section 91.137(a)(3) are any of those listed above or by State, county, or city government entities.

e. The type of restrictions issued will be kept to a minimum by the FAA consistent with achievement of the necessary objective. Situations which warrant the extreme restrictions of 14 CFR Section 91.137(a)(1) include, but are not limited to: toxic gas leaks or spills, flammable agents, or fumes which if fanned by rotor or propeller wash could endanger persons or property on the surface, or if entered by an aircraft could endanger persons or property in the air; imminent volcano eruptions which could endanger airborne aircraft and occupants; nuclear accident or incident; and hijackings. Situations which warrant the restrictions associated with 14 CFR Section 91.137(a)(2) include: forest fires which are being fought by releasing fire retardants from aircraft; and aircraft relief activities following a disaster (earthquake, tidal wave, flood, etc.). 14 CFR Section 91.137(a)(3) restrictions are established for events and incidents that would attract an unsafe congestion of sightseeing aircraft.

f. The amount of airspace needed to protect persons and property or provide a safe environment for rescue/relief aircraft operations is normally limited to within 2,000 feet above the surface and within a 3−nautical−mile radius. Incidents occurring within Class B, Class C, or Class D airspace will normally be handled through existing procedures and should not require the issuance of a temporary flight restrictions NOTAM. Temporary flight restrictions affecting airspace outside of the U.S. and its territories and possessions are issued with verbiage excluding that airspace outside of the 12−mile coastal limits.

g. The FSS nearest the incident site is normally the "coordination facility." When FAA communications assistance is required, the designated FSS will function as the primary communications facility for coordination between emergency control authorities and affected aircraft. The ARTCC may act as liaison for the emergency control authorities if adequate communications cannot be established between the designated FSS and the relief organization. For example, the coordination facility may relay authorizations from the on-scene emergency response official in cases where news media aircraft operations are approved at the altitudes used by relief aircraft.

h. ATC may authorize operations in a temporary flight restrictions area under its own authority only when flight restrictions are established under 14 CFR Section 91.137(a)(2) and (a)(3). The appropriate ARTCC/airport traffic control tower manager will, however, ensure that such authorized flights do not hamper activities or interfere with the event for which restrictions were implemented. However, ATC will not authorize local IFR flights into the temporary flight restrictions area.

i. To preclude misunderstanding, the implementing NOTAM will contain specific and formatted information. The facility establishing a temporary flight restrictions area will format a NOTAM beginning with the phrase "FLIGHT RESTRICTIONS" followed by: the location of the temporary flight restrictions area; the effective period; the area defined in statute miles; the altitudes affected; the FAA coordination facility and commercial telephone number; the reason for the temporary flight restrictions; the agency directing any relief activities and its commercial telephone number; and other information considered appropriate by the issuing authority.

EXAMPLE−

1. *14 CFR Section 91.137(a)(1):*
The following NOTAM prohibits all aircraft operations except those specified in the NOTAM.
Flight restrictions Matthews, Virginia, effective immediately until 9610211200. Pursuant to 14 CFR Section 91.137(a)(1) temporary flight restrictions are in effect. Rescue operations in progress. Only relief aircraft operations under the direction of the Department of Defense are authorized in the airspace at and below 5,000 feet MSL within a 2−nautical−mile radius of Laser AFB, Matthews, Virginia. Commander, Laser AFB, in charge (897) 946−5543 (122.4). Steenson FSS (792) 555−6141 (123.1) is the FAA coordination facility.

2. *14 CFR Section 91.137(a)(2):*
The following NOTAM permits flight operations in accordance with 14 CFR Section 91.137(a)(2). The on-site emergency response official to authorize media aircraft operations below the altitudes used by the relief aircraft.
Flight restrictions 25 miles east of Bransome, Idaho, effective immediately until 9601202359 UTC. Pursuant to 14 CFR Section 91.137(a)(2) temporary flight restrictions are in effect within a 4−nautical−mile radius of the intersection of county roads 564 and 315 at and below 3,500 feet MSL to provide a safe environment for fire fighting aircraft operations. Davis County sheriff's department (792) 555−8122 (122.9) is in charge of on-scene emergency response activities. Glivings FSS (792) 555−1618 (122.2) is the FAA coordination facility.

3. *14 CFR Section 91.137(a)(3):*
The following NOTAM prohibits sightseeing aircraft operations.
Flight restrictions Brown, Tennessee, due to olympic activity. Effective 9606181100 UTC until 9607190200 UTC. Pursuant to 14 CFR Section 91.137(a)(3) temporary flight restrictions are in effect within a 3−nautical−mile radius of N355783/W835242 and Volunteer VORTAC 019 degree radial 3.7 DME fix at and below 2,500 feet MSL. Norton FSS (423) 555−6742 (126.6) is the FAA coordination facility.

4. *14 CFR Section 91.138:*
The following NOTAM prohibits all aircraft except those operating under the authorization of the official in charge of associated emergency or disaster relief response activities, aircraft carrying law enforcement officials, aircraft carrying personnel involved in an emergency or legitimate scientific purposes, carrying properly accredited news media, and aircraft operating in accordance with an ATC clearance or instruction.
Flight restrictions Kapalua, Hawaii, effective 9605101200 UTC until 9605151500 UTC. Pursuant to 14 CFR Section 91.138 temporary flight restrictions are in effect within a 3−nautical−mile radius of N205778/W1564038 and Maui/OGG/VORTAC 275 degree radial at 14.1 nautical miles. John Doe 808−757−4469 or 122.4 is in charge of the operation. Honolulu/HNL 808−757−4470 (123.6) FSS is the FAA coordination facility.

5. *14 CFR Section 91.141:*
The following NOTAM prohibits all aircraft.
Flight restrictions Stillwater, Oklahoma, June 21, 1996. Pursuant to 14 CFR Section 91.141 aircraft flight operations are prohibited within a 3−nautical−mile radius, below 2000 feet AGL of N360962/W970515 and the Stillwater/SWO/VOR/DME 176 degree radial 3.8−nautical−mile fix from 1400 local time to 1700 local time June 21, 1996, unless otherwise authorized by ATC.

6. *14 CFR Section 91.143:*
The following NOTAM prohibits any aircraft of U.S. registry, or pilot any aircraft under the authority of an airman certificate issued by the FAA.
Kennedy space center space operations area effective immediately until 9610152100 UTC. Pursuant to 14 CFR Section 91.143, flight operations conducted by FAA certificated pilots or conducted in aircraft of U.S. registry are prohibited at any altitude from surface to unlimited, within the following area 30−nautical−mile radius of the Melbourne/MLB/VORTAC 010 degree radial 21−nautical−mile fix. St. Petersburg, Florida/PIE/FSS 813−545−1645 (122.2) is the FAA coordination facility and should be contacted for the current status of any airspace associated with the space shuttle operations. This airspace encompasses R2933, R2932, R2931, R2934, R2935, W497A and W158A. Additional warning and restricted areas will be active in conjunction with the operations. Pilots must consult all NOTAMs regarding this operation.

3−5−4. Parachute Jump Aircraft Operations

a. Procedures relating to parachute jump areas are contained in 14 CFR Part 105. Tabulations of parachute jump areas in the U.S. are contained in the Chart Supplement U.S.

b. Pilots of aircraft engaged in parachute jump operations are reminded that all reported altitudes must be with reference to mean sea level, or flight level, as appropriate, to enable ATC to provide meaningful traffic information.

c. Parachute operations in the vicinity of an airport without an operating control tower − there is no substitute for alertness while in the vicinity of an airport. It is essential that pilots conducting parachute operations be alert, look for other traffic, and exchange traffic information as recommended in Paragraph 4−1−9, Traffic Advisory Practices at Airports Without Operating Control Towers. In addition, pilots should avoid releasing parachutes while in an airport traffic pattern when there are other aircraft in that pattern. Pilots should make appropriate broadcasts on the designated Common Traffic Advisory Frequency (CTAF), and monitor that CTAF until all parachute activity has terminated or the aircraft has left the area. Prior to commencing a jump operation, the pilot should broadcast the aircraft's altitude and position in relation to the airport, the approximate relative time when the jump will commence and terminate, and listen to the position reports of other aircraft in the area.

3−5−5. Published VFR Routes

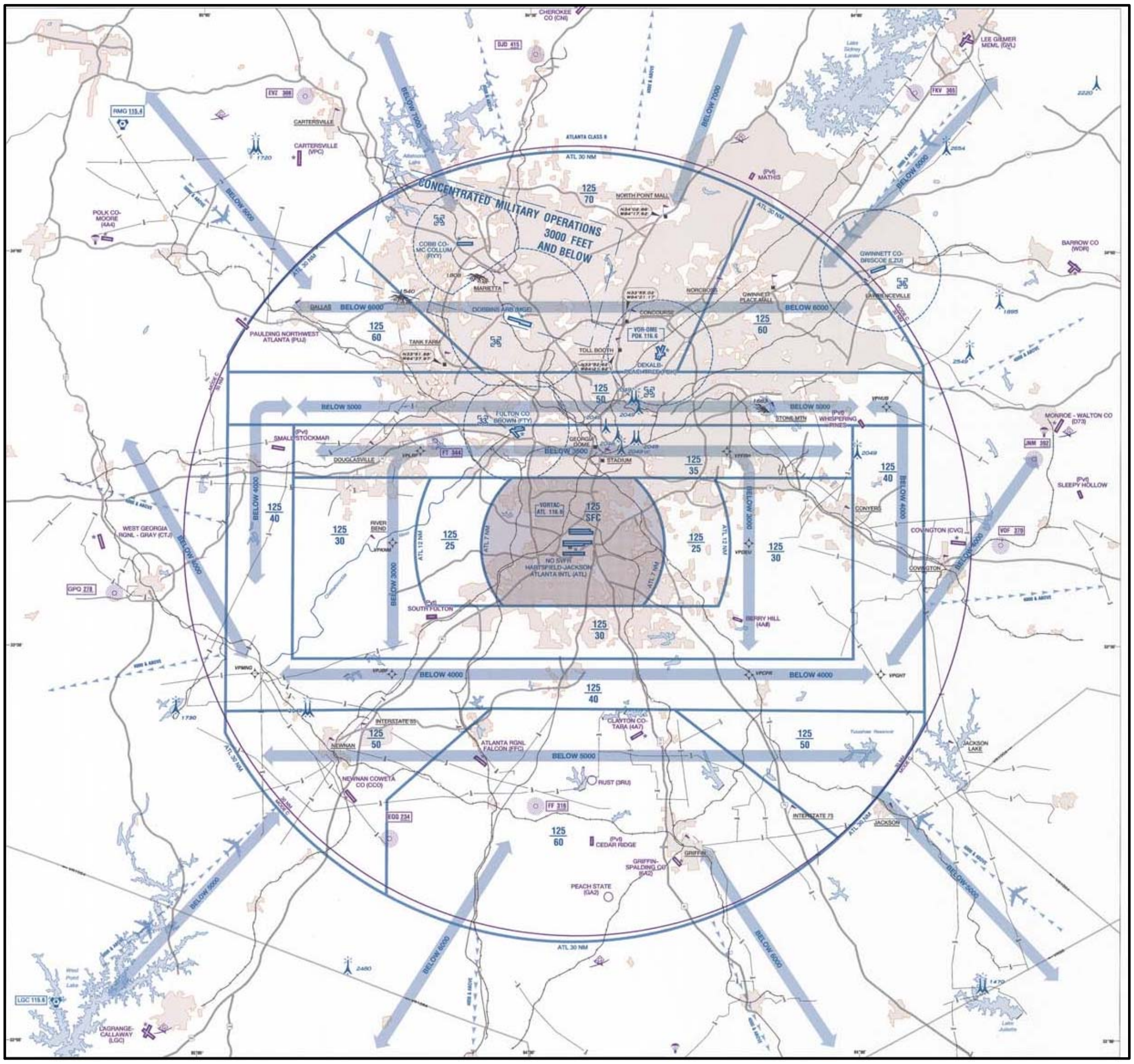
Published VFR routes for transitioning around, under and through complex airspace such as Class B airspace were developed through a number of FAA and industry initiatives. All of the following terms, i.e., "VFR Flyway" "VFR Corridor" and "Class B Airspace VFR Transition Route" have been used when referring to the same or different types of routes or airspace. The following paragraphs identify and clarify the functionality of each type of route, and specify where and when an ATC clearance is required.

a. VFR Flyways.

1. VFR Flyways and their associated Flyway Planning Charts were developed from the recommendations of a National Airspace Review Task Group. A VFR Flyway is defined as a general flight path not defined as a specific course, for use by pilots in planning flights into, out of, through or near complex terminal airspace to avoid Class B airspace. An ATC clearance is NOT required to fly these routes.

FIG 3−5−1

VFR Flyway Planning Chart



Chapter 4. Air Traffic Control

Section 1. Services Available to Pilots

4-1-1. Air Route Traffic Control Centers

Centers are established primarily to provide air traffic service to aircraft operating on IFR flight plans within controlled airspace, and principally during the en route phase of flight.

4-1-2. Control Towers

Towers have been established to provide for a safe, orderly and expeditious flow of traffic on and in the vicinity of an airport. When the responsibility has been so delegated, towers also provide for the separation of IFR aircraft in the terminal areas.

REFERENCE-
AIM, Paragraph 5-4-3, Approach Control

4-1-3. Flight Service Stations

Flight Service Stations (FSSs) are air traffic facilities which provide pilot briefings, flight plan processing, en route flight advisories, search and rescue services, and assistance to lost aircraft and aircraft in emergency situations. FSSs also relay ATC clearances, process Notices to Airmen, broadcast aviation weather and aeronautical information, and advise Customs and Border Protection of transborder flights. In Alaska, designated FSSs also provide TWEB recordings, take weather observations, and provide Airport Advisory Services (AAS).

4-1-4. Recording and Monitoring

a. Calls to air traffic control (ATC) facilities (ARTCCs, Towers, FSSs, Central Flow, and Operations Centers) over radio and ATC operational telephone lines (lines used for operational purposes such as controller instructions, briefings, opening and closing flight plans, issuance of IFR clearances and amendments, counter hijacking activities, etc.) may be monitored and recorded for operational uses such as accident investigations, accident prevention, search and rescue purposes, specialist training and evaluation, and technical evaluation and repair of control and communications systems.

b. Where the public access telephone is recorded, a beeper tone is not required. In place of the "beep" tone the FCC has substituted a mandatory requirement that persons to be recorded be given notice they are to be recorded and give consent. Notice is given by this entry, consent to record is assumed by the individual placing a call to the operational facility.

4-1-5. Communications Release of IFR Aircraft Landing at an Airport Without an Operating Control Tower

Aircraft operating on an IFR flight plan, landing at an airport without an operating control tower will be advised to change to the airport advisory frequency when direct communications with ATC are no longer required. Towers and centers do not have nontower airport traffic and runway in use information. The instrument approach may not be aligned with the runway in use; therefore, if the information has not already been obtained, pilots should make an expeditious change to the airport advisory frequency when authorized.

REFERENCE-
AIM, Paragraph 5-4-4, Advance Information on Instrument Approach

4-1-6. Pilot Visits to Air Traffic Facilities

Pilots are encouraged to visit air traffic facilities (Towers, Centers and FSSs) and familiarize themselves with the ATC system. On rare occasions, facilities may not be able to approve a visit because of ATC workload or other reasons. It is, therefore, requested that pilots contact the facility prior to the visit and advise of the number of persons in the group, the time and date of the proposed visit and the primary interest of the group. With this information available, the facility can prepare an itinerary and have someone available to guide the group through the facility.

4-1-7. Operation Take-off and Operation Raincheck

Operation Take-off is a program that educates pilots in how best to utilize the FSS modernization efforts and services available in Flight Service Stations (FSS), as stated in FAA Order 7230.17, Pilot Education Program - Operation Takeoff. Operation Raincheck is a program designed to familiarize pilots with the ATC system, its functions, responsibilities and benefits.

4-1-8. Approach Control Service for VFR Arriving Aircraft

a. Numerous approach control facilities have established programs for arriving VFR aircraft to contact approach control for landing information. This information includes: wind, runway, and altimeter setting at the airport of intended landing. This information may be omitted if contained in the Automatic Terminal Information Service (ATIS) broadcast and the pilot states the appropriate ATIS code.

NOTE-
Pilot use of "have numbers" does not indicate receipt of the ATIS broadcast. In addition, the controller will provide traffic advisories on a workload permitting basis.

b. Such information will be furnished upon initial contact with concerned approach control facility. The pilot will be requested to change to the *tower* frequency at a predetermined time or point, to receive further landing information.

c. Where available, use of this procedure will not hinder the operation of VFR flights by requiring excessive spacing between aircraft or devious routing.

d. Compliance with this procedure is not mandatory but pilot participation is encouraged.

REFERENCE-
AIM, Paragraph 4-1-18, Terminal Radar Services for VFR Aircraft

NOTE-
Approach control services for VFR aircraft are normally dependent on ATC radar. These services are not available during periods of a radar outage. Approach control services for VFR aircraft are limited when CENRAP is in use.

4-1-9. Traffic Advisory Practices at Airports Without Operating Control Towers

(See TBL 4-1-1.)

a. Airport Operations Without Operating Control Tower

1. There is no substitute for alertness while in the vicinity of an airport. It is essential that pilots be alert and look for other traffic and exchange traffic information when approaching or departing an airport without an operating control tower. This is of particular importance since other aircraft may not have communication capability or, in some cases, pilots may not communicate their presence or intentions when operating into or out of such airports. To achieve the greatest degree of safety, it is essential that all radio-equipped aircraft transmit/receive on a common frequency identified for the purpose of airport advisories.

2. An airport may have a full or part-time tower or FSS located on the airport, a full or part-time UNICOM station or no aeronautical station at all. There are three ways for pilots to communicate their intention and obtain airport/traffic information when operating at an airport that does not have an operating tower: by communicating with an FSS, a UNICOM operator, or by making a self-announce broadcast.

NOTE-
FSS airport advisories are available only in Alaska.

3. Many airports are now providing 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 of the automated UNICOM will be published in the Chart Supplement U.S. and approach charts.

b. Communicating on a Common Frequency

1. The key to communicating at an airport without an operating control tower is selection of the correct common frequency. The acronym CTAF which stands for Common Traffic Advisory Frequency, is synonymous with this program. A CTAF is a frequency designated for the purpose of carrying out airport advisory practices while operating to or from an airport without an operating control tower. The CTAF may be a UNICOM, MULTICOM, FSS, or tower frequency and is identified in appropriate aeronautical publications.

NOTE-
FSS frequencies are available only in Alaska.

TBL 4-1-1
Summary of Recommended Communication Procedures

			Communication/Broadcast Procedures		
	Facility at Airport	**Frequency Use**	**Outbound**	**Inbound**	**Practice Instrument Approach**
1.	UNICOM (No Tower or FSS)	Communicate with UNICOM station on published CTAF frequency (122.7; 122.8; 122.725; 122.975; or 123.0). If unable to contact UNICOM station, use self-announce procedures on CTAF.	Before taxiing and before taxiing on the runway for departure.	10 miles out. Entering downwind, base, and final. Leaving the runway.	
2.	No Tower, FSS, or UNICOM	Self-announce on MULTICOM frequency 122.9.	Before taxiing and before taxiing on the runway for departure.	10 miles out. Entering downwind, base, and final. Leaving the runway.	Departing final approach fix (name) or on final approach segment inbound.
3.	No Tower in operation, FSS open (Alaska only)	Communicate with FSS on CTAF frequency.	Before taxiing and before taxiing on the runway for departure.	10 miles out. Entering downwind, base, and final. Leaving the runway.	Approach completed/terminated.
4.	FSS Closed (No Tower)	Self-announce on CTAF.	Before taxiing and before taxiing on the runway for departure.	10 miles out. Entering downwind, base, and final. Leaving the runway.	
5.	Tower or FSS not in operation	Self-announce on CTAF.	Before taxiing and before taxiing on the runway for departure.	10 miles out. Entering downwind, base, and final. Leaving the runway.	
6.	Designated CTAF Area (Alaska Only)	Self-announce on CTAF designated on chart or Chart Supplement Alaska.	Before taxiing and before taxiing on the runway for departure until leaving designated area.	When entering designated CTAF area.	

2. CTAF (Alaska Only). In Alaska, a CTAF may also be designated for the purpose of carrying out advisory practices while operating in designated areas with a high volume of VFR traffic.

3. The CTAF frequency for a particular airport or area is contained in the Chart Supplement U.S., Chart Supplement Alaska, Alaska Terminal Publication, Instrument Approach Procedure Charts, and Instrument Departure Procedure (DP) Charts. Also, the CTAF frequency can be obtained by contacting any FSS. Use of the appropriate CTAF, combined with a visual alertness and application of the following recommended good operating practices, will enhance safety of flight into and out of all uncontrolled airports.

c. Recommended Traffic Advisory Practices

1. Pilots of inbound traffic should monitor and communicate as appropriate on the designated CTAF from 10 miles to landing. Pilots of departing aircraft should monitor/communicate on the appropriate frequency from start-up, during taxi, and until 10 miles from the airport unless the CFRs or local procedures require otherwise.

2. Pilots of aircraft conducting other than arriving or departing operations at altitudes normally used by arriving and departing aircraft should monitor/communicate on the appropriate frequency while within 10 miles of the airport unless required to do otherwise by the CFRs or local procedures. Such operations include parachute jumping/dropping, en route, practicing maneuvers, etc.

3. In Alaska, pilots of aircraft conducting other than arriving or departing operations in designated CTAF areas should monitor/communicate on the appropriate frequency while within the designated area, unless required to do otherwise by CFRs or local procedures. Such operations include parachute jumping/dropping, en route, practicing maneuvers, etc.

REFERENCE−
AIM, Paragraph 3−5−4 , Parachute Jump Aircraft Operations

d. Airport Advisory/Information Services Provided by a FSS

1. There are two advisory type services provided at selected airports.

(a) Local Airport Advisory (LAA) is available only in Alaska and provided at airports that have a FSS physically located on the airport, which does not have a control tower or where the tower is operated on a part−time basis. The CTAF for LAA airports is disseminated in the appropriate aeronautical publications.

(b) Remote Airport Information Service (RAIS) is provided in support of special events at nontowered airports by request from the airport authority.

2. In communicating with a CTAF FSS, check the airport's automated weather and establish two−way communications before transmitting outbound/inbound intentions or information. An inbound aircraft should initiate contact approximately 10 miles from the airport, reporting aircraft identification and type, altitude, location relative to the airport, intentions (landing or over flight), possession of the automated weather, and request airport advisory or airport information service. A departing aircraft should initiate contact before taxiing, reporting aircraft identification and type, VFR or IFR, location on the airport, intentions, direction of take−off, possession of the automated weather, and request airport advisory or information service. Also, report intentions before taxiing onto the active runway for departure. If you must change frequencies for other service after initial report to FSS, return to FSS frequency for traffic update.

(a) Inbound

EXAMPLE−
Vero Beach radio, Centurion Six Niner Delta Delta is ten miles south, two thousand, landing Vero Beach. I have the automated weather, request airport advisory.

(b) Outbound

EXAMPLE−
Vero Beach radio, Centurion Six Niner Delta Delta, ready to taxi to runway 22, VFR, departing to the southwest. I have the automated weather, request airport advisory.

3. Airport advisory service includes wind direction and velocity, favored or designated runway, altimeter setting, known airborne and ground traffic, NOTAMs, airport taxi routes, airport traffic pattern information, and instrument approach procedures. These elements are varied so as to best serve the current traffic situation. Some airport managers have specified that under certain wind or other conditions designated runways be used. Pilots should advise the FSS of the runway they intend to use.

CAUTION−
All aircraft in the vicinity of an airport may not be in communication with the FSS.

e. Information Provided by Aeronautical Advisory Stations (UNICOM)

1. UNICOM is a nongovernment air/ground radio communication station which may provide airport information at public use airports where there is no tower or FSS.

2. On pilot request, UNICOM stations may provide pilots with weather information, wind direction, the recommended runway, or other necessary information. If the UNICOM frequency is designated as the CTAF, it will be identified in appropriate aeronautical publications.

f. Unavailability of Information from FSS or UNICOM

Should LAA by an FSS or Aeronautical Advisory Station UNICOM be unavailable, wind and weather information may be obtainable from nearby controlled airports via Automatic Terminal Information Service (ATIS) or Automated Weather Observing System (AWOS) frequency.

g. Self-Announce Position and/or Intentions

1. General. Self-announce is a procedure whereby pilots broadcast their position or intended flight activity or ground operation on the designated CTAF. This procedure is used primarily at airports which do not have an FSS on the airport. The self-announce procedure should also be used if a pilot is unable to communicate with the FSS on the designated CTAF. Pilots stating, *"Traffic in the area, please advise"* is not a recognized Self−Announce Position and/or Intention phrase and should not be used under any condition.

2. If an airport has a tower and it is temporarily closed, or operated on a part-time basis and there is no FSS on the airport or the FSS is closed, use the CTAF to self-announce your position or intentions.

3. Where there is no tower, FSS, or UNICOM station on the airport, use MULTICOM frequency 122.9 for self-announce procedures. Such airports will be identified in appropriate aeronautical information publications.

4. Practice Approaches. Pilots conducting practice instrument approaches should be particularly alert for other aircraft that may be departing in the opposite direction. When conducting any practice approach, regardless of its direction relative to other airport operations, pilots should make announcements on the CTAF as follows:

(a) Departing the final approach fix, inbound (nonprecision approach) or departing the outer marker or fix used in lieu of the outer marker, inbound (precision approach);

(b) Established on the final approach segment or immediately upon being released by ATC;

(c) Upon completion or termination of the approach; and

(d) Upon executing the missed approach procedure.

5. Departing aircraft should always be alert for arrival aircraft coming from the opposite direction.

6. Recommended self-announce phraseologies: It should be noted that aircraft operating to or from another nearby airport may be making self-announce broadcasts on the same UNICOM or MULTICOM frequency. To help identify one airport from another, the airport name should be spoken at the beginning and end of each self-announce transmission.

(a) Inbound

EXAMPLE−
Strawn traffic, Apache Two Two Five Zulu, (position), (altitude), (descending) or entering downwind/base/final (as appropriate) runway one seven full stop, touch−and−go, Strawn.
Strawn traffic Apache Two Two Five Zulu clear of runway one seven Strawn.

(b) Outbound

EXAMPLE−
Strawn traffic, Queen Air Seven One Five Five Bravo (location on airport) taxiing to runway two six Strawn.
Strawn traffic, Queen Air Seven One Five Five Bravo departing runway two six. Departing the pattern to the (direction), climbing to (altitude) Strawn.

(c) Practice Instrument Approach

EXAMPLE−
Strawn traffic, Cessna Two One Four Three Quebec (position from airport) inbound descending through (altitude) practice (name of approach) approach runway three five Strawn.
Strawn traffic, Cessna Two One Four Three Quebec practice (type) approach completed or terminated runway three five Strawn.

h. UNICOM Communications Procedures

1. In communicating with a UNICOM station, the following practices will help reduce frequency congestion, facilitate a better understanding of pilot intentions, help identify the location of aircraft in the traffic pattern, and enhance safety of flight:

(a) Select the correct UNICOM frequency.

(b) State the identification of the UNICOM station you are calling in each transmission.

(c) Speak slowly and distinctly.

(d) Report approximately 10 miles from the airport, reporting altitude, and state your aircraft type, aircraft identification, location relative to the airport, state whether landing or overflight, and request wind information and runway in use.

(e) Report on downwind, base, and final approach.

(f) Report leaving the runway.

2. Recommended UNICOM phraseologies:

(a) Inbound

PHRASEOLOGY−
FREDERICK UNICOM CESSNA EIGHT ZERO ONE TANGO FOXTROT 10 MILES SOUTHEAST DESCENDING THROUGH (altitude) LANDING FREDERICK, REQUEST WIND AND RUNWAY INFORMATION FREDERICK.
FREDERICK TRAFFIC CESSNA EIGHT ZERO ONE TANGO FOXTROT ENTERING DOWNWIND/BASE/

FINAL (as appropriate) FOR RUNWAY ONE NINER (full stop/touch−and−go) FREDERICK.
FREDERICK TRAFFIC CESSNA EIGHT ZERO ONE TANGO FOXTROT CLEAR OF RUNWAY ONE NINER FREDERICK.

(b) Outbound

PHRASEOLOGY−
FREDERICK UNICOM CESSNA EIGHT ZERO ONE TANGO FOXTROT (location on airport) TAXIING TO RUNWAY ONE NINER, REQUEST WIND AND TRAFFIC INFORMATION FREDERICK.
FREDERICK TRAFFIC CESSNA EIGHT ZERO ONE TANGO FOXTROT DEPARTING RUNWAY ONE NINER. "REMAINING IN THE PATTERN" OR "DEPARTING THE PATTERN TO THE (direction) (as appropriate)" FREDERICK.

4−1−10. IFR Approaches/Ground Vehicle Operations

a. IFR Approaches. When operating in accordance with an IFR clearance and ATC approves a change to the advisory frequency, make an expeditious change to the CTAF and employ the recommended traffic advisory procedures.

b. Ground Vehicle Operation. Airport ground vehicles equipped with radios should monitor the CTAF frequency when operating on the airport movement area and remain clear of runways/taxiways being used by aircraft. Radio transmissions from ground vehicles should be confined to safety-related matters.

c. Radio Control of Airport Lighting Systems. Whenever possible, the CTAF will be used to control airport lighting systems at airports without operating control towers. This eliminates the need for pilots to change frequencies to turn the lights on and allows a continuous listening watch on a single frequency. The CTAF is published on the instrument approach chart and in other appropriate aeronautical information publications. For further details concerning radio controlled lights, see AC 150/5340−27, Air−to−Ground Radio Control of Airport Lighting Systems.

4−1−11. Designated UNICOM/MULTICOM Frequencies

Frequency use

a. The following listing depicts UNICOM and MULTICOM frequency uses as designated by the Federal Communications Commission (FCC).
(See TBL 4−1−2.)

TBL 4−1−2
Unicom/Multicom Frequency Usage

Use	Frequency
Airports without an operating control tower.	122.700 122.725 122.800 122.975 123.000 123.050 123.075
(MULTICOM FREQUENCY) Activities of a temporary, seasonal, emergency nature or search and rescue, as well as, airports with no tower, FSS, or UNICOM.	122.900
(MULTICOM FREQUENCY) Forestry management and fire suppression, fish and game management and protection, and environmental monitoring and protection.	122.925
Airports with a control tower or FSS on airport.	122.950

NOTE−
1. *In some areas of the country, frequency interference may be encountered from nearby airports using the same UNICOM frequency. Where there is a problem, UNICOM operators are encouraged to develop a "least interference" frequency assignment plan for airports concerned using the frequencies designated for airports without operating control towers. UNICOM licensees are encouraged to apply for UNICOM 25 kHz spaced channel frequencies. Due to the extremely limited number of frequencies with 50 kHz channel spacing, 25 kHz channel spacing should be implemented. UNICOM licensees may then request FCC to assign frequencies in accordance with the plan, which FCC will review and consider for approval.*

2. *Wind direction and runway information may not be available on UNICOM frequency 122.950.*

b. The following listing depicts other frequency uses as designated by the Federal Communications Commission (FCC). (See TBL 4−1−3.)

TBL 4−1−3
Other Frequency Usage Designated by FCC

Use	Frequency
Air-to-air communication (private fixed wing aircraft).	122.750
Air-to-air communications (general aviation helicopters).	123.025
Aviation instruction, Glider, Hot Air Balloon (**not to be used for advisory service**).	123.300 123.500

4−1−12. Use of UNICOM for ATC Purposes

UNICOM service may be used for ATC purposes, only under the following circumstances:

a. Revision to proposed departure time.

b. Takeoff, arrival, or flight plan cancellation time.

c. ATC clearance, provided arrangements are made between the ATC facility and the UNICOM licensee to handle such messages.

4−1−13. Automatic Terminal Information Service (ATIS)

a. ATIS is the continuous broadcast of recorded noncontrol information in selected high activity terminal areas. Its purpose is to improve controller effectiveness and to relieve frequency congestion by automating the repetitive transmission of essential but routine information. The information is continuously broadcast over a discrete VHF radio frequency or the voice portion of a local NAVAID. Arrival ATIS transmissions on a discrete VHF radio frequency are engineered according to the individual facility requirements, which would normally be a protected service volume of 20 NM to 60 NM from the ATIS site and a maximum altitude of 25,000 feet AGL. In the case of a departure ATIS, the protected service volume cannot exceed 5 NM and 100 feet AGL. At most locations, ATIS signals may be received on the surface of the airport, but local conditions may limit the maximum ATIS reception distance and/or altitude. Pilots are urged to cooperate in the ATIS program as it relieves frequency congestion on approach control, ground control, and local control frequencies. The Chart Supplement U.S. indicates airports for which ATIS is provided.

b. ATIS information includes the time of the latest weather sequence, ceiling, visibility, obstructions to visibility, temperature, dew point (if available), wind direction (magnetic), and velocity, altimeter, other pertinent remarks, instrument approach and runway in use. The ceiling/sky condition, visibility, and obstructions to vision may be omitted from the ATIS broadcast if the ceiling is above 5,000 feet and the visibility is more than 5 miles. The departure runway will only be given if different from the landing runway except at locations having a separate ATIS for departure. The broadcast may include the appropriate frequency and instructions for VFR arrivals to make initial contact with approach control. Pilots of aircraft arriving or departing the terminal area can receive the continuous ATIS broadcast at times when cockpit duties are least pressing and listen to as many repeats as desired. ATIS broadcast must be updated upon the receipt of any official hourly and special weather. A new recording will also be made when there is a change in other pertinent data such as runway change, instrument approach in use, etc.

EXAMPLE−
Dulles International information Sierra. 1300 zulu weather. Measured ceiling three thousand overcast. Visibility three, smoke. Temperature six eight. Wind three five zero at eight. Altimeter two niner niner two. ILS runway one right approach in use. Landing runway one right and left. Departure runway three zero. Armel VORTAC out of service. Advise you have Sierra.

c. Pilots should listen to ATIS broadcasts whenever ATIS is in operation.

d. Pilots should notify controllers on initial contact that they have received the ATIS broadcast by repeating the alphabetical code word appended to the broadcast.

EXAMPLE−
"Information Sierra received."

e. When a pilot acknowledges receipt of the ATIS broadcast, controllers may omit those items contained in the broadcast if they are current. Rapidly changing conditions will be issued by ATC and the ATIS will contain words as follows:

EXAMPLE−
"Latest ceiling/visibility/altimeter/wind/(other conditions) will be issued by approach control/tower."

NOTE−
The absence of a sky condition or ceiling and/or visibility on ATIS indicates a sky condition or ceiling of 5,000 feet or above and visibility of 5 miles or more. A remark may be

made on the broadcast, "the weather is better than 5000 and 5," or the existing weather may be broadcast.

f. Controllers will issue pertinent information to pilots who do not acknowledge receipt of a broadcast or who acknowledge receipt of a broadcast which is not current.

g. To serve frequency limited aircraft, FSSs are equipped to transmit on the omnirange frequency at most en route VORs used as ATIS voice outlets. Such communication interrupts the ATIS broadcast. Pilots of aircraft equipped to receive on other FSS frequencies are encouraged to do so in order that these override transmissions may be kept to an absolute minimum.

h. While it is a good operating practice for pilots to make use of the ATIS broadcast where it is available, some pilots use the phrase "have numbers" in communications with the control tower. Use of this phrase means that the pilot has received wind, runway, and altimeter information ONLY and the tower does not have to repeat this information. It does not indicate receipt of the ATIS broadcast and should never be used for this purpose.

4−1−14. Automatic Flight Information Service (AFIS) − Alaska FSSs Only

a. Alaska FSSs AFIS is the continuous broadcast of recorded noncontrol information at airports in Alaska where a Flight Service Station (FSS) provides local airport advisory service. Its purpose is to improve FSS Specialist efficiency by reducing frequency congestion on the local airport advisory frequency. The AFIS broadcast will automate the repetitive transmission of essential but routine information (weather, favored runway, breaking action, airport NOTAMs, other applicable information). The information is continuously broadcast over a discrete VHF radio frequency (usually the ASOS frequency). Use of AFIS is not mandatory, but pilots who choose to utilize two−way radio communications with the FSS are urged to listen to AFIS, as it relieves frequency congestion on the local airport advisory frequency. AFIS broadcasts are updated upon the receipt of any official hourly and special weather, worsening braking action reports, and changes in other pertinent data. When a pilot acknowledges receipt of the AFIS broadcast, FSS Specialists may omit those items contained in the broadcast if they are current. When rapidly changing conditions exist, the latest ceiling, visibility, altimeter, wind or other conditions may be omitted from the AFIS and will be issued by the Flight Service Specialist on the appropriate radio frequency.

EXAMPLE−
"Kotzebue information ALPHA. One six five five zulu. Wind, two one zero at five; visibility two, fog; ceiling one hundred overcast; temperature minus one two, dew point minus one four; altimeter three one zero five. Altimeter in excess of three one zero zero, high pressure altimeter setting procedures are in effect. Favored runway two six. Weather in Kotzebue surface area is below V−F−R minima − an ATC clearance is required. Contact Kotzebue Radio on 123.6 for traffic advisories and advise intentions. Notice to Airmen, Hotham NDB out of service. Transcribed Weather Broadcast out of service. Advise on initial contact you have ALPHA."

NOTE−
The absence of a sky condition or ceiling and/or visibility on Alaska FSS AFIS indicates a sky condition or ceiling of 5,000 feet or above and visibility of 5 miles or more. A remark may be made on the broadcast, "the weather is better than 5000 and 5."

b. Pilots should listen to Alaska FSSs AFIS broadcasts whenever Alaska FSSs AFIS is in operation.

NOTE−
Some Alaska FSSs are open part time and/or seasonally.

c. Pilots should notify controllers on initial contact that they have received the Alaska FSSs AFIS broadcast by repeating the phonetic alphabetic letter appended to the broadcast.

EXAMPLE−
"Information Alpha received."

d. While it is a good operating practice for pilots to make use of the Alaska FSS AFIS broadcast where it is available, some pilots use the phrase "have numbers" in communications with the FSS. Use of this phrase means that the pilot has received wind, runway, and altimeter information ONLY and the Alaska FSS does not have to repeat this information. It does not indicate receipt of the AFIS broadcast and should never be used for this purpose.

4−1−15. Radar Traffic Information Service

This is a service provided by radar ATC facilities. Pilots receiving this service are advised of any radar target observed on the radar display which may be in such proximity to the position of their aircraft or its intended route of flight that it warrants their attention.

This service is not intended to relieve the pilot of the responsibility for continual vigilance to see and avoid other aircraft.

a. Purpose of the Service

1. The issuance of traffic information as observed on a radar display is based on the principle of assisting and advising a pilot that a particular radar target's position and track indicates it may intersect or pass in such proximity to that pilot's intended flight path that it warrants attention. This is to alert the pilot to the traffic, to be on the lookout for it, and thereby be in a better position to take appropriate action should the need arise.

2. Pilots are reminded that the surveillance radar used by ATC does not provide altitude information unless the aircraft is equipped with Mode C and the radar facility is capable of displaying altitude information.

b. Provisions of the Service

1. Many factors, such as limitations of the radar, volume of traffic, controller workload and communications frequency congestion, could prevent the controller from providing this service. Controllers possess complete discretion for determining whether they are able to provide or continue to provide this service in a specific case. The controller's reason against providing or continuing to provide the service in a particular case is not subject to question nor need it be communicated to the pilot. In other words, the provision of this service is entirely dependent upon whether controllers believe they are in a position to provide it. Traffic information is routinely provided to all aircraft operating on IFR flight plans except when the pilot declines the service, or the pilot is operating within Class A airspace. Traffic information may be provided to flights not operating on IFR flight plans when requested by pilots of such flights.

NOTE−
Radar ATC facilities normally display and monitor both primary and secondary radar when it is available, except that secondary radar may be used as the sole display source in Class A airspace, and under some circumstances outside of Class A airspace (beyond primary coverage and in en route areas where only secondary is available). Secondary radar may also be used outside Class A airspace as the sole display source when the primary radar is temporarily unusable or out of service. Pilots in contact with the affected ATC facility are normally advised when a temporary outage occurs; i.e., "primary radar out of service; traffic advisories available on transponder aircraft only." This means simply that only the aircraft which have transponders installed and in use will be depicted on ATC radar indicators when the primary radar is temporarily out of service.

2. When receiving VFR radar advisory service, pilots should monitor the assigned frequency at all times. This is to preclude controllers' concern for radio failure or emergency assistance to aircraft under the controller's jurisdiction. VFR radar advisory service does not include vectors away from conflicting traffic unless requested by the pilot. When advisory service is no longer desired, advise the controller before changing frequencies and then change your transponder code to 1200, if applicable. Pilots should also inform the controller when changing VFR cruising altitude. Except in programs where radar service is automatically terminated, the controller will advise the aircraft when radar is terminated.

NOTE−
Participation by VFR pilots in formal programs implemented at certain terminal locations constitutes pilot request. This also applies to participating pilots at those locations where arriving VFR flights are encouraged to make their first contact with the tower on the approach control frequency.

c. Issuance of Traffic Information. Traffic information will include the following concerning a target which may constitute traffic for an aircraft that is:

1. Radar identified

(a) Azimuth from the aircraft in terms of the 12 hour clock, or

(b) When rapidly maneuvering civil test or military aircraft prevent accurate issuance of traffic as in (a) above, specify the direction from an aircraft's position in terms of the eight cardinal compass points (N, NE, E, SE, S, SW, W, NW). This method must be terminated at the pilot's request.

(c) Distance from the aircraft in nautical miles;

(d) Direction in which the target is proceeding; and

(e) Type of aircraft and altitude if known.

EXAMPLE−
Traffic 10 o'clock, 3 miles, west-bound (type aircraft and altitude, if known, of the observed traffic). The altitude may be known, by means of Mode C, but not verified with the

pilot for accuracy. (To be valid for separation purposes by ATC, the accuracy of Mode C readouts must be verified. This is usually accomplished upon initial entry into the radar system by a comparison of the readout to pilot stated altitude, or the field elevation in the case of continuous readout being received from an aircraft on the airport.) When necessary to issue traffic advisories containing unverified altitude information, the controller will issue the advisory in the same manner as if it were verified due to the accuracy of these readouts. The pilot may upon receipt of traffic information, request a vector (heading) to avoid such traffic. The vector will be provided to the extent possible as determined by the controller provided the aircraft to be vectored is within the airspace under the jurisdiction of the controller.

2. Not radar identified

(a) Distance and direction with respect to a fix;

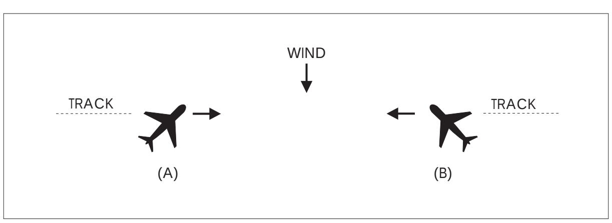
(b) Direction in which the target is proceeding; and

(c) Type of aircraft and altitude if known.

EXAMPLE−
Traffic 8 miles south of the airport northeastbound, (type aircraft and altitude if known).

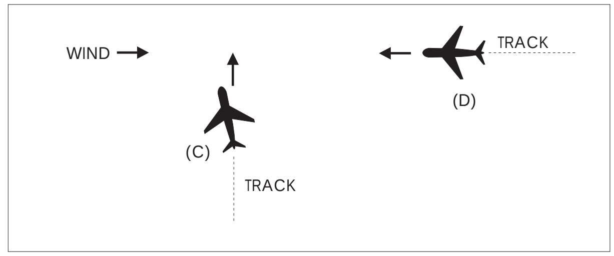
d. The examples depicted in the following figures point out the possible error in the position of this traffic when it is necessary for a pilot to apply drift correction to maintain this track. This error could also occur in the event a change in course is made at the time radar traffic information is issued.

FIG 4−1−1
Induced Error in Position of Traffic



EXAMPLE−
In FIG 4−1−1 traffic information would be issued to the pilot of aircraft "A" as 12 o'clock. The actual position of the traffic as seen by the pilot of aircraft "A" would be 2 o'clock. Traffic information issued to aircraft "B" would also be given as 12 o'clock, but in this case, the pilot of "B" would see the traffic at 10 o'clock.

FIG 4−1−2
Induced Error in Position of Traffic



EXAMPLE−
In FIG 4−1−2 traffic information would be issued to the pilot of aircraft "C" as 2 o'clock. The actual position of the traffic as seen by the pilot of aircraft "C" would be 3 o'clock. Traffic information issued to aircraft "D" would be at an 11 o'clock position. Since it is not necessary for the pilot of aircraft "D" to apply wind correction (crab) to remain on track, the actual position of the traffic issued would be correct. Since the radar controller can only observe aircraft track (course) on the radar display, traffic advisories are issued accordingly, and pilots should give due consideration to this fact when looking for reported traffic.

4−1−16. Safety Alert

A safety alert will be issued to pilots of aircraft being controlled by ATC if the controller is aware the aircraft is at an altitude which, in the controller's judgment, places the aircraft in unsafe proximity to terrain, obstructions or other aircraft. The provision of this service is contingent upon the capability of the controller to have an awareness of a situation involving unsafe proximity to terrain, obstructions and uncontrolled aircraft. The issuance of a safety alert cannot be mandated, but it can be expected on a reasonable, though intermittent basis. Once the alert is issued, it is solely the pilot's prerogative to determine what course of action, if any, to take. This procedure is intended for use in time critical situations where aircraft safety is in question. Noncritical situations should be handled via the normal traffic alert procedures.

a. Terrain or Obstruction Alert

1. Controllers will immediately issue an alert to the pilot of an aircraft under their control when they recognize that the aircraft is at an altitude which, in their judgment, may be in an unsafe proximity to terrain/obstructions. The primary method of detecting unsafe proximity is through Mode C automatic altitude reports.

EXAMPLE−
Low altitude alert Cessna Three Four Juliet, check your altitude immediately. And if the aircraft is not yet on final approach, the MVA (MEA/MIA/MOCA) in your area is six thousand.

2. Terminal Automated Radar Terminal System (ARTS) IIIA, Common ARTS (to include ARTS IIIE and ARTS IIE) (CARTS), Micro En Route Automated Radar Tracking System (MEARTS), and Standard Terminal Automation Replacement System (STARS) facilities have an automated function which, if operating, alerts controllers when a tracked Mode C equipped aircraft under their control is below or is predicted to be below a predetermined minimum safe altitude. This function, called Minimum Safe Altitude Warning (MSAW), is designed solely as a controller aid in detecting potentially unsafe aircraft proximity to terrain/obstructions. The ARTS IIIA, CARTS, MEARTS, and STARS facility will, when MSAW is operating, provide MSAW monitoring for all aircraft with an operating Mode C altitude encoding transponder that are tracked by the system and are:

(a) Operating on an IFR flight plan; or

(b) Operating VFR and have requested MSAW monitoring.

3. Terminal AN/TPX−42A (number beacon decoder system) facilities have an automated function called Low Altitude Alert System (LAAS). Although not as sophisticated as MSAW, LAAS alerts the controller when a Mode C transponder equipped aircraft operating on an IFR flight plan is below a predetermined minimum safe altitude.

NOTE−
Pilots operating VFR may request MSAW or LAAS monitoring if their aircraft are equipped with Mode C transponders.

EXAMPLE−
Apache Three Three Papa request MSAW/LAAS.

b. Aircraft Conflict Alert.

1. Controllers will immediately issue an alert to the pilot of an aircraft under their control if they are aware of another aircraft which is not under their control, at an altitude which, in the controller's judgment, places both aircraft in unsafe proximity to each other. With the alert, when feasible, the controller will offer the pilot the position of the traffic if time permits and an alternate course(s) of action. Any alternate course(s) of action the controller may recommend to the pilot will be predicated only on other traffic being worked by the controller.

EXAMPLE−
American Three, traffic alert, (position of traffic, if time permits), advise you turn right/left heading (degrees) and/or climb/descend to (altitude) immediately.

4−1−17. Radar Assistance to VFR Aircraft

a. Radar equipped FAA ATC facilities provide radar assistance and navigation service (vectors) to VFR aircraft provided the aircraft can communicate with the facility, are within radar coverage, and can be radar identified.

b. Pilots should clearly understand that authorization to proceed in accordance with such radar navigational assistance does not constitute authorization for the pilot to violate CFRs. In effect, assistance provided is on the basis that navigational guidance information issued is advisory in nature and the job of flying the aircraft safely, remains with the pilot.

c. In many cases, controllers will be unable to determine if flight into instrument conditions will result from their instructions. To avoid possible hazards resulting from being vectored into IFR conditions, pilots should keep controllers advised of the weather conditions in which they are operating and along the course ahead.

d. Radar navigation assistance (vectors) may be initiated by the controller when one of the following conditions exist:

1. The controller suggests the vector and the pilot concurs.

2. A special program has been established and vectoring service has been advertised.

3. In the controller's judgment the vector is necessary for air safety.

e. Radar navigation assistance (vectors) and other radar derived information may be provided in response to pilot requests. Many factors, such as limitations of radar, volume of traffic, communications frequency, congestion, and controller workload could prevent the controller from providing it. Controllers have complete discretion for determining if they are able to provide the service in a particular case. Their decision not to provide the service in a particular case is not subject to question.

4−1−18. Terminal Radar Services for VFR Aircraft

a. Basic Radar Service:

1. In addition to the use of radar for the control of IFR aircraft, all commissioned radar facilities provide the following basic radar services for VFR aircraft:

(a) Safety alerts.

(b) Traffic advisories.

(c) Limited radar vectoring (on a workload permitting basis).

(d) Sequencing at locations where procedures have been established for this purpose and/or when covered by a Letter of Agreement.

NOTE−
When the stage services were developed, two basic radar services (traffic advisories and limited vectoring) were identified as "Stage I." This definition became unnecessary and the term "Stage I" was eliminated from use. The term "Stage II" has been eliminated in conjunction with the airspace reclassification, and sequencing services to locations with local procedures and/or letters of agreement to provide this service have been included in basic services to VFR aircraft. These basic services will still be provided by all terminal radar facilities whether they include Class B, Class C, Class D or Class E airspace. "Stage III" services have been replaced with "Class B" and "TRSA" service where applicable.

2. Vectoring service may be provided when requested by the pilot or with pilot concurrence when suggested by ATC.

3. Pilots of arriving aircraft should contact approach control on the publicized frequency and give their position, altitude, aircraft call sign, type aircraft, radar beacon code (if transponder equipped), destination, and request traffic information.

4. Approach control will issue wind and runway, except when the pilot states "have numbers" or this information is contained in the ATIS broadcast and the pilot states that the current ATIS information has been received. Traffic information is provided on a workload permitting basis. Approach control will specify the time or place at which the pilot is to contact the tower on local control frequency for further landing information. Radar service is automatically terminated and the aircraft need not be advised of termination when an arriving VFR aircraft receiving radar services to a tower−controlled airport where basic radar service is provided has landed, or to all other airports, is instructed to change to tower or advisory frequency. (See FAA Order JO 7110.65, Air Traffic Control, Paragraph 5−1−13, Radar Service Termination.)

5. Sequencing for VFR aircraft is available at certain terminal locations (see locations listed in the Chart Supplement U.S.). The purpose of the service is to adjust the flow of arriving VFR and IFR aircraft into the traffic pattern in a safe and orderly manner and to provide radar traffic information to departing VFR aircraft. Pilot participation is urged but is not mandatory. Traffic information is provided on a workload permitting basis. Standard radar separation between VFR or between VFR and IFR aircraft is not provided.

(a) Pilots of arriving VFR aircraft should initiate radio contact on the publicized frequency with approach control when approximately 25 miles from the airport at which sequencing services are being provided. On initial contact by VFR aircraft, approach control will assume that sequencing service is requested. After radar contact is established, the pilot may use pilot navigation to enter the traffic pattern or, depending on traffic conditions, approach control may provide the pilot with routings or vectors necessary for proper sequencing with other participating VFR and IFR traffic en route to the airport. When a flight is positioned behind a preceding aircraft and the pilot reports having that aircraft in sight, the pilot will be instructed to follow the preceding aircraft. THE ATC INSTRUCTION TO FOLLOW THE PRECEDING AIRCRAFT DOES NOT AUTHORIZE THE PILOT TO COMPLY WITH ANY ATC CLEARANCE OR INSTRUCTION ISSUED TO THE PRECEDING AIRCRAFT. If other "nonparticipating" or "local" aircraft are in the traffic pattern, the tower will issue a landing sequence. If an arriving aircraft does not want radar service, the pilot should state "NEGATIVE RADAR SERVICE" or make a similar comment, on initial contact with approach control.

(b) Pilots of departing VFR aircraft are encouraged to request radar traffic information by notifying ground control on initial contact with their request and proposed direction of flight.

EXAMPLE−
Xray ground control, November One Eight Six, Cessna One Seventy Two, ready to taxi, VFR southbound at 2,500, have information bravo and request radar traffic information.

NOTE−
Following takeoff, the tower will advise when to contact departure control.

(c) Pilots of aircraft transiting the area and in radar contact/communication with approach control will receive traffic information on a controller workload permitting basis. Pilots of such aircraft should give their position, altitude, aircraft call sign, aircraft type, radar beacon code (if transponder equipped), destination, and/or route of flight.

b. TRSA Service (Radar Sequencing and Separation Service for VFR Aircraft in a TRSA).

1. This service has been implemented at certain terminal locations. The service is advertised in the Chart Supplement U.S. The purpose of this service is to provide separation between all participating VFR aircraft and all IFR aircraft operating within the airspace defined as the Terminal Radar Service Area (TRSA). Pilot participation is urged but is not mandatory.

2. If any aircraft does not want the service, the pilot should state "NEGATIVE TRSA SERVICE" or make a similar comment, on initial contact with approach control or ground control, as appropriate.

3. TRSAs are depicted on sectional aeronautical charts and listed in the Chart Supplement U.S.

4. While operating within a TRSA, pilots are provided TRSA service and separation as prescribed in this paragraph. In the event of a radar outage, separation and sequencing of VFR aircraft will be suspended as this service is dependent on radar. The pilot will be advised that the service is not available and issued wind, runway information, and the time or place to contact the tower. Traffic information will be provided on a workload permitting basis.

5. Visual separation is used when prevailing conditions permit and it will be applied as follows:

(a) When a VFR flight is positioned behind a preceding aircraft and the pilot reports having that aircraft in sight, the pilot will be instructed by ATC to follow the preceding aircraft. Radar service will be continued to the runway. THE ATC INSTRUCTION TO FOLLOW THE PRECEDING AIRCRAFT DOES NOT AUTHORIZE THE PILOT TO COMPLY WITH ANY ATC CLEARANCE OR INSTRUCTION ISSUED TO THE PRECEDING AIRCRAFT.

(b) If other "nonparticipating" or "local" aircraft are in the traffic pattern, the tower will issue a landing sequence.

(c) Departing VFR aircraft may be asked if they can visually follow a preceding departure out of the TRSA. The pilot will be instructed to follow the other aircraft provided that the pilot can maintain visual contact with that aircraft.

6. VFR aircraft will be separated from VFR/IFR aircraft by one of the following:

(a) 500 feet vertical separation.

(b) Visual separation.

(c) Target resolution (a process to ensure that correlated radar targets do not touch).

7. Participating pilots operating VFR in a TRSA:

(a) Must maintain an altitude when assigned by ATC unless the altitude assignment is to maintain at or below a specified altitude. ATC may assign altitudes for separation that do not conform to 14 CFR Section 91.159. When the altitude assignment is no longer needed for separation or when leaving the TRSA, the instruction will be broadcast, "RESUME APPROPRIATE VFR ALTITUDES." Pilots must then return to an altitude that conforms to 14 CFR Section 91.159 as soon as practicable.

(b) When not assigned an altitude, the pilot should coordinate with ATC prior to any altitude change.

8. Within the TRSA, traffic information on observed but unidentified targets will, to the extent possible, be provided to all IFR and participating VFR aircraft. The pilot will be vectored upon request to avoid the observed traffic, provided the aircraft to be vectored is within the airspace under the jurisdiction of the controller.

9. Departing aircraft should inform ATC of their intended destination and/or route of flight and proposed cruising altitude.

10. ATC will normally advise participating VFR aircraft when leaving the geographical limits of the TRSA. Radar service is not automatically terminated with this advisory unless specifically stated by the controller.

c. Class C Service. This service provides, in addition to basic radar service, approved separation between IFR and 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).

e. PILOT RESPONSIBILITY. THESE SERVICES ARE NOT TO BE INTERPRETED AS RELIEVING PILOTS OF THEIR RESPONSIBILITIES TO SEE AND AVOID OTHER TRAFFIC OPERATING IN BASIC VFR WEATHER CONDITIONS, TO ADJUST THEIR OPERATIONS AND FLIGHT PATH AS NECESSARY TO PRECLUDE SERIOUS WAKE ENCOUNTERS, TO MAINTAIN APPROPRIATE TERRAIN AND OBSTRUCTION CLEARANCE, OR TO REMAIN IN WEATHER CONDITIONS EQUAL TO OR BETTER THAN THE MINIMUMS REQUIRED BY 14 CFR SECTION 91.155. WHENEVER COMPLIANCE WITH AN ASSIGNED ROUTE, HEADING AND/OR ALTITUDE IS LIKELY TO COMPROMISE PILOT RESPONSIBILITY RESPECTING TERRAIN AND OBSTRUCTION CLEARANCE, VORTEX EXPOSURE, AND WEATHER MINIMUMS, APPROACH CONTROL SHOULD BE SO ADVISED AND A REVISED CLEARANCE OR INSTRUCTION OBTAINED.

f. ATC services for VFR aircraft participating in terminal radar services are dependent on ATC radar. Services for VFR aircraft are not available during periods of a radar outage and are limited during CENRAP operations. The pilot will be advised when VFR services are limited or not available.

NOTE−
Class B and Class C airspace are areas of regulated airspace. The absence of ATC radar does not negate the requirement of an ATC clearance to enter Class B airspace or two way radio contact with ATC to enter Class C airspace.

4−1−19. Tower En Route Control (TEC)

a. TEC is an ATC program to provide a service to aircraft proceeding to and from metropolitan areas. It links designated Approach Control Areas by a network of identified routes made up of the existing airway structure of the National Airspace System. The FAA initiated an expanded TEC program to include as many facilities as possible. The program's intent is to provide an overflow resource in the low altitude system which would enhance ATC services. A few facilities have historically allowed turbojets to proceed between certain city pairs, such as Milwaukee and Chicago, via tower en route and these locations may continue this service. However, the expanded TEC program will be applied, generally, for nonturbojet aircraft operating at and below 10,000 feet. The program is entirely within the approach control airspace of multiple terminal facilities. Essentially, it is for relatively short flights. Participating pilots are encouraged to use TEC for flights of two hours duration or less. If longer flights are planned, extensive coordination may be required within the multiple complex which could result in unanticipated delays.

b. Pilots requesting TEC are subject to the same delay factor at the destination airport as other aircraft in the ATC system. In addition, departure and en route delays may occur depending upon individual facility workload. When a major metropolitan airport is incurring significant delays, pilots in the TEC program may want to consider an alternative airport experiencing no delay.

c. There are no unique requirements upon pilots to use the TEC program. Normal flight plan filing procedures will ensure proper flight plan processing. Pilots should include the acronym "TEC" in the remarks section of the flight plan when requesting tower en route control.

d. All approach controls in the system may not operate up to the maximum TEC altitude of 10,000 feet. IFR flight may be planned to any satellite airport in proximity to the major primary airport via the same routing.

4−1−20. Transponder Operation

a. General

1. Pilots should be aware that proper application of transponder operating procedures will provide both VFR and IFR aircraft with a higher degree of safety while operating on the ground and airborne. Transponders with altitude reporting mode turned ON (Mode C or S) substantially increase the capability of surveillance systems to see an aircraft, thus providing the Air Traffic Controller increased situational awareness and the ability to identify potential traffic conflicts. Even VFR pilots who are not in contact with ATC will be afforded greater protection from IFR aircraft and VFR aircraft which are receiving traffic advisories. Nevertheless, pilots should never relax their visual scanning for other aircraft.

2. Air Traffic Control Radar Beacon System (ATCRBS) is similar to and compatible with military coded radar beacon equipment. Civil Mode A is identical to military Mode 3.

3. Transponder and ADS-B operations on the ground. Civil and military aircraft should operate with the transponder in the altitude reporting mode (consult the aircraft's flight manual to determine the specific transponder position to enable altitude reporting) and ADS-B Out transmissions enabled (if equipped) at all airports, any time the aircraft is positioned on any portion of an airport movement area. This includes all defined taxiways and runways. Pilots must pay particular attention to ATIS and airport diagram notations, General Notes (included on airport charts), and comply with directions pertaining to transponder and ADS-B usage. Generally, these directions are:

(a) Departures. Select the transponder mode which allows altitude reporting and enable ADS-B (if equipped) during pushback or taxi-out from parking spot. Select TA or TA/RA (if equipped with TCAS) when taking the active runway.

(b) Arrivals. Maintain transponder to the altitude reporting mode or if TCAS-equipped (TA or TA/RA), select the transponder to altitude reporting mode. Maintain ADS-B Out transmissions (if equipped) after clearing the active runway. Select STBY or OFF for transponder and ADS-B (if equipped) upon arriving at the aircraft's parking spot or gate.

4. Transponder and ADS-B Operations in the Air. EACH PILOT OPERATING AN AIRCRAFT EQUIPPED WITH AN OPERABLE ATC TRANSPONDER, MAINTAINED IN ACCORDANCE WITH 14 CFR SECTION 91.413 OR ADS-B TRANSMITTER, MUST OPERATE THE TRANSPONDER/TRANSMITTER, INCLUDING MODE C/S IF INSTALLED, ON THE APPROPRIATE MODE 3/A CODE OR AS ASSIGNED BY ATC. EACH PERSON OPERATING AN AIRCRAFT EQUIPPED WITH ADS-B OUT MUST OPERATE THIS EQUIPMENT IN THE TRANSMIT MODE AT ALL TIMES WHILE AIRBORNE UNLESS OTHERWISE REQUESTED BY ATC.

5. A pilot on an IFR flight who elects to cancel the IFR flight plan prior to reaching destination, should adjust the transponder according to VFR operations.

6. If entering a U.S. OFFSHORE AIRSPACE AREA from outside the U.S., the pilot should advise on first radio contact with a U.S. radar ATC facility that such equipment is available by adding "transponder" to the aircraft identification.

7. It should be noted by all users of ATC transponders and ADS−B Out systems that the surveillance coverage they can expect is limited to "line of sight" with ground radar and ADS−B radio sites. Low altitude or aircraft antenna shielding by the aircraft itself may result in reduced range or loss of aircraft contact. Surveillance coverage can be improved by climbing to a higher altitude.

NOTE−
Pilots of aircraft equipped with ADS−B should refer to AIM, Automatic Dependent Surveillance − Broadcast Services, Paragraph 4−5−7, for a complete description of operating limitations and procedures.

b. Transponder Code Designation

1. For ATC to utilize one or a combination of the 4096 discrete codes FOUR DIGIT CODE DESIGNATION will be used, e.g., code 2100 will be expressed as TWO ONE ZERO ZERO. Due to the operational characteristics of the rapidly expanding automated ATC system, THE LAST TWO DIGITS OF THE SELECTED TRANSPONDER CODE SHOULD ALWAYS READ "00" UNLESS SPECIFICALLY REQUESTED BY ATC TO BE OTHERWISE.

c. Automatic Altitude Reporting (Mode C)

1. Some transponders are equipped with a Mode C automatic altitude reporting capability. This system converts aircraft altitude in 100 foot increments to coded digital information which is transmitted together with Mode C framing pulses to the interrogating radar facility. The manner in which transponder panels are designed differs, therefore, a pilot should be thoroughly familiar with the operation of the transponder so that ATC may realize its full capabilities.

2. Adjust transponder to reply on the Mode A/3 code specified by ATC and, if equipped, to reply on Mode C with altitude reporting capability activated unless deactivation is directed by ATC or unless the installed aircraft equipment has not been tested and calibrated as required by 14 CFR Section 91.217. If deactivation is required by ATC, turn off the altitude reporting feature of your transponder. An instruction by ATC to "STOP ALTITUDE SQUAWK, ALTITUDE DIFFERS (number of feet) FEET," may be an indication that your transponder is transmitting incorrect altitude information or that you have an incorrect altimeter setting. While an incorrect altimeter setting has no effect on the Mode C altitude information transmitted by your transponder (transponders are preset at 29.92), it would cause you to fly at an actual altitude different from your assigned altitude. When a controller indicates that an altitude readout is invalid, the pilot should initiate a check to verify that the aircraft altimeter is set correctly.

3. Pilots of aircraft with operating Mode C altitude reporting transponders should report exact altitude or flight level to the nearest hundred foot increment when establishing initial contact with an ATC facility. Exact altitude or flight level reports on initial contact provide ATC with information that is required prior to using Mode C altitude information for separation purposes. This will significantly reduce altitude verification requests.

d. Transponder IDENT Feature

1. The transponder must be operated only as specified by ATC. Activate the "IDENT" feature only upon request of the ATC controller.

e. Code Changes

1. When making routine code changes, pilots should avoid inadvertent selection of Codes 7500, 7600 or 7700 thereby causing momentary false alarms at automated ground facilities. For example, when switching from Code 2700 to Code 7200, switch first to 2200 then to 7200, NOT to 7700 and then 7200. This procedure applies to nondiscrete Code 7500 and all discrete codes in the 7600 and 7700 series (i.e., 7600−7677, 7700−7777) which will trigger special indicators in automated facilities. Only nondiscrete Code 7500 will be decoded as the hijack code.

2. Under no circumstances should a pilot of a civil aircraft operate the transponder on Code 7777. This code is reserved for military interceptor operations.

3. Military pilots operating VFR or IFR within restricted/warning areas should adjust their transponders to Code 4000 unless another code has been assigned by ATC.

f. Mode C Transponder Requirements

1. Specific details concerning requirements to carry and operate Mode C transponders, as well as exceptions and ATC authorized deviations from the requirements are found in 14 CFR Section 91.215 and 14 CFR Section 99.12.

2. In general, the CFRs require aircraft to be equipped with Mode C transponders when operating:

(a) At or above 10,000 feet MSL over the 48 contiguous states or the District of Columbia, excluding that airspace below 2,500 feet AGL;

(b) Within 30 miles of a Class B airspace primary airport, below 10,000 feet MSL. Balloons, gliders, and aircraft not equipped with an engine driven electrical system are excepted from the above requirements when operating below the floor of Class A airspace and/or; outside of a Class B airspace and below the ceiling of the Class B airspace (or 10,000 feet MSL, whichever is lower);

(c) Within and above all Class C airspace, up to 10,000 feet MSL;

(d) Within 10 miles of certain designated airports, excluding that airspace which is both outside the Class D surface area and below 1,200 feet AGL. Balloons, gliders and aircraft not equipped with an engine driven electrical system are excepted from this requirement.

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.

4. Pilots must ensure that their aircraft transponder is operating on an appropriate ATC assigned VFR/IFR code and Mode C 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 requirement may be approved by controllers 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 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.

g. Transponder Operation Under Visual Flight Rules (VFR)

1. Unless otherwise instructed by an ATC facility, adjust transponder to reply on Mode 3/A Code 1200 regardless of altitude.

NOTE−
1. *Aircraft not in contact with an ATC facility may squawk 1255 in lieu of 1200 while en route to, from, or within the designated fire fighting area(s).*

2. *VFR aircraft which fly authorized SAR missions for the USAF or USCG may be advised to squawk 1277 in lieu of 1200 while en route to, from, or within the designated search area.*

3. *Gliders not in contact with an ATC facility should squawk 1202 in lieu of 1200.*

REFERENCE−
FAA Order 7110.66, National Beacon Code Allocation Plan.

2. Adjust transponder to reply on Mode C, with altitude reporting *capability activated* if the aircraft is so equipped, unless deactivation is directed by ATC or unless the installed equipment has not been tested and calibrated as required by 14 CFR Section 91.217. If deactivation is required and your transponder is so designed, turn off the altitude reporting switch and continue to transmit Mode C framing pulses. If this capability does not exist, turn off Mode C.

h. Radar Beacon Phraseology

Air traffic controllers, both civil and military, will use the following phraseology when referring to operation of the Air Traffic Control Radar Beacon System (ATCRBS). Instructions by ATC refer only to Mode A/3 or Mode C operation and do not affect the operation of the transponder on other Modes.

1. SQUAWK (number). Operate radar beacon transponder on designated code in Mode A/3.

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

3. SQUAWK (number) and IDENT. Operate transponder on specified code in Mode A/3 and engage the "IDENT" (military I/P) feature.

4. SQUAWK STANDBY. Switch transponder to standby position.

5. SQUAWK LOW/NORMAL. Operate transponder on low or normal sensitivity as specified. Transponder is operated in "NORMAL" position unless ATC specifies "LOW" ("ON" is used instead of "NORMAL" as a master control label on some types of transponders.)

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

7. STOP ALTITUDE SQUAWK. Turn off altitude reporting switch and continue transmitting Mode C framing pulses. If your equipment does not have this capability, turn off Mode C.

8. STOP SQUAWK (mode in use). Switch off specified mode. (Used for military aircraft when the controller is unaware of military service requirements for the aircraft to continue operation on another Mode.)

9. STOP SQUAWK. Switch off transponder.

10. SQUAWK MAYDAY. Operate transponder in the emergency position (Mode A Code 7700 for civil transponder. Mode 3 Code 7700 and emergency feature for military transponder.)

11. SQUAWK VFR. Operate radar beacon transponder on Code 1200 in the Mode A/3, or other appropriate VFR code.

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 operations 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 Web site listed below.

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. Refer to the Web site or touch−tone phone interface for the current listing of slot controlled airports, limitations, and reservation procedures.

NOTE−
The web interface/telephone numbers to obtain a reservation for unscheduled operations at a slot controlled airport are:
1. http://www.fly.faa.gov/ecvrs.
2. Touch−tone: 1−800−875−9694 or 703−707−0568. (e−CVRS interface).
3. Trouble number: 540−422−4246.

3. For more detailed information on operations and reservation procedures at a Slot Controlled Airport, please see Advisory Circular 93−1A, Reservations for Unscheduled Operations at slot controlled airports. A copy of the Advisory Circular may be obtained via the Internet at: http://www.faa.gov.

b. Special Traffic Management Programs (STMP).

1. Special procedures may be established when a location requires special traffic handling to accommodate above normal traffic demand (e.g., the Indianapolis 500, Super Bowl) or reduced airport capacity (e.g., airport runway/taxiway closures for airport construction). The special procedures may remain in effect until the problem has been resolved or until local traffic management procedures can handle the situation and a need for special handling no longer exists.

2. There will be two methods available for obtaining slot reservations through the ATCSCC: the web interface and the touch−tone interface. If these methods are used, a NOTAM will be issued relaying the web site address and toll free telephone number. Be sure to check current NOTAMs to determine: 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. Users may contact the ARO at 703−904−4452 if they have a problem making a reservation or have a question concerning the slot controlled airport/ STMP regulations or procedures.

d. Making Reservations.

1. Internet Users. Detailed information and User Instruction Guides for using the Web interface to the reservation systems are available on the websites for the slot controlled airports (e−CVRS), http://www.fly.faa.gov/ecvrs; and STMPs (e−STMP), http://www.fly.faa.gov/estmp.

2. Telephone users. When using the telephone to make a reservation, you are prompted for input of information about what you wish to do. All input is accomplished using the keypad on the telephone. The only problem with a telephone is that most keys have a letter and number associated with them. When the system asks for a date or time, it is expecting an input of numbers. A problem arises when entering an aircraft call sign or tail number. The system does not detect if you are entering a letter (alpha character) or a number. Therefore, when entering an aircraft call sign or tail number two keys are used to represent each letter or number. When entering a number, precede the number you wish by the number 0 (zero) i.e., 01, 02, 03, 04, ... If you wish to enter a letter, first press the key on which the letter appears and then press 1, 2, or 3, depending upon whether the letter you desire is the first, second, or third letter on that key. For example to enter the letter "N" first press the "6" key because "N" is on that key, then press the "2" key because the letter "N" is the second letter on the "6" key. Since there are no keys for the letters "Q" and "Z" e−CVRS pretends they are on the number "1" key. Therefore, to enter the letter "Q", press 11, and to enter the letter "Z" press 12.

NOTE−
Users are reminded to enter the "N" character with their tail numbers. (See TBL 4−1−4.)

3. For additional helpful key entries, see TBL 4−1−5.

TBL 4−1−4
Codes for Call Sign/Tail Number Input

Codes for Call Sign/Tail Number Input Only			
A−21	J−51	S−73	1-01
B−22	K−52	T−81	2−02
C−23	L−53	U−82	3−03
D−31	M−61	V−83	4−04
E−32	N−62	W−91	5−05
F−33	O−63	X−92	6−06
G−41	P−71	Y−93	7−07
H−42	Q−11	Z−12	8−08
I−43	R−72	0−00	9−09

TBL 4−1−5
Helpful Key Entries

#	After entering a call sign/tail number, depressing the "pound key" (#) twice will indicate the end of the entry.
*2	Will take the user back to the start of the process.
*3	Will repeat the call sign/tail number used in a previous reservation.
*5	Will repeat the previous question.
*8	Tutorial Mode: In the tutorial mode each prompt for input includes a more detailed description of what is expected as input. *8 is a toggle on/off switch. If you are in tutorial mode and enter *8, you will return to the normal mode.
*0	Expert Mode: In the expert mode each prompt for input is brief with little or no explanation. Expert mode is also on/off toggle.

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 System Processor

The Weather System 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.

TBL 4−2−1
Calling a Ground Station

Facility	Call Sign
Airport UNICOM	"Shannon UNICOM"
FAA Flight Service Station	"Chicago Radio"
Airport Traffic Control Tower	"Augusta Tower"
Clearance Delivery Position (IFR)	"Dallas Clearance Delivery"
Ground Control Position in Tower	"Miami Ground"
Radar or Nonradar Approach Control Position	"Oklahoma City Approach"
Radar Departure Control Position	"St. Louis Departure"
FAA Air Route Traffic Control Center	"Washington Center"

4−2−7. Phonetic Alphabet

The International Civil Aviation Organization (ICAO) phonetic alphabet is used by FAA personnel when communications conditions are such that the information cannot be readily received without their use. ATC facilities may also request pilots to use phonetic letter equivalents when aircraft with similar sounding identifications are receiving communications on the same frequency. Pilots should use the phonetic alphabet when identifying their aircraft during initial contact with air traffic control facilities. Additionally, use the phonetic equivalents for single letters and to spell out groups of letters or difficult words during adverse communications conditions. (See TBL 4−2−2.)

TBL 4−2−2
Phonetic Alphabet/Morse Code

Character	Morse Code	Telephony	Phonic (Pronunciation)
A	• —	Alfa	(AL−FAH)
B	— • • •	Bravo	(BRAH−VOH)
C	— • — •	Charlie	(CHAR−LEE) or (SHAR−LEE)
D	— • •	Delta	(DELL−TAH)
E	•	Echo	(ECK−OH)
F	• • — •	Foxtrot	(FOKS−TROT)
G	— — •	Golf	(GOLF)
H	• • • •	Hotel	(HOH−TEL)
I	• •	India	(IN−DEE−AH)
J	• — — —	Juliett	(JEW−LEE−ETT)
K	— • —	Kilo	(KEY−LOH)
L	• — • •	Lima	(LEE−MAH)
M	— —	Mike	(MIKE)
N	— •	November	(NO−VEM−BER)
O	— — —	Oscar	(OSS−CAH)
P	• — — •	Papa	(PAH−PAH)
Q	— — • —	Quebec	(KEH−BECK)
R	• — •	Romeo	(ROW−ME−OH)
S	• • •	Sierra	(SEE−AIR−RAH)
T	—	Tango	(TANG−GO)
U	• • —	Uniform	(YOU−NEE−FORM) or (OO−NEE−FORM)
V	• • • —	Victor	(VIK−TAH)
W	• — —	Whiskey	(WISS−KEY)
X	— • • —	Xray	(ECKS−RAY)
Y	— • — —	Yankee	(YANG−KEY)
Z	— — • •	Zulu	(ZOO−LOO)
1	• — — — —	One	(WUN)
2	• • — — —	Two	(TOO)
3	• • • — —	Three	(TREE)
4	• • • • —	Four	(FOW−ER)
5	• • • • •	Five	(FIFE)
6	— • • • •	Six	(SIX)
7	— — • • •	Seven	(SEV−EN)
8	— — — • •	Eight	(AIT)
9	— — — — •	Nine	(NIN−ER)
0	— — — — —	Zero	(ZEE−RO)

4−2−8. Figures

a. Figures indicating hundreds and thousands in round number, as for ceiling heights, and upper wind levels up to 9,900 must be spoken in accordance with the following.

EXAMPLE−
1. *500 . . . . five hundred*

2. *4,500 . . . . . . four thousand five hundred*

b. Numbers above 9,900 must be spoken by separating the digits preceding the word "thousand."

EXAMPLE−
1. *10,000 . . . . . one zero thousand*

2. *13,500 . . . . . one three thousand five hundred*

c. Transmit airway or jet route numbers as follows.

EXAMPLE−
1. *V12 . . . . Victor Twelve*

2. *J533 . . . . J Five Thirty−Three*

d. All other numbers must be transmitted by pronouncing each digit.

EXAMPLE−
10 . . . . one zero

e. When a radio frequency contains a decimal point, the decimal point is spoken as "POINT."

EXAMPLE−
122.1 . . . . one two two point one

NOTE−
ICAO procedures require the decimal point be spoken as "DECIMAL." The FAA will honor such usage by military aircraft and all other aircraft required to use ICAO procedures.

4−2−9. Altitudes and Flight Levels

a. Up to but not including 18,000 feet MSL, state the separate digits of the thousands plus the hundreds if appropriate.

EXAMPLE−
1. *12,000 . . . . . one two thousand*

2. *12,500 . . . . . one two thousand five hundred*

b. At and above 18,000 feet MSL (FL 180), state the words "flight level" followed by the separate digits of the flight level.

EXAMPLE−
1. *190 . . . . Flight Level One Niner Zero*

2. *275 . . . . Flight Level Two Seven Five*

4−2−10. Directions

The three digits of bearing, course, heading, or wind direction should always be magnetic. The word "true" must be added when it applies.

EXAMPLE−
1. *(Magnetic course) 005 . . . . . . zero zero five*

2. *(True course) 050 . . . . zero five zero true*

3. *(Magnetic bearing) 360 . . . . . three six zero*

4. *(Magnetic heading) 100 . . . . . heading one zero zero*

5. *(Wind direction) 220 . . . . wind two two zero*

4−2−11. Speeds

The separate digits of the speed followed by the word "KNOTS." Except, controllers may omit the word "KNOTS" when using speed adjustment procedures; e.g., "REDUCE/INCREASE SPEED TO TWO FIVE ZERO."

EXAMPLE−
(Speed) 250 . . . . two five zero knots
(Speed) 190 . . . . one niner zero knots

The separate digits of the Mach Number preceded by "Mach."

EXAMPLE−
(Mach number) 1.5 . . . . Mach one point five
(Mach number) 0.64 . . . . Mach point six four
(Mach number) 0.7 . . . . Mach point seven

4−2−12. Time

a. FAA uses Coordinated Universal Time (UTC) for all operations. The word "local" or the time zone equivalent must be used to denote local when local time is given during radio and telephone communications. The term "Zulu" may be used to denote UTC.

EXAMPLE−
0920 UTC . . . . . zero niner two zero,
zero one two zero pacific or local,
or one twenty AM

b. To convert from Standard Time to Coordinated Universal Time:

TBL 4−2−3
Standard Time to Coordinated Universal Time

Eastern Standard Time	Add 5 hours
Central Standard Time	Add 6 hours
Mountain Standard Time	Add 7 hours
Pacific Standard Time	Add 8 hours
Alaska Standard Time	Add 9 hours
Hawaii Standard Time	Add 10 hours

NOTE−
For daylight time, subtract 1 hour.

c. A reference may be made to local daylight or standard time utilizing the 24−hour clock system. The hour is indicated by the first two figures and the minutes by the last two figures.

EXAMPLE−
0000 . . . . zero zero zero zero
0920 . . . . zero niner two zero

d. Time may be stated in minutes only (two figures) in radiotelephone communications when no misunderstanding is likely to occur.

e. Current time in use at a station is stated in the nearest quarter minute in order that pilots may use this information for time checks. Fractions of a quarter minute less than 8 seconds are stated as the preceding quarter minute; fractions of a quarter minute of 8 seconds or more are stated as the succeeding quarter minute.

EXAMPLE−
0929:05 . . . . . . time, zero niner two niner
0929:10 . . . . . . time, zero niner two niner and one−quarter

4−2−13. Communications with Tower when Aircraft Transmitter or Receiver or Both are Inoperative

a. Arriving Aircraft.

1. Receiver inoperative.

(a) If you have reason to believe your receiver is inoperative, remain outside or above the Class D surface area until the direction and flow of traffic has been determined; then, advise the tower of your type aircraft, position, altitude, intention to land, and request that you be controlled with light signals.

REFERENCE−
AIM, Paragraph 4−3−13 , Traffic Control Light Signals

(b) When you are approximately 3 to 5 miles from the airport, advise the tower of your position and join the airport traffic pattern. From this point on, watch the tower for light signals. Thereafter, if a complete pattern is made, transmit your position downwind and/or turning base leg.

2. Transmitter inoperative. Remain outside or above the Class D surface area until the direction and flow of traffic has been determined; then, join the airport traffic pattern. Monitor the primary local control frequency as depicted on Sectional Charts for landing or traffic information, and look for a light signal which may be addressed to your aircraft. During hours of daylight, acknowledge tower transmissions or light signals by rocking your wings. At night, acknowledge by blinking the landing or navigation lights. To acknowledge tower transmissions during daylight hours, hovering helicopters will turn in the direction of the controlling facility and flash the landing light. While in flight, helicopters should show their acknowledgement of receiving a transmission by making shallow banks in opposite directions. At night, helicopters will acknowledge receipt of transmissions by flashing either the landing or the search light.

3. Transmitter and receiver inoperative. Remain outside or above the Class D surface area until the direction and flow of traffic has been determined; then, join the airport traffic pattern and maintain visual contact with the tower to receive light signals. Acknowledge light signals as noted above.

b. Departing Aircraft. If you experience radio failure prior to leaving the parking area, make every effort to have the equipment repaired. If you are unable to have the malfunction repaired, call the tower by telephone and request authorization to depart without two-way radio communications. If tower authorization is granted, you will be given departure information and requested to monitor the tower frequency or watch for light signals as appropriate. During daylight hours, acknowledge tower transmissions or light signals by moving the ailerons or rudder. At night, acknowledge by blinking the landing or navigation lights. If radio malfunction occurs after departing the parking area, watch the tower for light signals or monitor tower frequency.

REFERENCE−
14 CFR Section 91.125 and 14 CFR Section 91.129.

4−2−14. Communications for VFR Flights

a. FSSs and Supplemental Weather Service Locations (SWSLs) are allocated frequencies for different functions; for example, in Alaska, certain FSSs provide Local Airport Advisory on 123.6 MHz or other frequencies which can be found in the Chart Supplement U.S. If you are in doubt as to what frequency to use, 122.2 MHz is assigned to the majority of FSSs as a common en route simplex frequency.

NOTE−
In order to expedite communications, state the frequency being used and the aircraft location during initial callup.

EXAMPLE−
Dayton radio, November One Two Three Four Five on one two two point two, over Springfield V−O−R, over.

b. Certain VOR voice channels are being utilized for recorded broadcasts; i.e., ATIS, HIWAS, etc. These services and appropriate frequencies are listed in the Chart Supplement U.S. On VFR flights, pilots are urged to monitor these frequencies. When in contact with a control facility, notify the controller if you plan to leave the frequency to monitor these broadcasts.

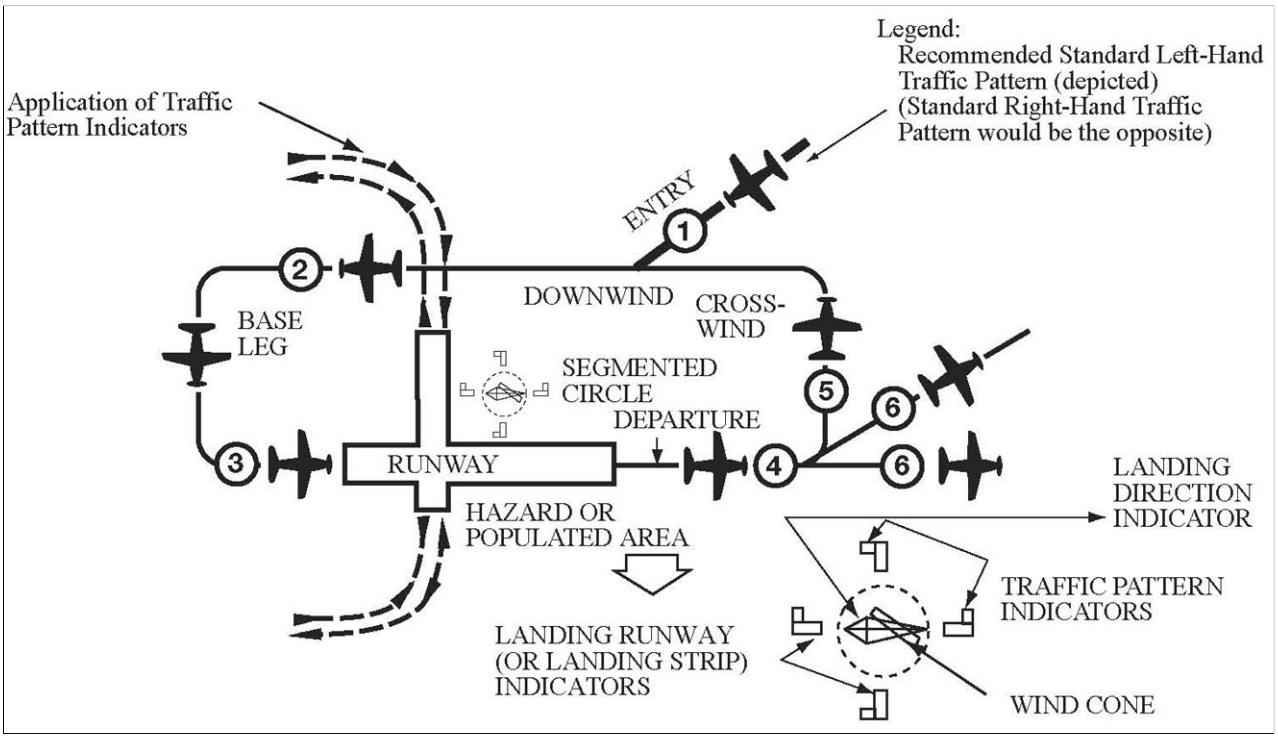
EXAMPLE−
RP 9, 18, 22R

NOTE−
1. *RP* indicates special conditions exist and refers pilots to the Chart Supplement U.S.*

2. *Right traffic patterns are not shown at airports with full−time control towers.*

b. Wind conditions affect all airplanes in varying degrees. Figure 4-3-4 is an example of a chart used to determine the headwind, crosswind, and tailwind components based on wind direction and velocity relative to the runway. Pilots should refer to similar information provided by the aircraft manufacturer when determining these wind components.

FIG 4−3−2
Traffic Pattern Operations
Single Runway



EXAMPLE−
Key to traffic pattern operations

1. *Enter pattern in level flight, abeam the midpoint of the runway, at pattern altitude. (1,000' AGL is recommended pattern altitude unless established otherwise. . .)*

2. *Maintain pattern altitude until abeam approach end of the landing runway on downwind leg.*

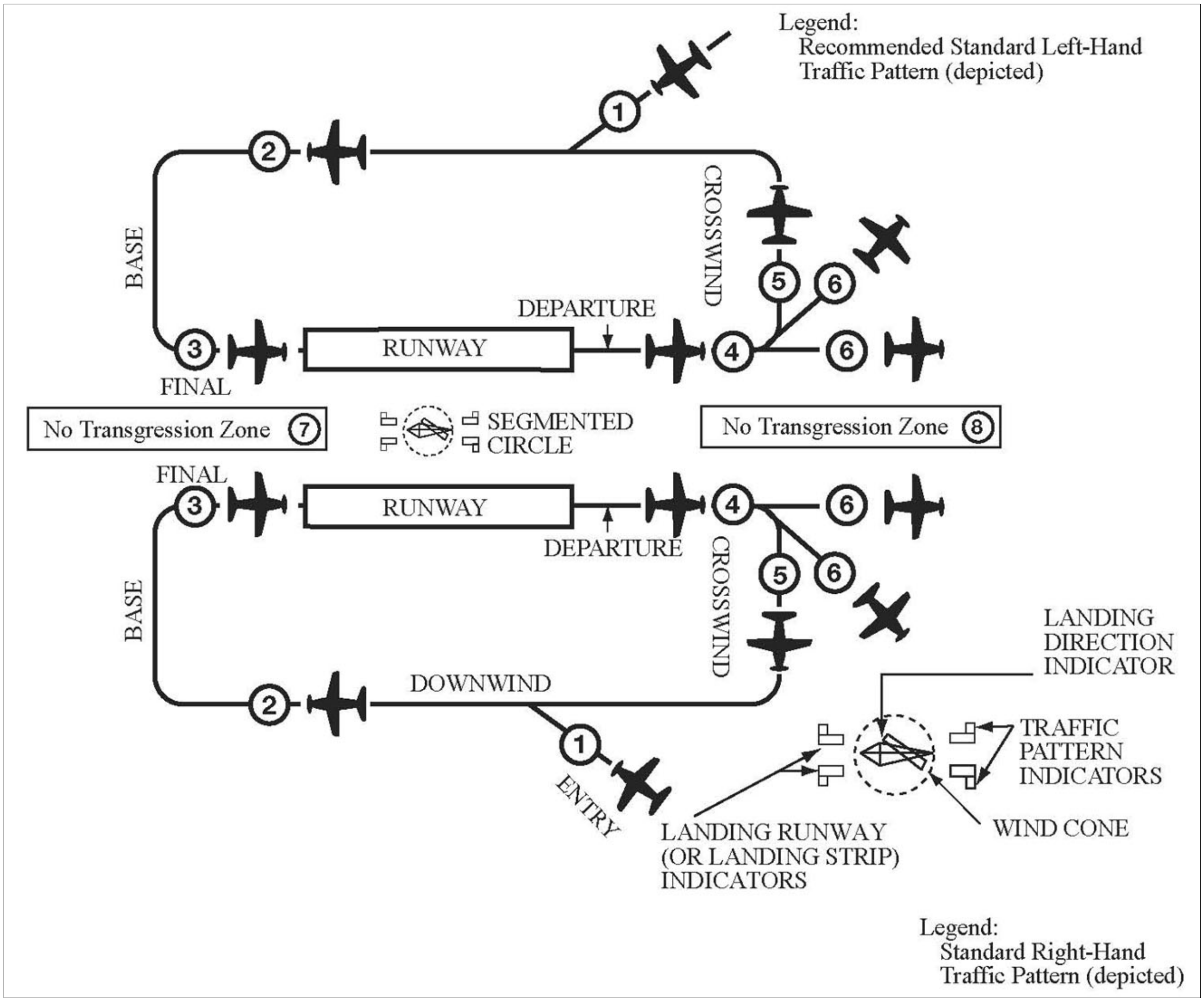
3. *Complete turn to final at least $^{1}/_{4}$ mile from the runway.*

4. *Continue straight ahead until beyond departure end of runway.*

5. *If remaining in the traffic pattern, commence turn to crosswind leg beyond the departure end of the runway within 300 feet of pattern altitude.*

6. *If departing the traffic pattern, continue straight out, or exit with a 45 degree turn (to the left when in a left−hand traffic pattern; to the right when in a right−hand traffic pattern) beyond the departure end of the runway, after reaching pattern altitude.*

FIG 4-3-3
Traffic Pattern Operations
Parallel Runways



EXAMPLE–
Key to traffic pattern operations

1. *Enter pattern in level flight, abeam the midpoint of the runway, at pattern altitude. (1,000' AGL is recommended pattern altitude unless established otherwise. . .)*

2. *Maintain pattern altitude until abeam approach end of the landing runway on downwind leg.*

3. *Complete turn to final at least 1/4 mile from the runway.*

4. *Continue straight ahead until beyond departure end of runway.*

5. *If remaining in the traffic pattern, commence turn to crosswind leg beyond the departure end of the runway within 300 feet of pattern altitude.*

6. *If departing the traffic pattern, continue straight out, or exit with a 45 degree turn (to the left when in a left-hand traffic pattern; to the right when in a right-hand traffic pattern) beyond the departure end of the runway, after reaching pattern altitude.*

7. *Do not overshoot final or continue on a track which will penetrate the final approach of the parallel runway.*

8. *Do not continue on a track which will penetrate the departure path of the parallel runway.*

major maneuver such as a 360 degree turn. If a pilot makes a 360 degree turn after obtaining a landing sequence, the result is usually a gap in the landing interval and, more importantly, it causes a chain reaction which may result in a conflict with following traffic and an interruption of the sequence established by the tower or approach controller. Should a pilot decide to make maneuvering turns to maintain spacing behind a preceding aircraft, the pilot should always advise the controller if at all possible. Except when requested by the controller or in emergency situations, a 360 degree turn should never be executed in the traffic pattern or when receiving radar service without first advising the controller.

4-3-6. Use of Runways/Declared Distances

a. Runways are identified by numbers which indicate the nearest 10-degree increment of the azimuth of the runway centerline. For example, where the magnetic azimuth is 183 degrees, the runway designation would be 18; for a magnetic azimuth of 87 degrees, the runway designation would be 9. For a magnetic azimuth ending in the number 5, such as 185, the runway designation could be either 18 or 19. Wind direction issued by the tower is also magnetic and wind velocity is in knots.

b. Airport proprietors are responsible for taking the lead in local aviation noise control. Accordingly, they may propose specific noise abatement plans to the FAA. If approved, these plans are applied in the form of Formal or Informal Runway Use Programs for noise abatement purposes.

REFERENCE–
Pilot/Controller Glossary Term– Runway Use Program

1. At airports where no runway use program is established, ATC clearances may specify:

(a) The runway most nearly aligned with the wind when it is 5 knots or more;

(b) The "calm wind" runway when wind is less than 5 knots; or

(c) Another runway if operationally advantageous.

NOTE–
It is not necessary for a controller to specifically inquire if the pilot will use a specific runway or to offer a choice of runways. If a pilot prefers to use a different runway from that specified, or the one most nearly aligned with the wind, the pilot is expected to inform ATC accordingly.

2. At airports where a runway use program is established, ATC will assign runways deemed to have the least noise impact. If in the interest of safety a runway different from that specified is preferred, the pilot is expected to advise ATC accordingly. ATC will honor such requests and advise pilots when the requested runway is noise sensitive. When use of a runway other than the one assigned is requested, pilot cooperation is encouraged to preclude disruption of traffic flows or the creation of conflicting patterns.

c. Declared Distances.

1. Declared distances for a runway represent the maximum distances available and suitable for meeting takeoff and landing distance performance requirements. These distances are determined in accordance with FAA runway design standards by adding to the physical length of paved runway any clearway or stopway and subtracting from that sum any lengths necessary to obtain the standard runway safety areas, runway object free areas, or runway protection zones. As a result of these additions and subtractions, the declared distances for a runway may be more or less than the physical length of the runway as depicted on aeronautical charts and related publications, or available in electronic navigation databases provided by either the U.S. Government or commercial companies.

2. All 14 CFR Part 139 airports report declared distances for each runway. Other airports may also report declared distances for a runway if necessary to meet runway design standards or to indicate the presence of a clearway or stopway. Where reported, declared distances for each runway end are published in the Chart Supplement U.S. For runways without published declared distances, the declared distances may be assumed to be equal to the physical length of the runway unless there is a displaced landing threshold, in which case the Landing Distance Available (LDA) is shortened by the amount of the threshold displacement.

NOTE–
A symbol **D** *is shown on U.S. Government charts to indicate that runway declared distance information is available (See appropriate Chart Supplement U.S., Chart Supplement Alaska or Pacific).*

(a) The FAA uses the following definitions for runway declared distances (See FIG 4-3-5):

REFERENCE–
Pilot/Controller Glossary Terms: "Accelerate-Stop Distance Available," "Landing Distance Available," "Takeoff Distance Available," "Takeoff Run Available," " Stopway," and "Clearway."

(1) Takeoff Run Available (TORA) – The runway length declared available and suitable for the ground run of an airplane taking off.

The TORA is typically the physical length of the runway, but it may be shorter than the runway length if necessary to satisfy runway design standards. For example, the TORA may be shorter than the runway length if a portion of the runway must be used to satisfy runway protection zone requirements.

(2) Takeoff Distance Available (TODA) – The takeoff run available plus the length of any remaining runway or clearway beyond the far end of the takeoff run available.

The TODA is the distance declared available for satisfying takeoff distance requirements for airplanes where the certification and operating rules and available performance data allow for the consideration of a clearway in takeoff performance computations.

NOTE–
The length of any available clearway will be included in the TODA published in the entry for that runway end within the Chart Supplement U.S.

(3) Accelerate–Stop Distance Available (ASDA) – The runway plus stopway length declared available and suitable for the acceleration and deceleration of an airplane aborting a takeoff.

The ASDA may be longer than the physical length of the runway when a stopway has been designated available by the airport operator, or it may be shorter than the physical length of the runway if necessary to use a portion of the runway to satisfy runway design standards; for example, where the airport operator uses a portion of the runway to achieve the runway safety area requirement. ASDA is the distance used to satisfy the airplane accelerate–stop distance performance requirements where the certification and operating rules require accelerate–stop distance computations.

NOTE–
The length of any available stopway will be included in the ASDA published in the entry for that runway end within the Chart Supplement U.S.

(4) Landing Distance Available (LDA) – The runway length declared available and suitable for a landing airplane.

The LDA may be less than the physical length of the runway or the length of the runway remaining beyond a displaced threshold if necessary to satisfy runway design standards;for example, where the airport operator uses a portion of the runway to achieve the runway safety area requirement.

Although some runway elements (such as stopway length and clearway length) may be available information, pilots must use the declared distances determined by the airport operator and not attempt to independently calculate declared distances by adding those elements to the reported physical length of the runway.

(b) The airplane operating rules and/or the airplane operating limitations establish minimum distance requirements for takeoff and landing and are based on performance data supplied in the Airplane Flight Manual or Pilot's Operating Handbook. The minimum distances required for takeoff and landing obtained either in planning prior to takeoff or in performance assessments conducted at the time of landing must fall **within** the applicable declared distances before the pilot can accept that runway for takeoff or landing.

(c) Runway design standards may impose restrictions on the amount of runway available for use in takeoff and landing that are not apparent from the reported physical length of the runway or from runway markings and lighting. The runway elements of Runway Safety Area (RSA), Runway Object Free Area (ROFA), and Runway Protection Zone (RPZ) may reduce a runway's declared distances to less than the physical length of the runway at geographically constrained airports (See FIG 4–3–6). When considering the amount of runway available for use in takeoff or landing performance calculations, the declared distances published for a runway must always be used in lieu of the runway's physical length.

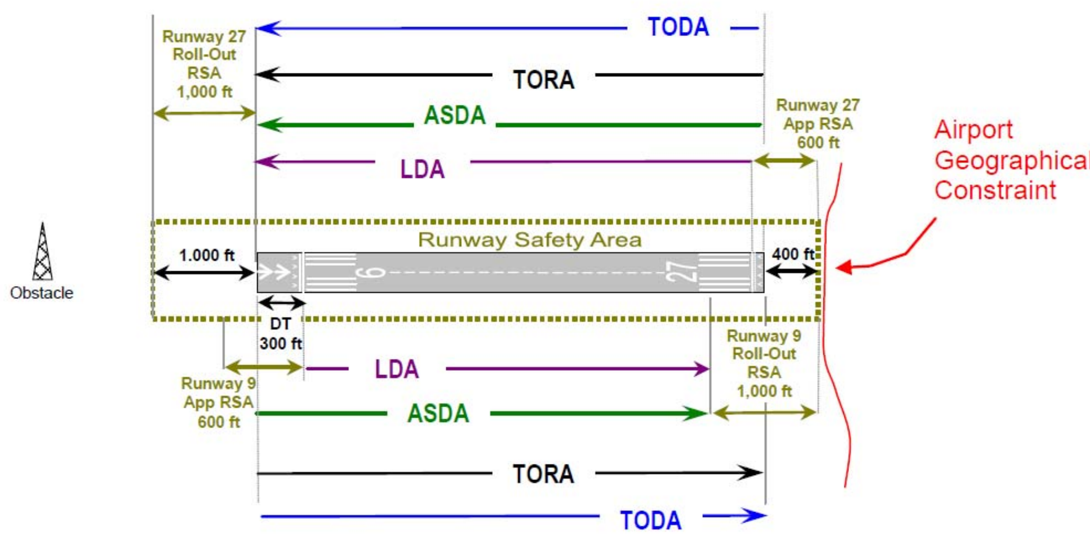
REFERENCE–
AC 150/5300–13, Airport Design

(d) While some runway elements associated with declared distances may be identifiable through runway markings or lighting (for example, a displaced threshold or a stopway), the individual declared distance limits are not marked or otherwise identified on the runway. An aircraft is **not prohibited** from operating beyond a declared distance limit during the takeoff, landing, or taxi operation provided the runway surface is appropriately marked as usable runway (See FIG 4–3–6). The

FIG 4−3−6

Effects of a Geographical Constraint on a Runway's Declared Distances

Runway 27 operations: Runway 27 threshold displaced to provide the required RSA at the approach end of the runway. As a result, the LDA is reduced 200 ft.



Runway 9 operations: The ASDA is reduced by 600 ft to achieve the required RSA at the roll-out end of the runway. The LDA is reduced by 900 ft because, 1) the 300 ft displaced threshold located at the approach end of the runway (due to an approach obstacle), and 2) as result of the 600 ft of runway needed to achieve the required RSA at the roll-out end of the runway.

Runway	Length (feet)	TORA	TODA	ASDA	LDA
9	8000	8000	8000	7400	7100
27		8000	8000	8000	7800

NOTE−

A runway's RSA begins a set distance prior to the threshold and will extend a set distance beyond the end of the runway depending on the runway's design criteria. If these required lengths cannot be achieved, the ASDA and/or LDA will be reduced as necessary to obtain the required lengths to the extent practicable.

4−3−7. Low Level Wind Shear/Microburst Detection Systems

Low Level Wind Shear Alert System (LLWAS), Terminal Doppler Weather Radar (TDWR), Weather System Processor (WSP), and Integrated Terminal Weather System (ITWS) display information on hazardous wind shear and microburst activity in the vicinity of an airport to air traffic controllers who relay this information to pilots.

a. LLWAS provides wind shear alert and gust front information but does not provide microburst alerts. The LLWAS is designed to detect low level wind shear conditions around the periphery of an airport. It does not detect wind shear beyond that limitation. Controllers will provide this information to pilots by giving the pilot the airport wind followed by the boundary wind.

EXAMPLE−
Wind shear alert, airport wind 230 at 8, south boundary wind 170 at 20.

b. LLWAS "network expansion," (LLWAS NE) and LLWAS Relocation/Sustainment (LLWAS−RS) are systems integrated with TDWR. These systems provide the capability of detecting microburst alerts and wind shear alerts. Controllers will issue the appropriate wind shear alerts or microburst alerts. In some of these systems controllers also have the ability to issue wind information oriented to the threshold or departure end of the runway.

EXAMPLE−
Runway 17 arrival microburst alert, 40 knot loss 3 mile final.

REFERENCE−
AIM, Paragraph 7−1−25 , Microbursts

c. More advanced systems are in the field or being developed such as ITWS. ITWS provides alerts for microbursts, wind shear, and significant thunderstorm activity. ITWS displays wind information oriented to the threshold or departure end of the runway.

d. The WSP provides weather processor enhancements to selected Airport Surveillance Radar (ASR)−9 facilities. The WSP provides Air Traffic with detection and alerting of hazardous weather such as wind shear, microbursts, and significant thunderstorm activity. The WSP displays 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. Controllers will receive and issue alerts based on Areas Noted for Attention (ARENA). An ARENA extends on the runway center line from a 3 mile final to the runway to a 2 mile departure.

e. An airport equipped with the LLWAS, ITWS, or WSP is so indicated in the Chart Supplement U.S. under Weather Data Sources for that particular airport.

4−3−8. Braking Action Reports and Advisories

a. When available, ATC furnishes pilots the quality of braking action received from pilots or airport management. The quality of braking action is described by the terms "good," "fair," "poor," and "nil," or a combination of these terms. Effective October 1, 2016, these terms will be replaced with "good," "good to medium," "medium," "medium to poor," "poor," and "nil." When pilots report the quality of braking action by using the terms noted above, they should use descriptive terms that are easily understood, such as, "braking action poor the first/last half of the runway," together with the particular type of aircraft.

b. For NOTAM purposes, braking action reports are classified according to the most critical term ("fair," "poor," or "nil"). Effective October 1, 2016, these terms will be replaced with "good," "good to medium," "medium," "medium to poor," "poor," and "nil" and issued as a NOTAM (D).

c. When tower controllers have received runway braking action reports which include the terms *poor* or *nil,* or whenever weather conditions are conducive to deteriorating or rapidly changing runway braking conditions, the tower will include on the ATIS broadcast the statement, *"BRAKING ACTION ADVISORIES ARE IN EFFECT."*

d. During the time that braking action advisories are in effect, ATC will issue the latest braking action report for the runway in use to each arriving and departing aircraft. Pilots should be prepared for deteriorating braking conditions and should request current runway condition information if not volunteered by controllers. Pilots should also be prepared to provide a descriptive runway condition report to controllers after landing.

4−3−9. Runway Friction Reports and Advisories

a. Friction is defined as the ratio of the tangential force needed to maintain uniform relative motion between two contacting surfaces (aircraft tires to the pavement surface) to the perpendicular force holding them in contact (distributed aircraft weight to the aircraft tire area). Simply stated, friction quantifies slipperiness of pavement surfaces.

b. The greek letter MU (pronounced "myew"), is used to designate a friction value representing runway surface conditions.

c. MU (friction) values range from 0 to 100 where zero is the lowest friction value and 100 is the maximum friction value obtainable. For frozen contaminants on runway surfaces, a MU value of 40 or less is the level when the aircraft braking performance starts to deteriorate and directional control begins to be less responsive. The lower the MU value, the less effective braking performance becomes and the more difficult directional control becomes.

d. At airports with friction measuring devices, airport management should conduct friction measurements on runways covered with compacted snow and/or ice.

1. Numerical readings may be obtained by using any FAA approved friction measuring device. As these devices do not provide equal numerical readings on contaminated surfaces, it is necessary to designate the type of friction measuring device used.

2. When the MU value for any one−third zone of an active runway is 40 or less, a report should be given to ATC by airport management for dissemination to pilots. The report will identify the runway, the time of measurement, the type of friction measuring device used, MU values for each zone, and the contaminant conditions, e.g., wet snow, dry snow, slush, deicing chemicals, etc. Measurements for each one−third zone will be given in the direction of takeoff and landing on the runway. A report should also be given when MU values rise above 40 in all zones of a runway previously reporting a MU below 40.

3. Airport management should initiate a NOTAM(D) when the friction measuring device is out of service.

e. When MU reports are provided by airport management, the ATC facility providing approach control or local airport advisory will provide the report to any pilot upon request.

f. Pilots should use MU information with other knowledge including aircraft performance characteristics, type, and weight, previous experience, wind conditions, and aircraft tire type (i.e., bias ply vs. radial constructed) to determine runway suitability.

g. No correlation has been established between MU values and the descriptive terms "good," "fair," "poor," and "nil." Effective October 1, 2016, these terms will be replaced with "good," "good to medium," "medium," "medium to poor," "poor," and "nil" in braking action reports.

4−3−10. Intersection Takeoffs

a. In order to enhance airport capacities, reduce taxiing distances, minimize departure delays, and provide for more efficient movement of air traffic, controllers may initiate intersection takeoffs as well as approve them when the pilot requests. If for ANY reason a pilot prefers to use a different intersection or the full length of the runway or desires to obtain the distance between the intersection and the runway end, THE PILOT IS EXPECTED TO INFORM ATC ACCORDINGLY.

b. Pilots are expected to assess the suitability of an intersection for use at takeoff during their preflight planning. They must consider the resultant length reduction to the published runway length and to the published declared distances from the intersection intended to be used for takeoff. The minimum runway required for takeoff must fall within the reduced runway length and the reduced declared distances before the intersection can be accepted for takeoff.

REFERENCE−
AIM, Paragraph 4−3−6, Use of Runways/Declared Distances

c. Controllers will issue the measured distance from the intersection to the runway end rounded "down" to the nearest 50 feet to any pilot who requests and to all military aircraft, unless use of the intersection is covered in appropriate directives. Controllers, however, will not be able to inform pilots of the distance from the intersection to the end of any of the published declared distances.

REFERENCE−
FAA Order JO 7110.65, Paragraph 3−7−1, Ground Traffic Movement

d. An aircraft is expected to taxi to (but not onto) the end of the assigned runway unless prior approval for an intersection departure is received from ground control.

e. Pilots should state their position on the airport when calling the tower for takeoff from a runway intersection.

EXAMPLE−
Cleveland Tower, Apache Three Seven Two Two Papa, at the intersection of taxiway Oscar and runway two three right, ready for departure.

f. Controllers are required to separate small aircraft that are departing from an intersection on the same runway (same or opposite direction) behind a large nonheavy aircraft (except B757), by ensuring that at least a 3−minute interval exists between the time the preceding large aircraft has taken off and the succeeding small aircraft begins takeoff roll. The 3−minute separation requirement will also be applied to small aircraft with a maximum certificated takeoff weight of 12,500 pounds or less departing behind a small aircraft with a maximum certificated takeoff weight of more than 12,500 pounds. To inform the pilot of the required 3−minute hold, the controller will state, "Hold for wake turbulence." If after considering wake turbulence hazards, the pilot feels that a lesser time interval is appropriate, the pilot may request a waiver to the 3−minute interval. To initiate such a request, simply say "Request waiver to 3−minute interval" or a similar statement. Controllers may then issue a takeoff clearance if other traffic permits, since the pilot has accepted the responsibility for wake turbulence separation.

g. The 3−minute interval is not required when the intersection is 500 feet or less from the departure point of the preceding aircraft and both aircraft are taking off in the same direction. Controllers may permit the small aircraft to alter course after takeoff to avoid the flight path of the preceding departure.

h. A 4−minute interval is mandatory for small, large, and heavy aircraft behind a super aircraft. The 3−minute interval is mandatory behind a heavy aircraft in all cases, and for small aircraft behind a B757.

4−3−11. Pilot Responsibilities When Conducting Land and Hold Short Operations (LAHSO)

a. LAHSO is an acronym for "Land and Hold Short Operations." These operations include landing and holding short of an **intersecting runway**, an **intersecting taxiway**, or some other designated **point on a runway** other than an intersecting runway or taxiway. (See FIG 4−3−7, FIG 4−3−8, FIG 4−3−9.)

b. Pilot Responsibilities and Basic Procedures.

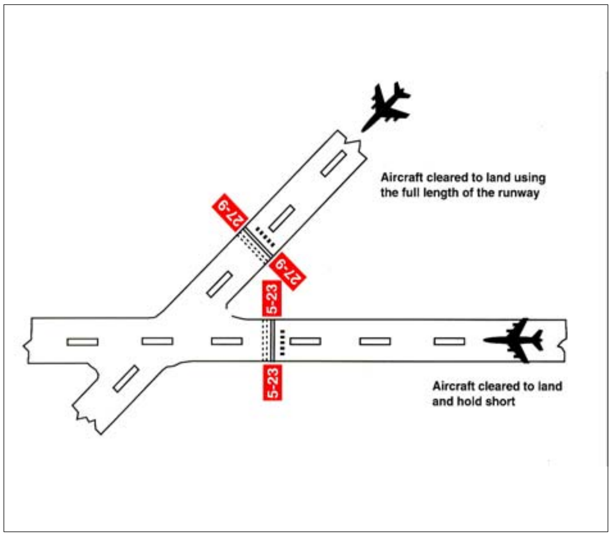
1. LAHSO is an air traffic control procedure that requires pilot participation to balance the needs for increased airport capacity and system efficiency, consistent with safety. This procedure can be done safely **provided** pilots and controllers are knowledgeable and understand their responsibilities. The following paragraphs outline specific pilot/operator responsibilities when conducting LAHSO.

2. At controlled airports, air traffic may clear a pilot to land and hold short. Pilots may accept such a clearance provided that the pilot−in−command determines that the aircraft can safely land and stop within the Available Landing Distance (ALD). ALD data are published in the special notices section of the Chart Supplement U.S. and in the U.S. Terminal Procedures Publications. Controllers will also provide ALD data upon request. Student pilots or pilots not familiar with LAHSO should **not** participate in the program.

3. The pilot−in−command has the final authority to accept or decline any land and hold short clearance. The safety and operation of the aircraft remain the responsibility of the pilot. Pilots are expected to decline a LAHSO clearance if they determine it will compromise safety.

4. To conduct LAHSO, pilots should become familiar with all available information concerning LAHSO at their destination airport. Pilots should have, *readily available,* the **published ALD** and runway **slope information** for **all** LAHSO runway combinations at **each** airport of intended landing. Additionally, knowledge about landing performance data permits the pilot to *readily* determine that the ALD for the assigned runway is sufficient for safe LAHSO. As part of a pilot's preflight planning process, pilots should determine if their destination airport has LAHSO. If so, their preflight planning process should include an assessment of which LAHSO combinations would work for them given their aircraft's required landing distance. Good pilot decision making is knowing in advance whether one can accept a LAHSO clearance if offered.

FIG 4−3−7
Land and Hold Short of an Intersecting Runway



EXAMPLE−
FIG 4−3−9 − holding short at a designated point may be required to avoid conflicts with the runway safety area/flight path of a nearby runway.

NOTE−
Each figure shows the approximate location of LAHSO markings, signage, and in−pavement lighting when installed.

REFERENCE−
AIM, Chapter 2, Aeronautical Lighting and Other Airport Visual Aids.

FIG 4−3−8
Land and Hold Short of an Intersecting Taxiway

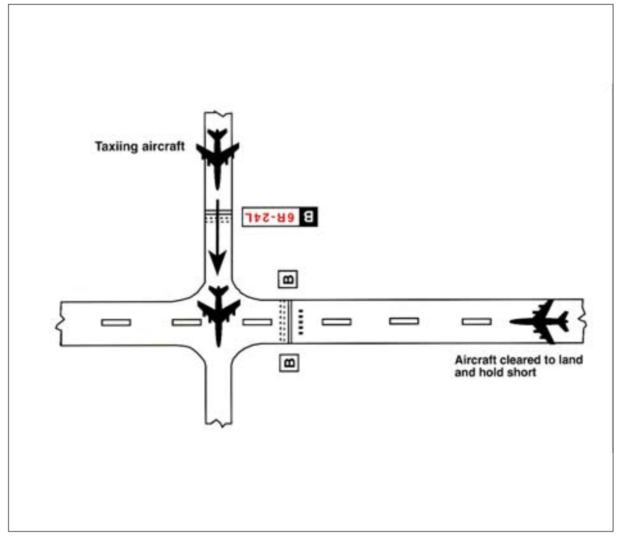
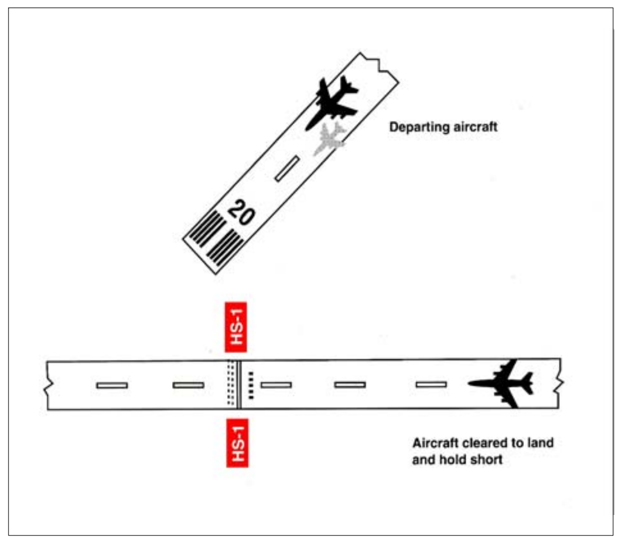


FIG 4−3−9
Land and Hold Short of a Designated Point on a Runway Other Than an Intersecting Runway or Taxiway



5. If, for any reason, such as difficulty in discerning the location of a LAHSO intersection, wind conditions, aircraft condition, etc., the pilot elects to request to land on the full length of the runway, to land on another runway, or to decline LAHSO, a pilot is expected to promptly inform air traffic, ideally even before the clearance is issued. **A LAHSO clearance, once accepted, must be adhered to, just as any other ATC clearance, unless an amended clearance is obtained or an emergency occurs. A LAHSO clearance does not preclude a rejected landing.**

6. A pilot who accepts a LAHSO clearance should land and exit the runway at the first convenient taxiway (unless directed otherwise) before reaching the hold short point. Otherwise, the pilot must stop and hold at the hold short point. **If a rejected landing becomes necessary after accepting a LAHSO clearance, the pilot should maintain safe separation from other aircraft or vehicles, and should promptly notify the controller.**

7. Controllers need a full read back of all LAHSO clearances. Pilots should read back their LAHSO clearance and include the words, "HOLD SHORT OF (RUNWAY/TAXIWAY/OR POINT)" in their acknowledgment of **all** LAHSO clearances. In order to reduce frequency congestion, pilots are encouraged to read back the LAHSO clearance without prompting. Don't make the controller have to ask for a read back!

c. LAHSO Situational Awareness

1. Situational awareness is **vital** to the success of LAHSO. Situational awareness starts with having current airport information in the cockpit, readily accessible to the pilot. (An airport diagram assists pilots in identifying their location on the airport, thus reducing requests for "progressive taxi instructions" from controllers.)

2. Situational awareness includes effective pilot−controller radio communication. ATC expects pilots to specifically acknowledge and read back all LAHSO clearances as follows:

EXAMPLE−
ATC: *"(Aircraft ID) cleared to land runway six right, hold short of taxiway bravo for crossing traffic (type aircraft)."*
Aircraft: *"(Aircraft ID), wilco, cleared to land runway six right to hold short of taxiway bravo."*
ATC: *"(Aircraft ID) cross runway six right at taxiway bravo, landing aircraft will hold short."*
Aircraft: *"(Aircraft ID), wilco, cross runway six right at bravo, landing traffic (type aircraft) to hold."*

3. For those airplanes flown with two crewmembers, effective **intra−cockpit** communication between cockpit crewmembers is also critical. There have been several instances where the pilot working the radios accepted a LAHSO clearance but then simply forgot to tell the pilot flying the aircraft.

4. Situational awareness also includes a thorough understanding of the airport markings, signage, and lighting associated with LAHSO. These visual aids consist of a three−part system of **yellow hold−short markings, red and white signage** and, in certain cases, **in−pavement lighting**. Visual aids assist the pilot in determining where to hold short. FIG 4−3−7, FIG 4−3−8, FIG 4−3−9 depict how these markings, signage, and lighting combinations will appear once installed. Pilots are cautioned that not all airports conducting LAHSO have installed any or all of the above markings, signage, or lighting.

5. Pilots should only receive a LAHSO clearance when there is a minimum ceiling of 1,000 feet and 3 statute miles visibility. The intent of having "basic" VFR weather conditions is to allow pilots to maintain visual contact with other aircraft and ground vehicle operations. Pilots should consider the effects of prevailing inflight visibility (such as landing into the sun) and how it may affect overall situational awareness. Additionally, surface vehicles and aircraft being taxied by maintenance personnel may also be participating in LAHSO, especially in those operations that involve crossing an active runway.

4−3−12. Low Approach

a. A low approach (sometimes referred to as a low pass) is the go−around maneuver following an approach. Instead of landing or making a touch−and−go, a pilot may wish to go around (low approach) in order to expedite a particular operation (a series of practice instrument approaches is an example of such an operation). Unless otherwise authorized by ATC, the low approach should be made straight ahead, with no turns or climb made until the pilot has made a thorough visual check for other aircraft in the area.

b. When operating within a Class B, Class C, and Class D surface area, a pilot intending to make a low approach should contact the tower for approval. This request should be made prior to starting the final approach.

c. When operating to an airport, not within a Class B, Class C, and Class D surface area, a pilot intending to make a low approach should, prior to leaving the final approach fix inbound (nonprecision approach) or the outer marker or fix used in lieu of the outer marker inbound (precision approach), so advise the FSS, UNICOM, or make a broadcast as appropriate.

REFERENCE−
AIM, Paragraph 4−1−9, Traffic Advisory Practices at Airports Without Operating Control Towers

4−3−13. Traffic Control Light Signals

a. The following procedures are used by ATCTs in the control of aircraft, ground vehicles, equipment, and personnel not equipped with radio. These same procedures will be used to control aircraft, ground vehicles, equipment, and personnel equipped with radio if radio contact cannot be established. ATC personnel use a directive traffic control signal which emits an intense narrow light beam of a selected color (either red, white, or green) when controlling traffic by light signals.

b. Although the traffic signal light offers the advantage that some control may be exercised over nonradio equipped aircraft, pilots should be cognizant of the disadvantages which are:

1. Pilots may not be looking at the control tower at the time a signal is directed toward their aircraft.

2. The directions transmitted by a light signal are very limited since only approval or disapproval of a pilot's anticipated actions may be transmitted. No supplement or explanatory information may be transmitted except by the use of the "General Warning Signal" which advises the pilot to be on the alert.

c. Between sunset and sunrise, a pilot wishing to attract the attention of the control tower should turn on a landing light and taxi the aircraft into a position, clear of the active runway, so that light is visible to the tower. The landing light should remain on until appropriate signals are received from the tower.

d. Airport Traffic Control Tower Light Gun Signals. (See TBL 4−3−1.)

e. During daylight hours, acknowledge tower transmissions or light signals by moving the ailerons or rudder. At night, acknowledge by blinking the landing or navigation lights. If radio malfunction occurs after departing the parking area, watch the tower for light signals or monitor tower frequency.

TBL 4−3−1
Airport Traffic Control Tower Light Gun Signals

	Meaning		
Color and Type of Signal	**Movement of Vehicles, Equipment and Personnel**	**Aircraft on the Ground**	**Aircraft in Flight**
Steady green	Cleared to cross, proceed or go	Cleared for takeoff	Cleared to land
Flashing green	Not applicable	Cleared for taxi	Return for landing (to be followed by steady green at the proper time)
Steady red	STOP	STOP	Give way to other aircraft and continue circling
Flashing red	Clear the taxiway/runway	Taxi clear of the runway in use	Airport unsafe, do not land
Flashing white	Return to starting point on airport	Return to starting point on airport	Not applicable
Alternating red and green	Exercise extreme caution	Exercise extreme caution	Exercise extreme caution

4−3−14. Communications

a. Pilots of departing aircraft should communicate with the control tower on the appropriate ground control/clearance delivery frequency prior to starting engines to receive engine start time, taxi and/or clearance information. Unless otherwise advised by the tower, remain on that frequency during taxiing and runup, then change to local control frequency when ready to request takeoff clearance.

NOTE−
Pilots are encouraged to monitor the local tower frequency as soon as practical consistent with other ATC requirements.

REFERENCE−
AIM, Paragraph 4−1−13, Automatic Terminal Information Service (ATIS)

b. The tower controller will consider that pilots of turbine−powered aircraft are ready for takeoff when they reach the runway or warm−up block unless advised otherwise.

c. The majority of ground control frequencies are in the 121.6−121.9 MHz bandwidth. Ground control frequencies are provided to eliminate frequency congestion on the tower (local control) frequency and are limited to communications between the tower and aircraft on the ground and between the tower and utility vehicles on the airport, provide a clear VHF channel for arriving and departing aircraft. They are used for issuance of taxi information, clearances, and other necessary contacts between the tower and aircraft or other vehicles operated on the airport. A pilot who has just landed should not change from the tower frequency to the ground control frequency until directed to do so by the controller. Normally, only one ground control frequency is assigned at an airport; however, at locations where the amount of traffic so warrants, a second ground control frequency and/or another frequency designated as a clearance delivery frequency, may be assigned.

d. A controller may omit the ground or local control frequency if the controller believes the pilot knows which frequency is in use. If the ground control frequency is in the 121 MHz bandwidth the controller may omit the numbers preceding the decimal point; e.g., 121.7, "CONTACT GROUND POINT SEVEN." However, if any doubt exists as to what frequency is in use, the pilot should promptly request the controller to provide that information.

e. Controllers will normally avoid issuing a radio frequency change to helicopters, known to be single−piloted, which are hovering, air taxiing, or flying near the ground. At times, it may be necessary for pilots to alert ATC regarding single pilot operations to minimize delay of essential ATC communications. Whenever possible, ATC instructions will be relayed through the frequency being monitored until a frequency change can be accomplished. You must promptly advise ATC if you are unable to comply with a frequency change. Also, you should advise ATC if you must land to accomplish the frequency change unless it is clear the landing will have no impact on other air traffic; e.g., on a taxiway or in a helicopter operating area.

4−3−15. Gate Holding Due to Departure Delays

a. Pilots should contact ground control or clearance delivery prior to starting engines as gate hold procedures will be in effect whenever departure delays exceed or are anticipated to exceed 15 minutes. The sequence for departure will be maintained in accordance with initial call up unless modified by flow control restrictions. Pilots should monitor the ground control or clearance delivery frequency for engine startup advisories or new proposed start time if the delay changes.

b. The tower controller will consider that pilots of turbine−powered aircraft are ready for takeoff when they reach the runway or warm−up block unless advised otherwise.

4−3−16. VFR Flights in Terminal Areas

Use reasonable restraint in exercising the prerogative of VFR flight, especially in terminal areas. The weather minimums and distances from clouds are minimums. Giving yourself a greater margin in specific instances is just good judgment.

a. Approach Area. Conducting a VFR operation in a Class B, Class C, Class D, and Class E surface area when the official visibility is 3 or 4 miles is not prohibited, but good judgment would dictate that you keep out of the approach area.

b. Reduced Visibility. It has always been recognized that precipitation reduces forward visibility. Consequently, although again it may be perfectly legal to cancel your IFR flight plan at any time you can proceed VFR, it is good practice, when precipitation is occurring, to continue IFR operation into a terminal area until you are reasonably close to your destination.

c. Simulated Instrument Flights. In conducting simulated instrument flights, be sure that the weather is good enough to compensate for the restricted visibility of the safety pilot and your greater concentration on your flight instruments. Give yourself a little greater margin when your flight plan lies in or near a busy airway or close to an airport.

4−3−17. VFR Helicopter Operations at Controlled Airports

a. General.

1. The following ATC procedures and phraseologies recognize the unique capabilities of helicopters and were developed to improve service to all users. Helicopter design characteristics and user needs often require operations from movement areas and nonmovement areas within the airport boundary. In order for ATC to properly apply these procedures, it is essential that pilots familiarize themselves with the local operations and make it known to controllers when additional instructions are necessary.

2. Insofar as possible, helicopter operations will be instructed to avoid the flow of fixed−wing aircraft to minimize overall delays; however, there will be many situations where faster/larger helicopters may be integrated with fixed−wing aircraft for the benefit of all concerned. Examples would include IFR flights, avoidance of noise sensitive areas, or use of runways/taxiways to minimize the hazardous effects of rotor downwash in congested areas.

3. Because helicopter pilots are intimately familiar with the effects of rotor downwash, they are best qualified to determine if a given operation can be conducted safely. Accordingly, the pilot has the final authority with respect to the specific airspeed/altitude combinations. ATC clearances are in no way intended to place the helicopter in a hazardous position. It is expected that pilots will advise ATC if a specific clearance will cause undue hazards to persons or property.

b. Controllers normally limit ATC ground service and instruction to *movement* areas; therefore, operations from *nonmovement* areas are conducted at pilot discretion and should be based on local policies, procedures, or letters of agreement. In order to maximize the flexibility of helicopter operations, it is necessary to rely heavily on sound pilot judgment. For example, hazards such as debris, obstructions, vehicles, or personnel must be recognized by the pilot, and action should be taken as necessary to avoid such hazards. Taxi, hover taxi, and air taxi operations are considered to be ground movements. Helicopters conducting such operations are expected to adhere to the same conditions, requirements, and practices as apply to other ground taxiing and ATC procedures in the AIM.

1. The phraseology *taxi* is used when it is intended or expected that the helicopter will taxi on the airport surface, either via taxiways or other prescribed routes. *Taxi* is used primarily for helicopters equipped with wheels or in response to a pilot request. Preference should be given to this procedure whenever it is necessary to minimize effects of rotor downwash.

2. Pilots may request a *hover taxi* when slow forward movement is desired or when it may be appropriate to move very short distances. Pilots should avoid this procedure if rotor downwash is likely to cause damage to parked aircraft or if blowing dust/snow could obscure visibility. If it is necessary to operate above 25 feet AGL when hover taxiing, the pilot should initiate a request to ATC.

3. *Air taxi* is the preferred method for helicopter ground movements on airports provided ground operations and conditions permit. Unless otherwise requested or instructed, pilots are expected to remain below 100 feet AGL. However, if a higher than normal airspeed or altitude is desired, the request should be made prior to lift−off. The pilot is solely responsible for selecting a safe airspeed for the altitude/operation being conducted. Use of *air taxi* enables the pilot to proceed at an optimum airspeed/altitude, minimize downwash effect, conserve fuel, and expedite movement from one point to another. Helicopters should avoid overflight of other aircraft, vehicles, and personnel during air−taxi operations. Caution must be exercised concerning active runways and pilots must be certain that air taxi instructions are understood. Special precautions may be necessary at unfamiliar airports or airports with multiple/intersecting active runways. The taxi procedures given in Paragraph 4−3−18, Taxiing, Paragraph 4−3−19, Taxi During Low Visibility, and Paragraph 4−3−20, Exiting the Runway After Landing, also apply.

REFERENCE−
Pilot/Controller Glossary Term− Taxi.
Pilot/Controller Glossary Term− Hover Taxi.
Pilot/Controller Glossary Term− Air Taxi.

c. Takeoff and Landing Procedures.

1. Helicopter operations may be conducted from a runway, taxiway, portion of a landing strip, or any clear area which could be used as a landing site such as the scene of an accident, a construction site, or the roof of a building. The terms used to describe designated areas from which helicopters operate are: movement area, landing/takeoff area, apron/ramp, heliport and helipad (See Pilot/Controller Glossary). These areas may be improved or unimproved and may be separate from or located on an airport/heliport. ATC will issue takeoff clearances from *movement* areas other than active runways, or in diverse directions from active runways, with additional instructions as necessary. Whenever possible, takeoff clearance will be issued in lieu of extended hover/air taxi operations. Phraseology will be "CLEARED FOR TAKEOFF FROM (taxiway, helipad, runway number, etc.), MAKE RIGHT/

LEFT TURN FOR (direction, heading, NAVAID radial) DEPARTURE/DEPARTURE ROUTE (number, name, etc.).” Unless requested by the pilot, downwind takeoffs will not be issued if the tailwind exceeds 5 knots.

2. Pilots should be alert to wind information as well as to wind indications in the vicinity of the helicopter. ATC should be advised of the intended method of departing. A pilot request to takeoff in a given direction indicates that the pilot is willing to accept the wind condition and controllers will honor the request if traffic permits. Departure points could be a significant distance from the control tower and it may be difficult or impossible for the controller to determine the helicopter's relative position to the wind.

3. If takeoff is requested from *nonmovement* areas, an area not authorized for helicopter use, an area not visible from the tower, an unlighted area at night, or an area off the airport, the phraseology “DEPARTURE FROM (requested location) WILL BE AT YOUR OWN RISK (additional instructions, as necessary). USE CAUTION (if applicable).” The pilot is responsible for operating in a safe manner and should exercise due caution.

4. Similar phraseology is used for helicopter landing operations. Every effort will be made to permit helicopters to proceed direct and land as near as possible to their final destination on the airport. Traffic density, the need for detailed taxiing instructions, frequency congestion, or other factors may affect the extent to which service can be expedited. As with ground movement operations, a high degree of pilot/controller cooperation and communication is necessary to achieve safe and efficient operations.

4−3−18. Taxiing

a. General. Approval must be obtained prior to moving an aircraft or vehicle onto the movement area during the hours an Airport Traffic Control Tower is in operation.

1. Always state your position on the airport when calling the tower for taxi instructions.

2. The movement area is normally described in local bulletins issued by the airport manager or control tower. These bulletins may be found in FSSs, fixed base operators offices, air carrier offices, and operations offices.

3. The control tower also issues bulletins describing areas where they cannot provide ATC service due to nonvisibility or other reasons.

4. A clearance must be obtained prior to taxiing on a runway, taking off, or landing during the hours an Airport Traffic Control Tower is in operation.

5. A clearance must be obtained prior to crossing any runway. ATC will issue an explicit clearance for all runway crossings.

6. When assigned a takeoff runway, ATC will first specify the runway, issue taxi instructions, and state any hold short instructions or runway crossing clearances if the taxi route will cross a runway. This does not authorize the aircraft to “enter” or “cross” the assigned departure runway at any point. In order to preclude misunderstandings in radio communications, ATC will not use the word “cleared” in conjunction with authorization for aircraft to taxi.

7. When issuing taxi instructions to any point other than an assigned takeoff runway, ATC will specify the point to taxi to, issue taxi instructions, and state any hold short instructions or runway crossing clearances if the taxi route will cross a runway.

NOTE−
ATC is required to obtain a readback from the pilot of all runway hold short instructions.

8. If a pilot is expected to hold short of a runway approach (“APPCH”) area or ILS holding position (see FIG 2−3−15, Taxiways Located in Runway Approach Area), ATC will issue instructions.

9. When taxi instructions are received from the controller, pilots should always read back:

(a) The runway assignment.

(b) Any clearance to enter a specific runway.

(c) Any instruction to hold short of a specific runway or line up and wait.

Controllers are required to request a readback of runway hold short assignment when it is not received from the pilot/vehicle.

b. ATC clearances or instructions pertaining to taxiing are predicated on known traffic and known physical airport conditions. Therefore, it is important that pilots clearly understand the clearance or instruction. Although an ATC clearance is issued for taxiing purposes, when operating in accordance with the CFRs, it is the responsibility of the pilot to avoid collision with other aircraft. Since "the pilot−in−command of an aircraft is directly responsible for, and is the final authority as to, the operation of that aircraft" the pilot should obtain clarification of any clearance or instruction which is not understood.

REFERENCE−
AIM, Paragraph 7−3−1 , General

1. Good operating practice dictates that pilots acknowledge all runway crossing, hold short, or takeoff clearances unless there is some misunderstanding, at which time the pilot should query the controller until the clearance is understood.

NOTE−
Air traffic controllers are required to obtain from the pilot a readback of all runway hold short instructions.

2. Pilots operating a single pilot aircraft should monitor only assigned ATC communications after being cleared onto the active runway for departure. Single pilot aircraft should not monitor other than ATC communications until flight from Class B, Class C, or Class D surface area is completed. This same procedure should be practiced from after receipt of the clearance for landing until the landing and taxi activities are complete. Proper effective scanning for other aircraft, surface vehicles, or other objects should be continuously exercised in all cases.

3. If the pilot is unfamiliar with the airport or for any reason confusion exists as to the correct taxi routing, a request may be made for progressive taxi instructions which include step−by−step routing directions. Progressive instructions may also be issued if the controller deems it necessary due to traffic or field conditions (for example, construction or closed taxiways).

c. At those airports where the U.S. Government operates the control tower and ATC has authorized noncompliance with the requirement for two−way radio communications while operating within the Class B, Class C, or Class D surface area, or at those airports where the U.S. Government does not operate the control tower and radio communications cannot be established, pilots must obtain a clearance by visual light signal prior to taxiing on a runway and prior to takeoff and landing.

d. The following phraseologies and procedures are used in radiotelephone communications with aeronautical ground stations.

1. Request for taxi instructions prior to departure. State your aircraft identification, location, type of operation planned (VFR or IFR), and the point of first intended landing.

EXAMPLE−
Aircraft: *"Washington ground, Beechcraft One Three One Five Niner at hangar eight, ready to taxi, I−F−R to Chicago."*

Tower: *"Beechcraft one three one five niner, Washington ground, runway two seven, taxi via taxiways Charlie and Delta, hold short of runway three three left."*

Aircraft: *"Beechcraft One Three One Five Niner, hold short of runway three three left."*

2. Receipt of ATC clearance. ARTCC clearances are relayed to pilots by airport traffic controllers in the following manner.

EXAMPLE−
Tower: *"Beechcraft One Three One Five Niner, cleared to the Chicago Midway Airport via Victor Eight, maintain eight thousand."*

Aircraft: *"Beechcraft One Three One Five Niner, cleared to the Chicago Midway Airport via Victor Eight, maintain eight thousand."*

NOTE−
Normally, an ATC IFR clearance is relayed to a pilot by the ground controller. At busy locations, however, pilots may be instructed by the ground controller to "contact clearance delivery" on a frequency designated for this purpose. No surveillance or control over the movement of traffic is exercised by this position of operation.

3. Request for taxi instructions after landing. State your aircraft identification, location, and that you request taxi instructions.

EXAMPLE−
Aircraft: *"Dulles ground, Beechcraft One Four Two Six One clearing runway one right on taxiway echo three, request clearance to Page."*

Tower: *"Beechcraft One Four Two Six One, Dulles ground, taxi to Page via taxiways echo three, echo one, and echo niner."*

or

Aircraft: *"Orlando ground, Beechcraft One Four Two Six One clearing runway one eight left at taxiway bravo three, request clearance to Page."*

Tower: *"Beechcraft One Four Two Six One, Orlando* *ground, hold short of runway one eight right.”*

Aircraft: *“Beechcraft One Four Two Six One, hold short of runway one eight right.”*

4−3−19. Taxi During Low Visibility

a. Pilots and aircraft operators should be constantly aware that during certain low visibility conditions the movement of aircraft and vehicles on airports may not be visible to the tower controller. This may prevent visual confirmation of an aircraft's adherence to taxi instructions.

b. Of vital importance is the need for pilots to notify the controller when difficulties are encountered or at the first indication of becoming disoriented. Pilots should proceed with extreme caution when taxiing toward the sun. When vision difficulties are encountered pilots should immediately inform the controller.

c. Advisory Circular 120−57, Low Visibility Operations Surface Movement Guidance and Control System, commonly known as LVOSMGCS (pronounced “LVO SMIGS”) describes an adequate example of a low visibility taxi plan for any airport which has takeoff or landing operations in less than 1,200 feet runway visual range (RVR) visibility conditions. These plans, which affect aircrew and vehicle operators, may incorporate additional lighting, markings, and procedures to control airport surface traffic. They will be addressed at two levels; operations less than 1,200 feet RVR to 500 feet RVR and operations less than 500 feet RVR.

NOTE−
Specific lighting systems and surface markings may be found in Paragraph 2−1−11, Taxiway Lights, and Paragraph 2−3−4, Taxiway Markings.

d. When low visibility conditions exist, pilots should focus their entire attention on the safe operation of the aircraft while it is moving. Checklists and nonessential communication should be withheld until the aircraft is stopped and the brakes set.

4−3−20. Exiting the Runway After Landing

The following procedures must be followed after landing and reaching taxi speed.

a. Exit the runway without delay at the first available taxiway or on a taxiway as instructed by ATC. Pilots must not exit the landing runway onto another runway unless authorized by ATC. At airports with an operating control tower, pilots should not stop or reverse course on the runway without first obtaining ATC approval.

b. Taxi clear of the runway unless otherwise directed by ATC. An aircraft is considered clear of the runway when all parts of the aircraft are past the runway edge and there are no restrictions to its continued movement beyond the runway holding position markings. In the absence of ATC instructions, the pilot is expected to taxi clear of the landing runway by taxiing beyond the runway holding position markings associated with the landing runway, even if that requires the aircraft to protrude into or cross another taxiway or ramp area. Once all parts of the aircraft have crossed the runway holding position markings, the pilot must hold unless further instructions have been issued by ATC.

NOTE−
1. *The tower will issue the pilot instructions which will permit the aircraft to enter another taxiway, runway, or ramp area when required.*

2. *Guidance contained in subparagraphs a and b above is considered an integral part of the landing clearance and satisfies the requirement of 14 CFR Section 91.129.*

c. Immediately change to ground control frequency when advised by the tower and obtain a taxi clearance.

NOTE−
1. *The tower will issue instructions required to resolve any potential conflictions with other ground traffic prior to advising the pilot to contact ground control.*

2. *Ground control will issue taxi clearance to parking. That clearance does not authorize the aircraft to “enter” or “cross” any runways. Pilots not familiar with the taxi route should request specific taxi instructions from ATC.*

4−3−21. Practice Instrument Approaches

a. Various air traffic incidents have indicated the necessity for adoption of measures to achieve more organized and controlled operations where practice instrument approaches are conducted. Practice instrument approaches are considered to be instrument approaches made by either a VFR aircraft not on an IFR flight plan or an aircraft on an IFR flight plan. To achieve this and thereby enhance air safety, it is Air Traffic's policy to provide for separation of such operations at locations where approach control facilities are located and, as resources permit, at certain other locations served by ARTCCs or parent approach control facilities. Pilot requests to practice instrument approaches may be approved by ATC subject to traffic and workload conditions. Pilots should anticipate that in some instances the controller may find it necessary to deny approval or withdraw previous approval when traffic conditions warrant. It must be clearly understood, however, that even though the controller may be providing separation, pilots on VFR flight plans are required to comply with basic VFR weather minimums (14 CFR Section 91.155). Application of ATC procedures or any action taken by the controller to avoid traffic conflictions does not relieve IFR and VFR pilots of their responsibility to see−and−avoid other traffic while operating in VFR conditions (14 CFR Section 91.113). In addition to the normal IFR separation minimums (which includes visual separation) during VFR conditions, 500 feet vertical separation may be applied between VFR aircraft and between a VFR aircraft and the IFR aircraft. Pilots not on IFR flight plans desiring practice instrument approaches should always state 'practice' when making requests to ATC. Controllers will instruct VFR aircraft requesting an instrument approach to maintain VFR. This is to preclude misunderstandings between the pilot and controller as to the status of the aircraft. If pilots wish to proceed in accordance with instrument flight rules, they must specifically request and obtain, an IFR clearance.

b. Before practicing an instrument approach, pilots should inform the approach control facility or the tower of the type of practice approach they desire to make and how they intend to terminate it, i.e., full−stop landing, touch−and−go, or missed or low approach maneuver. This information may be furnished progressively when conducting a series of approaches. Pilots on an IFR flight plan, who have made a series of instrument approaches to full stop landings should inform ATC when they make their final landing. The controller will control flights practicing instrument approaches so as to ensure that they do not disrupt the flow of arriving and departing itinerant IFR or VFR aircraft. The priority afforded itinerant aircraft over practice instrument approaches is not intended to be so rigidly applied that it causes grossly inefficient application of services. A minimum delay to itinerant traffic may be appropriate to allow an aircraft practicing an approach to complete that approach.

NOTE−
A clearance to land means that appropriate separation on the landing runway will be ensured. A landing clearance does not relieve the pilot from compliance with any previously issued restriction.

c. At airports without a tower, pilots wishing to make practice instrument approaches should notify the facility having control jurisdiction of the desired approach as indicated on the approach chart. All approach control facilities and ARTCCs are required to publish a Letter to Airmen depicting those airports where they provide standard separation to both VFR and IFR aircraft conducting practice instrument approaches.

d. The controller will provide approved separation between both VFR and IFR aircraft when authorization is granted to make practice approaches to airports where an approach control facility is located and to certain other airports served by approach control or an ARTCC. Controller responsibility for separation of VFR aircraft begins at the point where the approach clearance becomes effective, or when the aircraft enters Class B or Class C airspace, or a TRSA, whichever comes first.

e. VFR aircraft practicing instrument approaches are not automatically authorized to execute the missed approach procedure. This authorization must be specifically requested by the pilot and approved by the controller. Separation will not be provided unless the missed approach has been approved by ATC.

f. Except in an emergency, aircraft cleared to practice instrument approaches must not deviate from the approved procedure until cleared to do so by the controller.

g. At radar approach control locations when a full approach procedure (procedure turn, etc.,) cannot be approved, pilots should expect to be vectored to a final approach course for a practice instrument approach which is compatible with the general direction of traffic at that airport.

h. When granting approval for a practice instrument approach, the controller will usually ask the pilot to report to the tower prior to or over the final approach fix inbound (nonprecision approaches) or over the outer marker or fix used in lieu of the outer marker inbound (precision approaches).

i. When authorization is granted to conduct practice instrument approaches to an airport with a tower, but where approved standard separation is not provided to aircraft conducting practice instrument approaches, the tower will approve the practice approach, instruct the aircraft to maintain VFR and issue traffic information, as required.

j. When an aircraft notifies a FSS providing Local Airport Advisory to the airport concerned of the intent to conduct a practice instrument approach and whether or not separation is to be provided, the pilot will be instructed to contact the appropriate facility on a specified frequency prior to initiating the approach. At airports where separation is not provided, the FSS will acknowledge the message and issue known traffic information but will neither approve or disapprove the approach.

k. Pilots conducting practice instrument approaches should be particularly alert for other aircraft operating in the local traffic pattern or in proximity to the airport.

4−3−22. Option Approach

The "Cleared for the Option" procedure will permit an instructor, flight examiner or pilot the option to make a touch−and−go, low approach, missed approach, stop−and−go, or full stop landing. This procedure can be very beneficial in a training situation in that neither the student pilot nor examinee would know what maneuver would be accomplished. The pilot should make a request for this procedure passing the final approach fix inbound on an instrument approach or entering downwind for a VFR traffic pattern. After ATC approval of the option, the pilot should inform ATC as soon as possible of any delay on the runway during their stop-and-go or full stop landing. The advantages of this procedure as a training aid are that it enables an instructor or examiner to obtain the reaction of a trainee or examinee under changing conditions, the pilot would not have to discontinue an approach in the middle of the procedure due to student error or pilot proficiency requirements, and finally it allows more flexibility and economy in training programs. This procedure will only be used at those locations with an operational control tower and will be subject to ATC approval.

4−3−23. Use of Aircraft Lights

a. Aircraft position lights are required to be lighted on aircraft operated on the surface and in flight from sunset to sunrise. In addition, aircraft equipped with an anti−collision light system are required to operate that light system during all types of operations (day and night). However, during any adverse meteorological conditions, the pilot−in−command may determine that the anti−collision lights should be turned off when their light output would constitute a hazard to safety (14 CFR Section 91.209). Supplementary strobe lights should be turned off on the ground when they adversely affect ground personnel or other pilots, and in flight when there are adverse reflection from clouds.

b. An aircraft anti−collision light system can use one or more rotating beacons and/or strobe lights, be colored either red or white, and have different (higher than minimum) intensities when compared to other aircraft. Many aircraft have both a rotating beacon and a strobe light system.

c. The FAA has a voluntary pilot safety program, Operation Lights On, to enhance the *see−and−avoid* concept. Pilots are encouraged to turn on their landing lights during takeoff; i.e., either after takeoff clearance has been received or when beginning takeoff roll. Pilots are further encouraged to turn on their landing lights when operating below 10,000 feet, day or night, especially when operating within 10 miles of any airport, or in conditions of reduced visibility and in areas where flocks of birds may be expected, i.e., coastal areas, lake areas, around refuse dumps, etc. Although turning on aircraft lights does enhance the *see−and−avoid* concept, pilots should not become complacent about keeping a sharp lookout for other aircraft. Not all aircraft are equipped with lights and some pilots may not have their lights turned on. Aircraft manufacturer's recommendations for operation of landing lights and electrical systems should be observed.

d. Prop and jet blast forces generated by large aircraft have overturned or damaged several smaller aircraft taxiing behind them. To avoid similar results, and in the interest of preventing upsets and injuries to ground personnel from such forces, the FAA recommends that air carriers and commercial operators turn on their rotating beacons anytime their aircraft engines are in operation. General aviation pilots using rotating beacon equipped aircraft are also encouraged to participate in this program which is designed to alert others to the potential hazard. Since this is a voluntary program, exercise caution and do not rely solely on the rotating beacon as an indication that aircraft engines are in operation.

e. Prior to commencing taxi, it is recommended to turn on navigation, position, anti-collision, and logo lights (if equipped). To signal intent to other pilots, consider turning on the taxi light when the aircraft is moving or intending to move on the ground, and turning it off when stopped or yielding to other ground traffic. Strobe lights should not be illuminated during taxi if they will adversely affect the vision of other pilots or ground personnel.

f. At the discretion of the pilot-in-command, all exterior lights should be illuminated when taxiing on or across any runway. This increases the conspicuousness of the aircraft to controllers and other pilots approaching to land, taxiing, or crossing the runway. Pilots should comply with any equipment operating limitations and consider the effects of landing and strobe lights on other aircraft in their vicinity.

g. When entering the departure runway for takeoff or to "line up and wait," all lights, except for landing lights, should be illuminated to make the aircraft conspicuous to ATC and other aircraft on approach. Landing lights should be turned on when takeoff clearance is received or when commencing takeoff roll at an airport without an operating control tower.

4-3-24. Flight Inspection/'Flight Check' Aircraft in Terminal Areas

a. *Flight check* is a call sign used to alert pilots and air traffic controllers when a FAA aircraft is engaged in flight inspection/certification of NAVAIDs and flight procedures. Flight check aircraft fly preplanned high/low altitude flight patterns such as grids, orbits, DME arcs, and tracks, including low passes along the full length of the runway to verify NAVAID performance.

b. Pilots should be especially watchful and avoid the flight paths of any aircraft using the call sign "Flight Check." These flights will normally receive special handling from ATC. Pilot patience and cooperation in allowing uninterrupted recordings can significantly help expedite flight inspections, minimize costly, repetitive runs, and reduce the burden on the U.S. taxpayer.

4-3-25. Hand Signals

FIG 4-3-10
Signalman Directs Towing

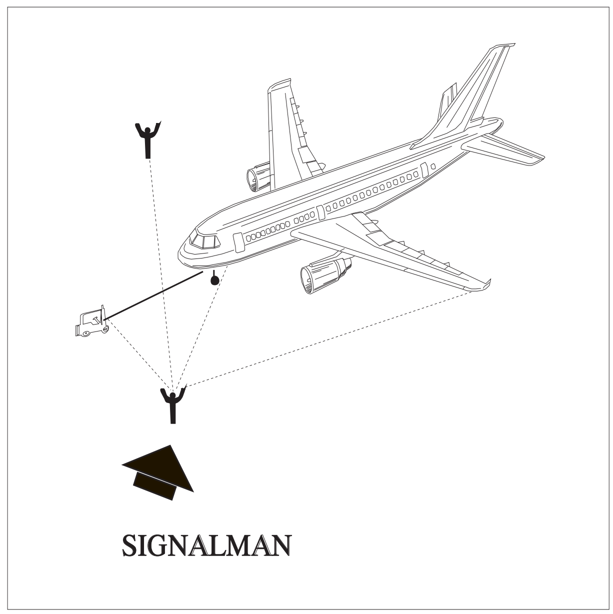


FIG 4-3-11
Signalman's Position

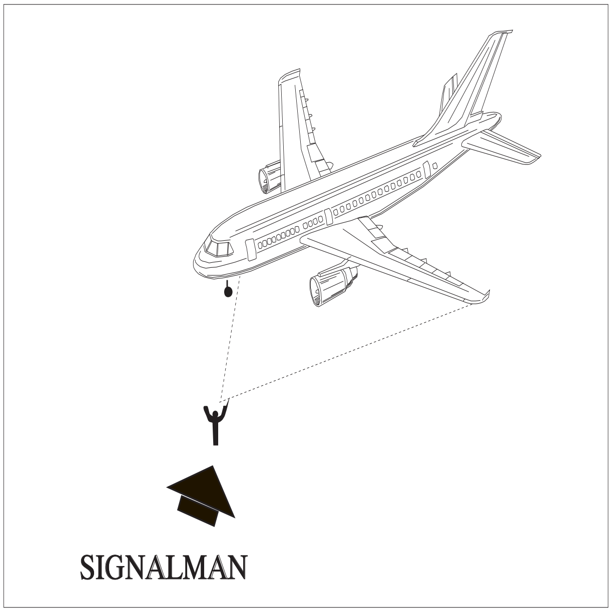


FIG 4-3-12
All Clear
(O.K.)

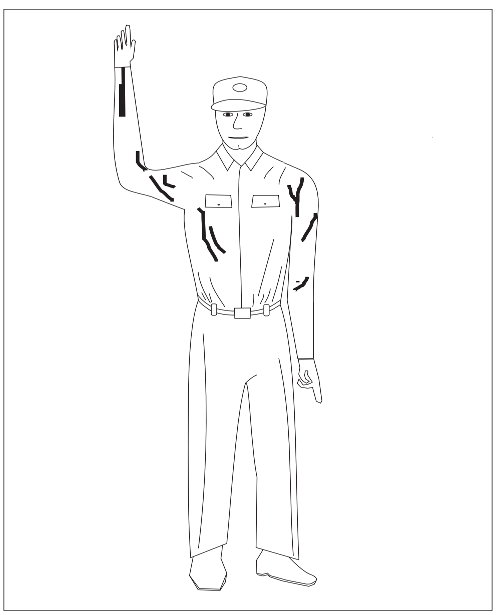


FIG 4-3-13
Start Engine

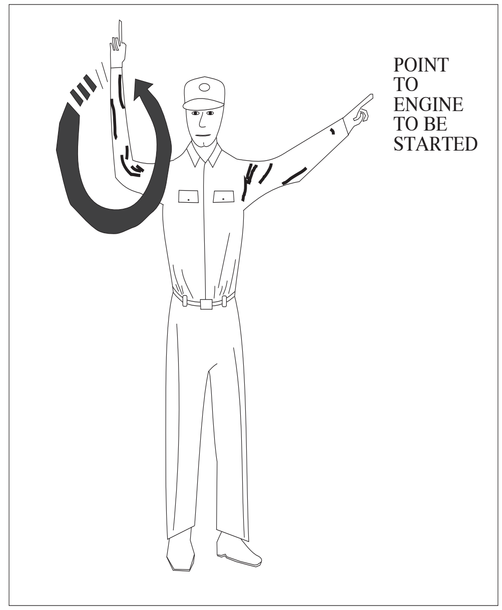


FIG 4-3-14
Pull Chocks

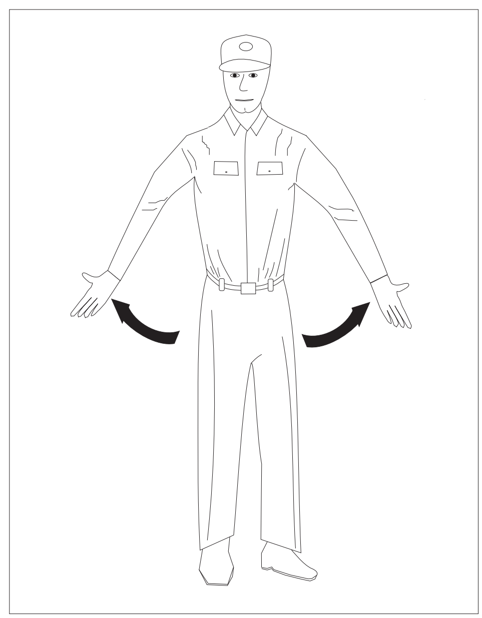
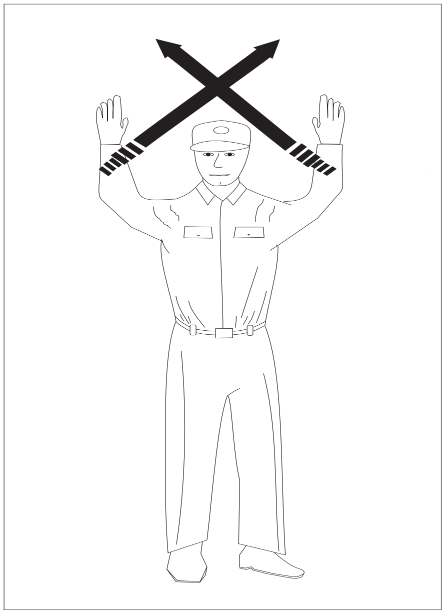


FIG 4−3−23
Stop



4−3−26. Operations at Uncontrolled Airports With Automated Surface Observing System (ASOS)/Automated Weather Sensor System(AWSS)/Automated Weather Observing System (AWOS)

a. Many airports throughout the National Airspace System are equipped with either ASOS, AWSS, or AWOS. At most airports with an operating control tower or human observer, the weather will be available to you in an Aviation Routine Weather Report (METAR) hourly or special observation format on the Automatic Terminal Information Service (ATIS) or directly transmitted from the controller/observer.

b. At uncontrolled airports that are equipped with ASOS/AWSS/AWOS with ground−to−air broadcast capability, the one−minute updated airport weather should be available to you within approximately 25 NM of the airport below 10,000 feet. The frequency for the weather broadcast will be published on sectional charts and in the Chart Supplement U.S. Some part−time towered airports may also broadcast the automated weather on their ATIS frequency during the hours that the tower is closed.

c. Controllers issue SVFR or IFR clearances based on pilot request, known traffic and reported weather, i.e., METAR/Nonroutine (Special) Aviation Weather Report (SPECI) observations, when they are available. Pilots have access to more current weather at uncontrolled ASOS/AWSS/AWOS airports than do the controllers who may be located several miles away. Controllers will rely on the pilot to determine the current airport weather from the ASOS/AWSS/AWOS. All aircraft arriving or departing an ASOS/AWSS/AWOS equipped uncontrolled airport should monitor the airport weather frequency to ascertain the status of the airspace. Pilots in Class E airspace must be alert for changing weather conditions which may effect the status of the airspace from IFR/VFR. If ATC service is required for IFR/SVFR approach/departure or requested for VFR service, the pilot should advise the controller that he/she has received the one−minute weather and state his/her intentions.

EXAMPLE−
"I have the (airport) one−minute weather, request an ILS Runway 14 approach."

REFERENCE−
AIM, Paragraph 7−1−11 , Weather Observing Programs

Section 5. Surveillance Systems

4−5−1. Radar

a. Capabilities

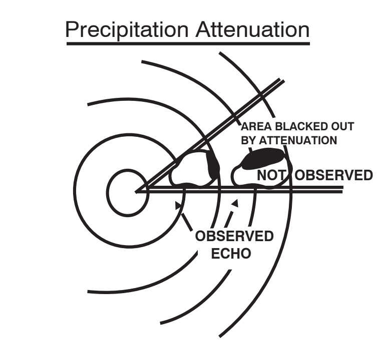
1. Radar is a method whereby radio waves are transmitted into the air and are then received when they have been reflected by an object in the path of the beam. Range is determined by measuring the time it takes (at the speed of light) for the radio wave to go out to the object and then return to the receiving antenna. The direction of a detected object from a radar site is determined by the position of the rotating antenna when the reflected portion of the radio wave is received.

2. More reliable maintenance and improved equipment have reduced radar system failures to a negligible factor. Most facilities actually have some components duplicated, one operating and another which immediately takes over when a malfunction occurs to the primary component.

b. Limitations

1. It is very important for the aviation community to recognize the fact that there are limitations to radar service and that ATC controllers may not always be able to issue traffic advisories concerning aircraft which are not under ATC control and cannot be seen on radar. (See FIG 4−5−1.)

FIG 4−5−1
Limitations to Radar Service



The nearby target absorbs and scatters so much of the out-going and returning energy that the radar does not detect the distant target.

(a) The characteristics of radio waves are such that they normally travel in a continuous straight line unless they are:

(1) "Bent" by abnormal atmospheric phenomena such as temperature inversions;

(2) Reflected or attenuated by dense objects such as heavy clouds, precipitation, ground obstacles, mountains, etc.; or

(3) Screened by high terrain features.

(b) The bending of radar pulses, often called anomalous propagation or ducting, may cause many extraneous blips to appear on the radar operator's display if the beam has been bent toward the ground or may decrease the detection range if the wave is bent upward. It is difficult to solve the effects of anomalous propagation, but using beacon radar and electronically eliminating stationary and slow moving targets by a method called moving target indicator (MTI) usually negate the problem.

(c) Radar energy that strikes dense objects will be reflected and displayed on the operator's scope thereby blocking out aircraft at the same range and greatly weakening or completely eliminating the display of targets at a greater range. Again, radar beacon and MTI are very effectively used to combat ground clutter and weather phenomena, and a method of circularly polarizing the radar beam will eliminate some weather returns. A negative characteristic of MTI is that an aircraft flying a speed that coincides with the canceling signal of the MTI (tangential or "blind" speed) may not be displayed to the radar controller.

(d) Relatively low altitude aircraft will not be seen if they are screened by mountains or are below the radar beam due to earth curvature. The only solution to screening is the installation of strategically placed multiple radars which has been done in some areas.

(e) There are several other factors which affect radar control. The amount of reflective surface of an aircraft will determine the size of the radar return. Therefore, a small light airplane or a sleek jet fighter will be more difficult to see on radar than a large commercial jet or military bomber. Here again, the use of radar beacon is invaluable if the aircraft is equipped with an airborne transponder. All ARTCCs' radars in the conterminous U.S. and many airport surveillance radars have the capability to interrogate Mode C and display altitude information to the controller from appropriately equipped aircraft. However, there are a number of airport surveillance radars that don't have Mode C display capability and; therefore, altitude information must be obtained from the pilot.

(f) At some locations within the ATC en route environment, secondary−radar−only (no primary radar) gap filler radar systems are used to give lower altitude radar coverage between two larger radar systems, each of which provides both primary and secondary radar coverage. In those geographical areas served by secondary−radar only, aircraft without transponders cannot be provided with radar service. Additionally, transponder equipped aircraft cannot be provided with radar advisories concerning primary targets and weather.

REFERENCE−
Pilot/Controller Glossary Term− Radar.

(g) The controller's ability to advise a pilot flying on instruments or in visual conditions of the aircraft's proximity to another aircraft will be limited if the unknown aircraft is not observed on radar, if no flight plan information is available, or if the volume of traffic and workload prevent issuing traffic information. The controller's first priority is given to establishing vertical, lateral, or longitudinal separation between aircraft flying IFR under the control of ATC.

c. FAA radar units operate continuously at the locations shown in the Chart Supplement U.S., and their services are available to all pilots, both civil and military. Contact the associated FAA control tower or ARTCC on any frequency guarded for initial instructions, or in an emergency, any FAA facility for information on the nearest radar service.

4−5−2. Air Traffic Control Radar Beacon System (ATCRBS)

a. The ATCRBS, sometimes referred to as secondary surveillance radar, consists of three main components:

1. Interrogator. Primary radar relies on a signal being transmitted from the radar antenna site and for this signal to be reflected or "bounced back" from an object (such as an aircraft). This reflected signal is then displayed as a "target" on the controller's radarscope. In the ATCRBS, the Interrogator, a ground based radar beacon transmitter−receiver, scans in synchronism with the primary radar and transmits discrete radio signals which repetitiously request all transponders, on the mode being used, to reply. The replies received are then mixed with the primary returns and both are displayed on the same radarscope.

2. Transponder. This airborne radar beacon transmitter−receiver automatically receives the signals from the interrogator and selectively replies with a specific pulse group (code) only to those interrogations being received on the mode to which it is set. These replies are independent of, and much stronger than a primary radar return.

3. Radarscope. The radarscope used by the controller displays returns from both the primary radar system and the ATCRBS. These returns, called targets, are what the controller refers to in the control and separation of traffic.

b. The job of identifying and maintaining identification of primary radar targets is a long and tedious task for the controller. Some of the advantages of ATCRBS over primary radar are:

1. Reinforcement of radar targets.

2. Rapid target identification.

3. Unique display of selected codes.

c. A part of the ATCRBS ground equipment is the decoder. This equipment enables a controller to assign discrete transponder codes to each aircraft under his/her control. Normally only one code will be assigned for the entire flight. Assignments are made by the ARTCC computer on the basis of the National Beacon Code Allocation Plan. The equipment is also designed to receive Mode C altitude information from the aircraft.

NOTE−
Refer to figures with explanatory legends for an illustration of the target symbology depicted on radar scopes in the NAS Stage A (en route), the ARTS III (terminal) Systems, and other nonautomated (broadband) radar systems. (See FIG 4−5−2 and FIG 4−5−3.)

d. It should be emphasized that aircraft transponders greatly improve the effectiveness of radar systems.

REFERENCE−
AIM, Paragraph 4−1−20 , Transponder Operation

3. Registration of Non−U.S. Operators. Non−U.S. operators can find policy/procedures for registration on the North American Approvals Registry and Monitoring Organization (NAARMO) database in the "Registration on RVSM Approvals Database" section of RVSM Documentation.

4−6−4. Flight Planning into RVSM Airspace

a. Operators that do not file the correct aircraft equipment suffix on the FAA or ICAO Flight Plan may be denied clearance into RVSM airspace. Policies for the FAA Flight Plan are detailed in subparagraph c below. Policies for the ICAO Flight Plan are detailed in subparagraph d.

b. The operator will annotate the equipment block of the FAA or ICAO Flight Plan with an aircraft equipment suffix indicating RVSM capability only after the responsible civil aviation authority has determined that both the operator and its aircraft are RVSM−compliant and has issued RVSM authorization to the operator.

c. General Policies for FAA Flight Plan Equipment Suffix. TBL 5−1−3, Aircraft Suffixes, allows operators to indicate that the aircraft has both RVSM and Advanced Area Navigation (RNAV) capabilities or has only RVSM capability.

1. The operator will annotate the equipment block of the FAA Flight Plan with the appropriate aircraft equipment suffix from TBL 5−1−3.

2. Operators can only file one equipment suffix in block 3 of the FAA Flight Plan. Only this equipment suffix is displayed directly to the controller.

3. Aircraft with RNAV Capability. For flight in RVSM airspace, aircraft with RNAV capability, but not Advanced RNAV capability, will file "/W". Filing "/W" will not preclude such aircraft from filing and flying direct routes in en route airspace.

d. Policy for ICAO Flight Plan Equipment Suffixes.

1. Operators/aircraft that are RVSM−compliant and that file ICAO flight plans will file "/W" in block 10 (Equipment) to indicate RVSM authorization and will also file the appropriate ICAO Flight Plan suffixes to indicate navigation and communication capabilities. The equipment suffixes in TBL 5−1−3 are for use only in an FAA Flight Plan (FAA Form 7233−1).

2. Operators/aircraft that file ICAO flight plans that include flight in Domestic U.S. RVSM airspace must file "/W" in block 10 to indicate RVSM authorization.

e. Importance of Flight Plan Equipment Suffixes. The operator must file the appropriate equipment suffix in the equipment block of the FAA Flight Plan (FAA Form 7233−1) or the ICAO Flight Plan. The equipment suffix informs ATC:

1. Whether or not the operator and aircraft are authorized to fly in RVSM airspace.

2. The navigation and/or transponder capability of the aircraft (e.g., advanced RNAV, transponder with Mode C).

f. Significant ATC uses of the flight plan equipment suffix information are:

1. To issue or deny clearance into RVSM airspace.

2. To apply a 2,000 foot vertical separation minimum in RVSM airspace to aircraft that are not authorized for RVSM, but are in one of the limited categories that the FAA has agreed to accommodate. (See Paragraphs 4−6−10, Procedures for Accommodation of Non−RVSM Aircraft, and 4−6−11, Non−RVSM Aircraft Requesting Climb to and Descent from Flight Levels Above RVSM Airspace Without Intermediate Level Off, for policy on limited operation of unapproved aircraft in RVSM airspace).

3. To determine if the aircraft has "Advanced RNAV" capabilities and can be cleared to fly procedures for which that capability is required.

g. Improperly changing an aircraft equipment suffix and/or adding "NON-RVSM" in the NOTES or REMARKS section (Field 18) while not removing the "W" from Field 10, will not provide air traffic control with the proper visual indicator necessary to detect Non-RVSM aircraft. To ensure information processes correctly for Non-RVSM aircraft, the "W" in Field 10 must be removed. Entry of information in the NOTES or REMARKS section (Field 18) will not affect the determination of RVSM capability and must not be used to indicate a flight is Non-RVSM.

4−6−5. Pilot RVSM Operating Practices and Procedures

a. RVSM Mandate. If either the operator or the aircraft or both have not received RVSM authorization (non−RVSM aircraft), the pilot will neither request nor accept a clearance into RVSM airspace unless:

1. The flight is conducted by a non−RVSM DOD, MEDEVAC, certification/development or foreign State (government) aircraft in accordance with Paragraph 4−6−10, Procedures for Accommodation of Non−RVSM Aircraft.

2. The pilot intends to climb to or descend from FL 430 or above in accordance with Paragraph 4−6−11, Non−RVSM Aircraft Requesting Climb to and Descent from Flight Levels Above RVSM Airspace Without Intermediate Level Off.

3. An emergency situation exists.

b. Basic RVSM Operating Practices and Procedures. Appendix 4 of AC 91−85, Authorization of Aircraft and Operators for Flight in Reduced Vertical Separation Minimum Airspace contains pilot practices and procedures for RVSM. Operators must incorporate Appendix 4 practices and procedures, as supplemented by the applicable paragraphs of this section, into operator training or pilot knowledge programs and operator documents containing RVSM operational policies.

c. Appendix 4 contains practices and procedures for flight planning, preflight procedures at the aircraft, procedures prior to RVSM airspace entry, inflight (en route) procedures, contingency procedures and post flight.

d. The following paragraphs either clarify or supplement Appendix 4 practices and procedures.

4−6−6. Guidance on Severe Turbulence and Mountain Wave Activity (MWA)

a. Introduction/Explanation

1. The information and practices in this paragraph are provided to emphasize to pilots and controllers the importance of taking appropriate action in RVSM airspace when aircraft experience severe turbulence and/or MWA that is of sufficient magnitude to significantly affect altitude−keeping.

2. Severe Turbulence. Severe turbulence causes large, abrupt changes in altitude and/or attitude usually accompanied by large variations in indicated airspeed. Aircraft may be momentarily out of control. Encounters with severe turbulence must be remedied immediately in any phase of flight. Severe turbulence may be associated with MWA.

3. Mountain Wave Activity (MWA)

(a) Significant MWA occurs both below and above the floor of RVSM airspace, FL 290. MWA often occurs in western states in the vicinity of mountain ranges. It may occur when strong winds blow perpendicular to mountain ranges resulting in up and down or wave motions in the atmosphere. Wave action can produce altitude excursions and airspeed fluctuations accompanied by only light turbulence. With sufficient amplitude, however, wave action can induce altitude and airspeed fluctuations accompanied by severe turbulence. MWA is difficult to forecast and can be highly localized and short lived.

(b) Wave activity is not necessarily limited to the vicinity of mountain ranges. Pilots experiencing wave activity anywhere that significantly affects altitude−keeping can follow the guidance provided below.

(c) Inflight MWA Indicators (Including Turbulence). Indicators that the aircraft is being subjected to MWA are:

(1) Altitude excursions and/or airspeed fluctuations with or without associated turbulence.

(2) Pitch and trim changes required to maintain altitude with accompanying airspeed fluctuations.

(3) Light to severe turbulence depending on the magnitude of the MWA.

4. Priority for Controller Application of Merging Target Procedures

(a) Explanation of Merging Target Procedures. As described in subparagraph c3 below, ATC will use "merging target procedures" to mitigate the effects of both severe turbulence and MWA. The procedures in subparagraph c3 have been adapted from existing procedures published in FAA Order JO 7110.65, Air Traffic Control, Paragraph 5−1−8, Merging Target Procedures. Paragraph 5−1−8 calls for en route controllers to advise pilots of potential traffic that they perceive may fly directly above or below his/her aircraft at minimum vertical separation. In response, pilots are given the option of requesting a radar vector to ensure their radar target will not merge or overlap with the traffic's radar target.

(b) The provision of "merging target procedures" to mitigate the effects of severe turbulence and/or MWA is not optional for the controller, but rather is a priority responsibility. Pilot requests for vectors for traffic avoidance when encountering MWA or pilot reports of "Unable RVSM due turbulence or MWA" are considered first priority aircraft separation and sequencing responsibilities. (FAA Order JO 7110.65, Paragraph 2−1−2, Duty Priority, states that the controller's first priority is to separate aircraft and issue safety alerts).

(c) Explanation of the term "traffic permitting." The contingency actions for MWA and severe turbulence detailed in Paragraph 4−6−9, Contingency Actions: Weather Encounters and Aircraft System Failures that Occur After Entry into RVSM Airspace, state that the controller will "vector aircraft to avoid merging targets with traffic at adjacent flight levels, traffic permitting." The term "traffic permitting" is not intended to imply that merging target procedures are not a priority duty. The term is intended to recognize that, as stated in FAA Order JO 7110.65, Paragraph 2−1−2, Duty Priority, there are circumstances when the controller is required to perform more than one action and must "exercise their best judgment based on the facts and circumstances known to them" to prioritize their actions. Further direction given is: "That action which is most critical from a safety standpoint is performed first."

5. TCAS Sensitivity. For both MWA and severe turbulence encounters in RVSM airspace, an additional concern is the sensitivity of collision avoidance systems when one or both aircraft operating in close proximity receive TCAS advisories in response to disruptions in altitude hold capability.

b. Pre−flight tools. Sources of observed and forecast information that can help the pilot ascertain the possibility of MWA or severe turbulence are: Forecast Winds and Temperatures Aloft (FD), Area Forecast (FA), Graphical Turbulence Guidance (GTG), SIGMETs and PIREPs.

c. Pilot Actions When Encountering Weather (e.g., Severe Turbulence or MWA)

1. Weather Encounters Inducing Altitude Deviations of Approximately 200 feet. When the pilot experiences weather induced altitude deviations of approximately 200 feet, the pilot will contact ATC and state "Unable RVSM Due (state reason)" (e.g., turbulence, mountain wave). See contingency actions in paragraph 4−6−9.

2. Severe Turbulence (including that associated with MWA). When pilots encounter severe turbulence, they should contact ATC and report the situation. Until the pilot reports clear of severe turbulence, the controller will apply merging target vectors to one or both passing aircraft to prevent their targets from merging:

EXAMPLE−
"Yankee 123, FL 310, unable RVSM due severe turbulence."

"Yankee 123, fly heading 290; traffic twelve o'clock, 10 miles, opposite direction; eastbound MD−80 at FL 320" (or the controller may issue a vector to the MD−80 traffic to avoid Yankee 123).

3. MWA. When pilots encounter MWA, they should contact ATC and report the magnitude and location of the wave activity. When a controller makes a merging targets traffic call, the pilot may request a vector to avoid flying directly over or under the traffic. In situations where the pilot is experiencing altitude deviations of 200 feet or greater, the pilot will request a vector to avoid traffic. Until the pilot reports clear of MWA, the controller will apply merging target vectors to one or both passing aircraft to prevent their targets from merging:

EXAMPLE−
"Yankee 123, FL 310, unable RVSM due mountain wave."

"Yankee 123, fly heading 290; traffic twelve o'clock, 10 miles, opposite direction; eastbound MD−80 at FL 320" (or the controller may issue a vector to the MD−80 traffic to avoid Yankee 123).

4. FL Change or Re−route. To leave airspace where MWA or severe turbulence is being encountered, the pilot may request a FL change and/or re−route, if necessary.

4−6−7. Guidance on Wake Turbulence

a. Pilots should be aware of the potential for wake turbulence encounters in RVSM airspace. Experience gained since 1997 has shown that such encounters in RVSM airspace are generally moderate or less in magnitude.

b. Prior to DRVSM implementation, the FAA established provisions for pilots to report wake turbulence events in RVSM airspace using the NASA Aviation Safety Reporting System (ASRS). A "Safety Reporting" section established on the FAA RVSM Documentation webpage provides contacts, forms, and reporting procedures.

c. To date, wake turbulence has not been reported as a significant factor in DRVSM operations. European authorities also found that reports of wake turbulence encounters did not increase significantly after RVSM implementation (eight versus seven reports in a ten−month period). In addition, they found that reported wake turbulence was generally similar to moderate clear air turbulence.

d. Pilot Action to Mitigate Wake Turbulence Encounters

1. Pilots should be alert for wake turbulence when operating:

(a) In the vicinity of aircraft climbing or descending through their altitude.

(b) Approximately 10−30 miles after passing 1,000 feet below opposite−direction traffic.

(c) Approximately 10−30 miles behind and 1,000 feet below same−direction traffic.

2. Pilots encountering or anticipating wake turbulence in DRVSM airspace have the option of requesting a vector, FL change, or if capable, a lateral offset.

NOTE−
1. *Offsets of approximately a wing span upwind generally can move the aircraft out of the immediate vicinity of another aircraft's wake vortex.*

2. *In domestic U.S. airspace, pilots must request clearance to fly a lateral offset. Strategic lateral offsets flown in oceanic airspace do not apply.*

e. The FAA will track wake turbulence events as an element of its post implementation program. The FAA will advertise wake turbulence reporting procedures to the operator community and publish reporting procedures on the RVSM Documentation Webpage (See address in Paragraph 4−6−3, Aircraft and Operator Approval Policy/Procedures, RVSM Monitoring and Databases for Aircraft and Operator Approval.

4−6−8. Pilot/Controller Phraseology

TBL 4−6−1 shows standard phraseology that pilots and controllers will use to communicate in DRVSM operations.

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

4−7−1. Introduction and Background

a. Introduction. On 20 October 2011 at 0900 UTC, the Federal Aviation Administration (FAA), Serviciós a la Navegacion en el Espacio Aéreo Mexicano (SENEAM) and the Direccion General de Aeronautica Civil (DGAC) Mexico implemented 50 Nautical Mile (NM) lateral separation between aircraft authorized Required Navigation Performance 10 (RNP 10) or RNP 4 operating in the Gulf of Mexico (GoMex) Oceanic Control Areas (CTA). Existing Air Traffic Services (ATS) routes and route operating policies did not change for this implementation.

b. RNP 10 Versus RNAV 10 Terminology. "RNP 10" has the same meaning and application as "RNAV 10". The ICAO Performance-based Navigation (PBN) Manual (ICAO Doc 9613), Volume II, Part B, Chapter 1 (Implementing RNAV 10, Designated and Authorized as RNP 10) explains that the term "RNP 10" was in use before the publication of the ICAO PBN Manual and the manual has "grandfathered in" its continued use when implementing an "RNAV 10" navigation specification.

c. Background. 50 NM lateral separation was first applied between aircraft authorized for RNP 10 operations on the North Pacific Route System in April 1998. Since that time, 50 NM lateral separation has been expanded throughout the Pacific Flight Information Regions (FIRs) and is currently applied in other airspaces, including, starting in June 2008, the West Atlantic Route System. GoMex 50 NM lateral separation implementation will apply the experience gained in those operations.

d. Control Areas (CTA) Affected. 50 NM lateral separation is implemented in the following CTAs/FIRs/Upper Control Areas (UTA).

1 The Houston Oceanic CTA/FIR and the Gulf of Mexico portion of the Miami Oceanic CTA/FIR.

(a) The Monterrey CTA and Merida High CTA within the Mexico FIR/UTA

e. Reference Material. Information useful for flight planning and operations within the Gulf of Mexico under this 50 NM lateral separation initiative can be found in the *West Atlantic Route System, Gulf of Mexico, and Caribbean Resource Guide for U.S. Operators* located at www.faa.gov/about/office_org/headquarters_offices/avs/offices/afs/afs400/afs470/media/WATRS.pdf. The Guide can also be found through a web search for "WATRS, GOMEX, Caribbean Resource Guide."

4−7−2. Lateral Separation Minima Applied

a. 50 NM lateral separation is applied in the GoMex CTA's between aircraft authorized RNP 10 or RNP 4 at all altitudes above the floor of controlled airspace.

b. The current lateral separation minima of 100 NM in the Houston, Monterrey and Merida CTAs, and 90 NM in the Miami Oceanic CTA will continues to be applied between aircraft not authorized RNP 10 or RNP 4.

4−7−3. Operation on Routes on the Periphery of the Gulf of Mexico CTAs

Operations on certain routes that fall within the boundaries of affected CTAs are not affected by the introduction of 50 NM lateral separation. Operation on the following routes is not affected:

a. Routes that are flown by reference to ICAO standard ground-based navigation aids (VOR, VOR/DME, NDB).

b. Special Area Navigation (RNAV) routes Q100, Q102 and Q105 in the Houston, Jacksonville and Miami CTAs.

4−7−4. Provisions for Non−RNP 10 Aircraft (Not Authorized RNP 10 or RNP 4)

a. Operators of aircraft not authorized RNP 10 (or RNP 4) must annotate their ICAO flight plan for Gulf of Mexico operations as follows:

Item 18: "STS/NON−RNP10" (no space between letters and numbers).

b. Pilots of Non−RNP 10 aircraft that operate in GoMex CTA's must report the lack of authorization by stating "Negative RNP 10":

1. On initial call to ATC in a GoMex CTA:

2. In read back of a clearance to climb to or descend from cruise altitude. (See paragraph 4−7−4 e); and

3. When approval status is requested by the controller. (See paragraph 4−7−8 e.)

c. Use of flight plan item 18 codes "PBN/A1" or "PBN/L1" are restricted to operators and aircraft specifically authorized for RNP 10 or RNP 4, as applicable.

d. Non−RNP 10 operators/aircraft may file any route at any altitude in a GoMex CTA. They will be cleared to operate on their preferred routes and altitudes as traffic permits. 50 NM lateral separation will not be applied to Non−RNP 10 aircraft.

e. Non−RNP 10 aircraft are encouraged to operate at altitudes above those where traffic is most dense (i.e., at/above FL 380), if possible. Non−RNP 10 aircraft should plan on completing their climb to or descent from higher FLs within radar coverage, if possible.

4−7−5. Operator Action

In order to maximize operational flexibility provided by 50 NM lateral separation, operators capable of meeting RNP 10 or RNP 4 that operate on oceanic routes or areas in the GoMex CTA's should obtain authorization for RNP 10 or RNP 4 and annotate the ICAO flight plan accordingly.

NOTE−
1. *RNP 10 is the minimum "Navigation Specification (NavSpec)" required for the application of 50 NM lateral separation. RNP 4 is an operator option. Operators/aircraft authorized RNP 4 are not required to also obtain RNP 10 authorization.*

2. *"RNP navigation specification" (e.g., RNP 10) is the term adopted in the ICAO Performance-based Navigation (PBN) Manual (Doc 9613). It replaces the term "RNP type".*

4−7−6. RNP 10 or RNP 4 Authorization: Policy and Procedures for Aircraft and Operators

a. RNP NavSpecs Applicable To Oceanic Operations. In accordance with ICAO guidance, RNP 10 and RNP 4 are the only NavSpecs applicable to oceanic and remote area operations. Other RNAV and RNP NavSpecs are applicable to continental en route, terminal area and approach operations.

b. FAA Documents. Advisory Circular (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 operational approval guidance for RNP 4 and 10. It identifies minimum aircraft capabilities and operator procedural and training requirements in order to qualify for RNP 4 or 10. AC 90-105 is consistent with the ICAO PBN Manual discussed below. Pertinent FAA and ICAO documents are posted on the *West Atlantic Route System, Gulf of Mexico and Caribbean Resource Guide for U.S. Operators* described in paragraph 4−7−1.

c. ICAO Performance-based Navigation (PBN) Manual (ICAO Doc 9613). Guidance for authorization of RNP 10 and RNP 4 is provided in ICAO Doc 9613. RNP 10 is addressed in Volume II, Part B; Chapter 1. RNP 4 is addressed in Volume II, Part C; Chapter 1.

d. RNP 10 and RNP 4 Job Aids. Operators and authorities are encouraged to use the RNP 10 or RNP 4 Job Aids posted on the FAA Resource Guide for U.S. Operators described in paragraph 4−7−1. For U.S. operators, a set of RNP 10 and RNP 4 Job Aids provides references to FAA documents. An RNP 4 Job Aid, references to the ICAO PBN Manual, is also available on the ICAO European and North Atlantic Office website. These Job Aids address the operational and airworthiness elements of aircraft and operator authorization and provide references to appropriate document paragraphs. The Job Aids provide a method for operators to develop and authorities to track the operator/aircraft program elements required for RNP 10 or RNP 4 authorization.

e. Qualification of Aircraft Equipped With a Single Long-Range Navigation System (S-LRNS) For RNP 10 Operations In GoMex CTA's.

1. Background. S‐LRNS operations in the Gulf of Mexico, the Caribbean Sea and the other designated areas have been conducted for at least 25 years. Provisions allowing aircraft equipage with a S‐LRNS for operations in specified oceanic and off‐shore areas are contained in the following sections of 14 Code of Federal Regulations (CFR): 91.511, 121.351, 125.203 and 135.165.

2. ICAO PBN Manual Reference. In reference to RNP 10 authorization, the ICAO PBN Manual, Volume II, Part B, Chapter 1, paragraph 1.3.6.2 states that: "A State authority may approve the use of a single LRNS in specific circumstances (e.g., North Atlantic MNPS and 14 CFR 121.351 (c) refer). An RNP 10 approval is still required."

3. Policy Development. The FAA worked with the ICAO NACC Office (North American, Central American and Caribbean), State regulators and ATS providers in the GoMex and Caribbean areas to implement a policy for S‐LRNS equipped aircraft to qualify for RNP 10 for GoMex operations. Allowing S‐LRNS equipped aircraft to qualify for RNP 10 enables more operator aircraft to be authorized RNP 10, thereby creating a more uniform operating environment for the application of 50 NM lateral separation. The factors considered were: the shortness of the legs outside the range of ground navigation aids, the availability of radar and VHF coverage in a large portion of GoMex airspace and the absence of events attributed to S‐LRNS in GoMex operations.

4. Single LRNS/RNP 10 Authorization Limited to Gulf of Mexico. At this time, qualification for RNP 10 based on use of a single long‐range navigation system (LRNS) only applies to Gulf of Mexico operations. Any expansion of this provision will require assessment and agreement by the appropriate State authorities.

f. RNP 10 Time Limit for INS or IRU Only Equipped Aircraft. Operators should review their Airplane Flight Manual (AFM), AFM Supplement or other appropriate documents and/or contact the airplane or avionics manufacturer to determine the RNP 10 time limit applicable to their aircraft. They will then need to determine its effect, if any, on their operation. Unless otherwise approved, the basic RNP 10 time limit is 6.2 hours between position updates for aircraft on which Inertial Navigation Systems (INS) or Inertial Reference Units (IRU) provide the only source of long range navigation. Extended RNP 10 time limits of 10 hours and greater are already approved for many IRU systems. FAA Advisory Circular 90-105 contains provisions for extending RNP 10 time limits.

4-7-7. Flight Planning Requirements

Operators must make ICAO flight plan annotations in accordance with this paragraph and, if applicable, Paragraph 4-7-4, Provisions for Non-RNP 10 Aircraft (Not Authorized RNP 10 or RNP 4).

a. ICAO Flight Plan Requirement. ICAO flight plans must be filed for operation on oceanic routes and areas in the Houston Oceanic CTA/FIR, the Gulf of Mexico portion of the Miami CTA/FIR, the Monterrey CTA and Merida High CTA.

b. To inform ATC that they have obtained RNP 10 or RNP 4 authorization and are eligible for 50 NM lateral separation, operators must:

1. Annotate ICAO Flight Plan Item 10 (Equipment) with the letter "R" and

2. Annotate Item 18 (Other Information) with, as appropriate, "PBN/A1" (for RNP10) or "PBN/L1" (for RNP4).

NOTE-
On the ICAO Flight Plan, the letter "R" in Item 10 indicates that the flight is authorized for PBN operations. Item 18 PBN/ indicates the types of PBN capabilities that are authorized.

c. 50 NM lateral separation will only be applied to operators/aircraft that annotate the ICAO flight plan in accordance with this policy. (See 4-7-7 b.)

d. Operators that have not obtained RNP 10 or RNP 4 authorization must not annotate ICAO flight plan Item 18 (Other information) with "PBN/A1" or "PBN/L1", but must follow the practices detailed in paragraph 4-7-4.

4-7-8. Pilot and Dispatcher Procedures: Basic and In-flight Contingency Procedures

a. Basic Pilot Procedures. The RNP 10 and RNP 4 Job Aids contain references to pilot and, if applicable, dispatcher procedures contained in Advisory Circular 90-105 and ICAO PBN Manual, Volume II, Parts B and C, Chapter 1.

b. ICAO Doc 4444, In-Flight Contingency Procedures. Chapter 15 of ICAO Doc 4444

(Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM)) contains important guidance for pilot training programs. Chapter 15 includes Special Procedures for In-flight Contingencies in Oceanic Airspace, as well as Weather Deviation Procedures. Chapter 15 covers in-flight diversion and turn-back scenarios, loss of navigation capability, and procedures to follow for weather avoidance. This critical guidance is reprinted in the Oceanic Operations section of the U.S. Aeronautical Information Publication (AIP), the International section of the Notices to Airmen Publication, and FAA Advisory Circular 91-70, *Oceanic and Remote Continental Airspace Operations*.

c. Strategic Lateral Offset Procedures (SLOP). Pilots should use SLOP procedures in the course of regular oceanic operations. Guidance regarding SLOP, including how to perform the procedures, is provided in the Oceanic Operations section of the U.S. AIP.

d. Pilot Report of Non−RNP 10 Status. The pilot must report the lack of RNP 10 or RNP 4 status in accordance with the following:

1. When the operator/aircraft is not authorized RNP 10 or RNP 4 − see paragraph 4−7−4.

2. If approval status is requested by the controller − see paragraph 4−7−8 e.

e. Pilot Statement of RNP 10 or RNP 4 Approval Status, If Requested. If requested by the controller, the pilot must communicate approval status using the following phraseology:

Controller Request:
(Call sign) confirm RNP 10 or 4 approved
Pilot Response:
"Affirm RNP 10 approved" or "Affirm RNP 4 approved," as appropriate, or "Negative RNP 10" (See paragraph 4−7−4 for Non−RNP 10 aircraft procedures.)

f. Pilot action when navigation system malfunctions. In addition to the actions addressed in the Oceanic Operations section of the U.S. AIP, when pilots suspect a navigation system malfunction, the following actions should be taken:

1. Immediately inform ATC of navigation system malfunction or failure.

2. Accounting for wind drift, fly magnetic compass heading to maintain track.

3. Request radar vectors from ATC, when available.

Chapter 5. Air Traffic Procedures

Section 1. Preflight

5−1−1. Preflight Preparation

a. Every pilot is urged to receive a preflight briefing and to file a flight plan. This briefing should consist of the latest or most current weather, airport, and en route NAVAID information. Briefing service may be obtained from an FSS either by telephone, by radio when airborne, or by a personal visit to the station. Pilots with a current medical certificate in the 48 contiguous States may access Lockheed Martin Flight Services or the Direct User Access Terminal System (DUATS) via the internet. Lockheed Martin Flight Services and DUATS will provide preflight weather data and allow pilots to file domestic VFR or IFR flight plans.

REFERENCE−
AIM, Paragraph 7−1−2 , FAA Weather Services, lists DUATS vendors.

NOTE−
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 contained on FAA Form 7233−1, Flight Plan, or FAA Form 7233−4, International Flight Plan. The forms are available at all flight service stations. Additional copies will be provided on request.

REFERENCE−
AIM, Paragraph 5−1−4 , Flight Plan− VFR Flights
AIM, Paragraph 5−1−8 , Flight Plan− IFR Flights
AIM, Paragraph 5−1−9, International Flight Plan− IFR Flights

c. Consult an FSS, Lockheed Martin Flight Services, or DUATS for preflight weather briefing.

d. FSSs are required to advise of pertinent NOTAMs if a *standard* briefing is requested, but if they are overlooked, don't hesitate to remind the specialist that you have not received NOTAM information.

NOTE−
NOTAMs which are known in sufficient time for publication and are of 7 days duration or longer are normally incorporated into the Notices to Airmen Publication and carried there until cancellation time. FDC NOTAMs, which apply to instrument flight procedures, are also included in the Notices to Airmen Publication up to and including the number indicated in the FDC NOTAM legend. Printed NOTAMs 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 Notices to Airmen Publication prior to calling. Remember to ask for NOTAMs in the Notices to Airmen Publication. This information is not normally furnished during your briefing.

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

e. 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 6 months, 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, Paragraph 9−1−4 , General Description of Each Chart Series

f. 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.**

g. 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. They do not read weather reports and forecasts verbatim unless specifically requested by the pilot. 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.

REFERENCE−
AIM, Paragraph 7−1−4 , Preflight Briefings, contains those items of a weather briefing that should be expected or requested.

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

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

i. 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, Paragraph 5−1−11 , Flights Outside the U.S. and U.S. Territories

j. Pilots operating under provisions of 14 CFR Part 135 on a domestic flight and not having an FAA assigned 3−letter designator, are urged to prefix the normal registration (N) number with the letter "T" on flight plan filing; e.g., TN1234B.

REFERENCE−
AIM, Paragraph 4−2−4 , Aircraft Call Signs

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 and weather briefing. Check the NOTAMs.

2. File a flight plan. This is an excellent low cost insurance policy. The cost is the time it takes to fill it out. The insurance includes the knowledge that someone will be looking for you if you become overdue at your destination.

3. Use current charts.

4. Use the navigation aids. Practice maintaining a good course−keep the needle centered.

5. Maintain a constant altitude which is appropriate for the direction of flight.

6. Estimate en route position times.

7. Make accurate and frequent position reports to the FSSs along your route of flight.

b. Simulated IFR flight is recommended (under the hood); however, pilots are cautioned to review and adhere to the requirements specified in 14 CFR Section 91.109 before and during such flight.

c. When flying VFR at night, in addition to the altitude appropriate for the direction of flight, pilots should maintain an altitude which is at or above the minimum en route altitude as shown on charts. This is especially true in mountainous terrain, where there is usually very little ground reference. Do not depend on your eyes alone to avoid rising unlighted terrain, or even lighted obstructions such as TV towers.

5−1−3. Notice to Airmen (NOTAM) System

a. Time-critical aeronautical information which is of either a temporary nature or not sufficiently known in advance to permit publication on aeronautical charts or in other operational publications receives immediate dissemination via the National NOTAM System.

NOTE−
1. *NOTAM information is that aeronautical information that could affect a pilot's decision to make a flight. It includes such information as airport or aerodrome primary runway closures, taxiways, ramps, obstructions, communications, airspace, changes in the status of navigational aids, ILSs, radar service availability, and other information essential to planned en route, terminal, or landing operations.*

2. *NOTAM information is transmitted using standard contractions to reduce transmission time. See TBL 5−1−2 for a listing of the most commonly used contractions. For a complete listing, see FAA JO Order 7340.2, Contractions.*

b. NOTAM information is classified into five categories. These are NOTAM (D) or distant, Flight

Data Center (FDC) NOTAMs, Pointer NOTAMs, Special Activity Airspace (SAA) NOTAMs, and Military NOTAMs.

1. NOTAM (D) information is disseminated for all navigational facilities that are part of the National Airspace System (NAS), all public use airports, seaplane bases, and heliports listed in the Chart Supplement U.S. The complete file of all NOTAM (D) information is maintained in a computer database at the Weather Message Switching Center (WMSC), located in Atlanta, Georgia. This category of information is distributed automatically via Service A telecommunications system. Air traffic facilities, primarily FSSs, with Service A capability have access to the entire WMSC database of NOTAMs. These NOTAMs remain available via Service A for the duration of their validity or until published. Once published, the NOTAM data is deleted from the system. NOTAM (D) information includes such data as taxiway closures, personnel and equipment near or crossing runways, and airport lighting aids that do not affect instrument approach criteria, such as VASI.

All NOTAM Ds must have one of the keywords listed in TBL 5−1−1 as the first part of the text after the location identifier.

2. FDC NOTAMs. On those occasions when it becomes necessary to disseminate information which is regulatory in nature, the National Flight Data Center (NFDC), in Washington, DC, will issue an FDC NOTAM. FDC NOTAMs contain such things as amendments to published IAPs and other current aeronautical charts. They are also used to advertise temporary flight restrictions caused by such things as natural disasters or large-scale public events that may generate a congestion of air traffic over a site.

NOTE−

1. *DUATS vendors will provide FDC NOTAMs only upon site-specific requests using a location identifier.*

2. *NOTAM data may not always be current due to the changeable nature of national airspace system components, delays inherent in processing information, and occasional temporary outages of the U.S. NOTAM system. While en route, pilots should contact FSSs and obtain updated information for their route of flight and destination.*

3. Pointer NOTAMs. NOTAMs issued by a flight service station to highlight or point out another NOTAM, such as an FDC or NOTAM (D) NOTAM. This type of NOTAM will assist users in cross−referencing important information that may not be found under an airport or NAVAID identifier. Keywords in pointer NOTAMs must match the keywords in the NOTAM that is being pointed out. The keyword in pointer NOTAMs related to Temporary Flight Restrictions (TFR) must be AIRSPACE.

4. SAA NOTAMs. These NOTAMs are issued when Special Activity Airspace will be active outside the published schedule times and when required by the published schedule. Pilots and other users are still responsible to check published schedule times for Special Activity Airspace as well as any NOTAMs for that airspace.

5. Military NOTAMs. NOTAMs pertaining to U.S. Air Force, Army, Marine, and Navy navigational aids/airports that are part of the NAS.

c. Notices to Airmen Publication (NTAP). The NTAP is published by Mission Support Services, ATC Products and Publications, every 28 days. Data of a permanent nature can be published in the NTAP as an interim step between publication cycles of the Chart Supplement U.S. and aeronautical charts. The NTAP is divided into four parts:

1. Notices in part 1 are provided by ATC Products and Publications. This part contains selected FDC NOTAMs that are expected to be in effect on the effective date of the publication. This part is divided into three sections:

(a) Section 1, Airway NOTAMs, reflects airway changes that fall within an ARTCC's airspace.

(b) Section 2, Procedural NOTAMs.

(c) Section 3, General NOTAMs, contains 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 area).

2. Part 2, provided by NFDC, contains Part 95 Revisions, Revisions to Minimum En Route IFR Altitudes and Changeover Points.

3. Part 3, International NOTAMs, is divided into two sections:

(a) Section 1, International Flight Prohibitions, Potential Hostile Situations, and Foreign Notices.

(b) Section 2, International Oceanic Airspace Notices.

4. Part 4, Graphic Notices, compiled by ATC Products and Publications from data provided by FAA service area offices and other lines of business, contains special notices and graphics pertaining to almost every aspect of aviation such as: military training areas, large scale sporting events, air show information, Special Traffic Management Programs (STMP), and airport-specific information. This part is comprised of 6 sections: General, Special Military Operations, Airport and Facility Notices, Major Sporting and Entertainment Events, Airshows, and Special Notices.

TBL 5−1−1

NOTAM Keywords

Keyword	Definition
RWY . . . . *Example*	**Runway** !BNA BNA RWY 36 CLSD 1309131300−1309132000EST
TWY . . . . *Example*	**Taxiway** !BTV BTV TWY C EDGE LGT OBSC 1310131300−1310141300EST
APRON . . . . . *Example*	**Apron/Ramp** !BNA BNA APRON NORTH APRON EAST SIDE CLSD 13111221500-1312220700
AD . . . . *Example*	**Aerodrome** !BET BET AD ELK NEAR MVMT AREAS 1309251300-1309262200EST
OBST . . . . *Example*	**Obstruction** !SJT SJT OBST MOORED BALLOON WITHIN AREA DEFINED AS 1NM RADIUS OF SJT 2430FT (510FT AGL) FLAGGED 1309251400−1309261400EST
NAV . . . . *Example*	**Navigation Aids** !SHV SHV NAV ILS RWY 32 110.3 COMMISSIONED 1311251600-PERM
COM . . . . *Example*	**Communications** !INW INW COM REMOTE COM OUTLET 122.6 OUT OF SERVICE 1307121330-1307151930EST
SVC . . . . *Example*	**Services** !ROA ROA SVC TWR COMMISSIONED 1301050001-PERM
AIRSPACE . . *Example*	**Airspace** !MIV MIV AIRSPACE AIRSHOW ACFT WITHIN AREA DEFINED AS 5NM RADIUS OF MIV SFC-10000FT AVOIDANCE ADVISED 1308122100-1308122300
ODP . . . . *Example*	**Obstacle Departure Procedure** !FDC 2/9700 DIK ODP DICKINSON - THEODORE ROOSEVELT RGNL, DICKINSON, ND. TAKEOFF MINIMUMS AND (OBSTACLE) DEPARTURE PROCEDURES AMDT 1... DEPARTURE PROCEDURE: RWY 25, CLIMB HEADING 250 TO 3500 BEFORE TURNING LEFT. ALL OTHER DATA REMAINS AS PUBLISHED. THIS IS TAKEOFF MINIMUMS AND (OBSTACLE) DEPARTURE PROCEDURES, AMDT 1A. 1305011200-PERM
SID . . . . *Example*	**Standard Instrument Departure** !FDC x/xxxx DFW SID DALLAS/FORT WORTH INTL, DALLAS, TX. PODDE THREE DEPARTURE... CHANGE NOTES TO READ: RWYS 17C/R, 18L/R: DO NOT EXCEED 240KT UNTIL LARRN. RWYS 35L/C, 36L/R: DONOT EXCEED 240KT UNTIL KMART 1305011200-1312111200EST
STAR . . . . *Example*	**Standard Terminal Arrival** !FDC x/xxxx DCA STAR RONALD REAGAN WASHINGTON NATIONAL,WASHINGTON, DC. WZRRD TWO ARRIVAL... SHAAR TRANSITION: ROUTE FROM DRUZZ INT TO WZRRD INT NOT AUTHORIZED. AFTER DRUZZ INT EXPECT RADAR VECTORS TO AML VORTAC 1305011200-1312111200ES

b. Airways and Jet Routes Depiction on Flight Plan

1. It is vitally important that the route of flight be accurately and completely described in the flight plan. To simplify definition of the proposed route, and to facilitate ATC, pilots are requested to file via airways or jet routes established for use at the altitude or flight level planned.

2. If flight is to be conducted via designated airways or jet routes, describe the route by indicating the type and number designators of the airway(s) or jet route(s) requested. If more than one airway or jet route is to be used, clearly indicate points of transition. If the transition is made at an unnamed intersection, show the next succeeding NAVAID or named intersection on the intended route and the complete route from that point. Reporting points may be identified by using authorized name/code as depicted on appropriate aeronautical charts. The following two examples illustrate the need to specify the transition point when two routes share more than one transition fix.

EXAMPLE−
1. *ALB J37 BUMPY J14 BHM*
Spelled out: from Albany, New York, via Jet Route 37 transitioning to Jet Route 14 at BUMPY intersection, thence via Jet Route 14 to Birmingham, Alabama.

2. *ALB J37 ENO J14 BHM*
Spelled out: from Albany, New York, via Jet Route 37 transitioning to Jet Route 14 at Smyrna VORTAC (ENO) thence via Jet Route 14 to Birmingham, Alabama.

3. The route of flight may also be described by naming the reporting points or NAVAIDs over which the flight will pass, provided the points named are established for use at the altitude or flight level planned.

EXAMPLE−
BWI V44 SWANN V433 DQO
Spelled out: from Baltimore-Washington International, via Victor 44 to Swann intersection, transitioning to Victor 433 at Swann, thence via Victor 433 to Dupont.

4. When the route of flight is defined by named reporting points, whether alone or in combination with airways or jet routes, and the navigational aids (VOR, VORTAC, TACAN, NDB) to be used for the flight are a combination of different types of aids, enough information should be included to clearly indicate the route requested.

EXAMPLE−
LAX J5 LKV J3 GEG YXC FL 330 J500 VLR J515 YWG
Spelled out: from Los Angeles International via Jet Route 5 Lakeview, Jet Route 3 Spokane, direct Cranbrook, British Columbia VOR/DME, Flight Level 330 Jet Route 500 to Langruth, Manitoba VORTAC, Jet Route 515 to Winnepeg, Manitoba.

5. When filing IFR, it is to the pilot's advantage to file a preferred route.

REFERENCE−
Preferred IFR Routes are described and tabulated in the Chart Supplement U.S.

6. ATC may issue a SID or a STAR, as appropriate.

REFERENCE−
AIM, Paragraph 5−2−8 , Instrument Departure Procedures (DP) − Obstacle Departure Procedures (ODP) and Standard Instrument Departures (SID)
AIM, Paragraph 5−4−1 , Standard Terminal Arrival (STAR), Area Navigation (RNAV) STAR, and Flight Management System Procedures (FMSP) for Arrivals

NOTE−
Pilots not desiring a SID or STAR should so indicate in the remarks section of the flight plan as "no SID" or "no STAR."

c. Direct Flights

1. All or any portions of the route which will not be flown on the radials or courses of established airways or routes, such as direct route flights, must be defined by indicating the radio fixes over which the flight will pass. Fixes selected to define the route must be those over which the position of the aircraft can be accurately determined. Such fixes automatically become compulsory reporting points for the flight, unless advised otherwise by ATC. Only those navigational aids established for use in a particular structure; i.e., in the low or high structures, may be used to define the en route phase of a direct flight within that altitude structure.

2. The azimuth feature of VOR aids and that azimuth and distance (DME) features of VORTAC and TACAN aids are assigned certain frequency protected areas of airspace which are intended for application to established airway and route use, and to provide guidance for planning flights outside of established airways or routes. These areas of airspace are expressed in terms of cylindrical service volumes of specified dimensions called "class limits" or "categories."

REFERENCE−
AIM, Paragraph 1−1−8 , Navigational Aid (NAVAID) Service Volumes

3. An operational service volume has been established for each class in which adequate signal coverage and frequency protection can be assured. To facilitate use of VOR, VORTAC, or TACAN aids, consistent with their operational service volume limits, pilot use of such aids for defining a direct route of flight in controlled airspace should not exceed the following:

(a) Operations above FL 450 − Use aids not more than 200 NM apart. These aids are depicted on enroute high altitude charts.

(b) Operation off established routes from 18,000 feet MSL to FL 450 − Use aids not more than 260 NM apart. These aids are depicted on enroute high altitude charts.

(c) Operation off established airways below 18,000 feet MSL − Use aids not more than 80 NM apart. These aids are depicted on enroute low altitude charts.

(d) Operation off established airways between 14,500 feet MSL and 17,999 feet MSL in the conterminous U.S. − (H) facilities not more than 200 NM apart may be used.

4. Increasing use of self-contained airborne navigational systems which do not rely on the VOR/VORTAC/TACAN system has resulted in pilot requests for direct routes which exceed NAVAID service volume limits. These direct route requests will be approved only in a radar environment, with approval based on pilot responsibility for navigation on the authorized direct route. Radar flight following will be provided by ATC for ATC purposes.

5. At times, ATC will initiate a direct route in a radar environment which exceeds NAVAID service volume limits. In such cases ATC will provide radar monitoring and navigational assistance as necessary.

6. Airway or jet route numbers, appropriate to the stratum in which operation will be conducted, may also be included to describe portions of the route to be flown.

EXAMPLE−
MDW V262 BDF V10 BRL STJ SLN GCK
Spelled out: from Chicago Midway Airport via Victor 262 to Bradford, Victor 10 to Burlington, Iowa, direct St. Joseph, Missouri, direct Salina, Kansas, direct Garden City, Kansas.

NOTE−
When route of flight is described by radio fixes, the pilot will be expected to fly a direct course between the points named.

7. Pilots are reminded that they are responsible for adhering to obstruction clearance requirements on those segments of direct routes that are outside of controlled airspace. The MEAs and other altitudes shown on low altitude IFR enroute charts pertain to those route segments within controlled airspace, and those altitudes may not meet obstruction clearance criteria when operating off those routes.

d. Area Navigation (RNAV)

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

2. Pilots of aircraft equipped with approved area navigation equipment may file for RNAV routes throughout the National Airspace System and may be filed for in accordance with the following procedures.

(a) File airport-to-airport flight plans.

(b) File the appropriate RNAV capability certification suffix in the flight plan.

(c) Plan the random route portion of the flight plan to begin and end over appropriate arrival and departure transition fixes or appropriate navigation aids for the altitude stratum within which the flight will be conducted. The use of normal preferred departure and arrival routes (DP/STAR), where established, is recommended.

(d) File route structure transitions to and from the random route portion of the flight.

(e) Define the random route by waypoints. File route description waypoints by using degree-distance fixes based on navigational aids which are appropriate for the altitude stratum.

(f) File a minimum of one route description waypoint for each ARTCC through whose area the random route will be flown. These waypoints must be located within 200 NM of the preceding center's boundary.

(g) File an additional route description waypoint for each turnpoint in the route.

Section 2. Departure Procedures

5−2−1. Pre-taxi Clearance Procedures

a. Certain airports have established pre-taxi clearance programs whereby pilots of departing instrument flight rules (IFR) aircraft may elect to receive their IFR clearances before they start taxiing for takeoff. The following provisions are included in such procedures:

1. Pilot participation is not mandatory.

2. Participating pilots call clearance delivery or ground control not more than 10 minutes before proposed taxi time.

3. IFR clearance (or delay information, if clearance cannot be obtained) is issued at the time of this initial call-up.

4. When the IFR clearance is received on clearance delivery frequency, pilots call ground control when ready to taxi.

5. Normally, pilots need not inform ground control that they have received IFR clearance on clearance delivery frequency. Certain locations may, however, require that the pilot inform ground control of a portion of the routing or that the IFR clearance has been received.

6. If a pilot cannot establish contact on clearance delivery frequency or has not received an IFR clearance before ready to taxi, the pilot should contact ground control and inform the controller accordingly.

b. Locations where these procedures are in effect are indicated in the Chart Supplement U.S.

5−2−2. Automated Pre−Departure Clearance Procedures

a. Many airports in the National Airspace System are equipped with the Terminal Data Link System (TDLS) that includes the Pre−Departure Clearance (PDC) and Controller Pilot Data Link Communication–Departure Clearance (CPDLC-DCL) functions. Both the PDC and CPDLC-DCL functions automate the Clearance Delivery operations in the ATCT for participating users. Both functions display IFR clearances from the ARTCC to the ATCT. The Clearance Delivery controller in the ATCT can append local departure information and transmit the clearance via data link to participating airline/service provider computers for PDC. The airline/service provider will then deliver the clearance via the Aircraft Communications Addressing and Reporting System (ACARS) or a similar data link system, or for non-data link equipped aircraft, via a printer located at the departure gate. For CPDLC-DCL, the departure clearance is uplinked from the ATCT via the Future Air Navigation System (FANS) to the aircraft avionics and requires a response from the flight crew. Both PDC and CPDLC-DCL reduce frequency congestion, controller workload, and are intended to mitigate delivery/read back errors.

b. Both services are available only to participating aircraft that have subscribed to the service through an approved service provider.

c. In all situations, the pilot is encouraged to contact clearance delivery if a question or concern exists regarding an automated clearance. Due to technical reasons, the following limitations/differences exist between the two services:

1. PDC

(a) Aircraft filing multiple flight plans are limited to one PDC clearance per departure airport within an 18−hour period. Additional clearances will be delivered verbally.

(b) If the clearance is revised or modified prior to delivery, it will be rejected from PDC and the clearance will need to be delivered verbally.

(c) No acknowledgment of receipt or read back is required for a PDC.

2. CPDLC−DCL

(a) No limitation to the number of clearances received.

(b) Allows delivery of revised flight data, including revised departure clearances.

(c) A response from the flight crew is required.

(d) Requires a logon using the International Civil Aviation Organization (ICAO) airport facility identification (for example, KSLC utilizing the ATC FANS application).

(e) To be eligible, operators must have received CPDLC/FANS authorization from the responsible civil aviation authority, and file appropriate equipment information in ICAO field 10a and in the ICAO field 18 DAT (Other Data Applications) of the flight plan.

5−2−3. Taxi Clearance

Pilots on IFR flight plans should communicate with the control tower on the appropriate ground control or clearance delivery frequency, prior to starting engines, to receive engine start time, taxi and/or clearance information.

5−2−4. Line Up and Wait (LUAW)

a. Line up and wait is an air traffic control (ATC) procedure designed to position an aircraft onto the runway for an imminent departure. The ATC instruction "LINE UP AND WAIT" is used to instruct a pilot to taxi onto the departure runway and line up and wait.

EXAMPLE−
Tower: "N234AR Runway 24L, line up and wait."

b. This ATC instruction is not an authorization to takeoff. In instances where the pilot has been instructed to line up and wait and has been advised of a reason/condition (wake turbulence, traffic on an intersecting runway, etc.) or the reason/condition is clearly visible (another aircraft that has landed on or is taking off on the same runway), and the reason/condition is satisfied, the pilot should expect an imminent takeoff clearance, unless advised of a delay. If you are uncertain about any ATC instruction or clearance, contact ATC immediately.

c. If a takeoff clearance is not received within a reasonable amount of time after clearance to line up and wait, ATC should be contacted.

EXAMPLE−
Aircraft: Cessna 234AR holding in position Runway 24L.

Aircraft: Cessna 234AR holding in position Runway 24L at Bravo.

NOTE−
FAA analysis of accidents and incidents involving aircraft holding in position indicate that two minutes or more elapsed between the time the instruction was issued to line up and wait and the resulting event (for example, land−over or go−around). Pilots should consider the length of time that they have been holding in position whenever they HAVE NOT been advised of any expected delay to determine when it is appropriate to query the controller.

REFERENCE−
Advisory Circulars 91−73A, Part 91 and Part 135 Single−Pilot Procedures during Taxi Operations, and 120−74A, Parts 91, 121, 125, and 135 Flightcrew Procedures during Taxi Operations

d. Situational awareness during line up and wait operations is enhanced by monitoring ATC instructions/clearances issued to other aircraft. Pilots should listen carefully if another aircraft is on frequency that has a similar call sign and pay close attention to communications between ATC and other aircraft. If you are uncertain of an ATC instruction or clearance, query ATC immediately. Care should be taken to not inadvertently execute a clearance/instruction for another aircraft.

e. Pilots should be especially vigilant when conducting line up and wait operations at night or during reduced visibility conditions. They should scan the full length of the runway and look for aircraft on final approach or landing roll out when taxiing onto a runway. ATC should be contacted anytime there is a concern about a potential conflict.

f. When two or more runways are active, aircraft may be instructed to "LINE UP AND WAIT" on two or more runways. When multiple runway operations are being conducted, it is important to listen closely for your call sign and runway. Be alert for similar sounding call signs and acknowledge all instructions with your call sign. When you are holding in position and are not sure if the takeoff clearance was for you, ask ATC before you begin takeoff roll. ATC prefers that you confirm a takeoff clearance rather than mistake another aircraft's clearance for your own.

g. When ATC issues intersection "line up and wait" and takeoff clearances, the intersection designator will be used. If ATC omits the intersection designator, call ATC for clarification.

EXAMPLE−
Aircraft: "Cherokee 234AR, Runway 24L at November 4, line up and wait."

h. If landing traffic is a factor during line up and wait operations, ATC will inform the aircraft in position of the closest traffic that has requested a full−stop, touch−and−go, stop−and−go, or an unrestricted low approach to the same runway. Pilots should take care to note the position of landing traffic. ATC will also advise the landing traffic when an aircraft is authorized to "line up and wait" on the same runway.

EXAMPLE−
Tower: "Cessna 234AR, Runway 24L, line up and wait. Traffic a Boeing 737, six mile final."

low the Minimum Vectoring Altitude (MVA) or Minimum IFR Altitude (MIA) in a radar environment at the request of Air Traffic. This type of DP meets the TERPS criteria for diverse departures, obstacles, and terrain avoidance in which random radar vectors below the MVA/MIA may be issued to departing aircraft. The DVA has been assessed for departures which do not follow a specific ground track, but will remain within the specified area.

(a) The existence of a DVA will be noted in the Takeoff Minimums and Obstacle Departure Procedure section of the U.S. Terminal Procedures Publication (TPP). The Takeoff Departure procedure will be listed first, followed by any applicable DVA.

EXAMPLE–
DIVERSE VECTOR AREA (RADAR VECTORS)
AMDT 1 14289 (FAA)
Rwy 6R*, headings as assigned by ATC; requires minimum climb of 290' per NM to 400.*
Rwys 6L, 7L, 7R, 24R, 25R*, headings as assigned by ATC.*

(b) Pilots should be aware that Air Traffic facilities may utilize a climb gradient greater than the standard 200 FPNM in a DVA. This information will be identified in the DVA text for pilot evaluation against the aircraft's available climb performance. Pilots should note that the DVA has been assessed for departures which do not follow a specific ground track. ATC may also vector an aircraft off a previously assigned DP. In all cases, the minimum 200 FPNM climb gradient is assumed unless a higher climb gradient is specified on the departure, and obstacle clearance is not provided by ATC until the controller begins to provide navigational guidance in the form of radar vectors.

NOTE–
As is always the case, when used by the controller during departure, the term "radar contact" should not be interpreted as relieving pilots of their responsibility to maintain appropriate terrain and obstruction clearance which may include flying the obstacle DP.

3. Pilots must preplan to determine if the aircraft can meet the climb gradient (expressed in feet per nautical mile) required by the departure procedure, and be aware that flying at a higher than anticipated ground speed increases the climb rate requirement in feet per minute. Higher than standard climb gradients are specified by a note on the departure procedure chart for graphic DPs, or in the Take–Off Minimums and (Obstacle) Departure Procedures section of the U.S. Terminal Procedures booklet for textual ODPs. The required climb gradient, or higher, must be maintained to the specified altitude or fix, then the standard climb gradient of 200 ft/NM can be resumed. A table for the conversion of climb gradient (feet per nautical mile) to climb rate (feet per minute), at a given ground speed, is included on the inside of the back cover of the U.S. Terminal Procedures booklets.

d. Where are DPs located? DPs will be listed by airport in the IFR Takeoff Minimums and (Obstacle) Departure Procedures Section, Section L, of the Terminal Procedures Publications (TPPs). If the DP is textual, it will be described in TPP Section L. SIDs and complex ODPs will be published graphically and named. The name will be listed by airport name and runway in Section L. Graphic ODPs will also have the term "(OBSTACLE)" printed in the charted procedure title, differentiating them from SIDs.

1. An ODP that has been developed solely for obstacle avoidance will be indicated with the symbol "T" on appropriate Instrument Approach Procedure (IAP) charts and DP charts for that airport. The "T" symbol will continue to refer users to TPP Section C. In the case of a graphic ODP, the TPP Section C will only contain the name of the ODP. Since there may be both a textual and a graphic DP, Section C should still be checked for additional information. The nonstandard takeoff minimums and minimum climb gradients found in TPP Section C also apply to charted DPs and radar vector departures unless different minimums are specified on the charted DP. Takeoff minimums and departure procedures apply to all runways unless otherwise specified. New graphic DPs will have all the information printed on the graphic depiction. As a general rule, ATC will only assign an ODP from a nontowered airport when compliance with the ODP is necessary for aircraft to aircraft separation. Pilots may use the ODP to help ensure separation from terrain and obstacles.

e. Responsibilities

1. Each pilot, prior to departing an airport on an IFR flight should:

(a) Consider the type of terrain and other obstacles on or in the vicinity of the departure airport;

(b) Determine whether an ODP is available;

(c) Determine if obstacle avoidance can be maintained visually or if the ODP should be flown; and

(d) Consider the effect of degraded climb performance and the actions to take in the event of an engine loss during the departure. Pilots should notify ATC as soon as possible of reduced climb capability in that circumstance.

NOTE–
Guidance concerning contingency procedures that address an engine failure on takeoff after V_1 speed on a large or turbine–powered transport category airplane may be found in AC 120–91, Airport Obstacle Analysis.

2. Pilots should not exceed a published speed restriction associated with a SID waypoint until passing that waypoint.

3. After an aircraft is established on an SID and subsequently vectored or cleared to deviate off of the SID or SID transition, pilots must consider the SID canceled, unless the controller adds "expect to resume SID;" pilots should then be prepared to rejoin the SID at a subsequent fix or procedure leg. If the SID contains published altitude restrictions, pilots should expect the controller to issue an altitude to maintain. ATC may also interrupt the vertical navigation of a SID and provide alternate altitude instructions while the aircraft remains established on the published lateral path. Aircraft may not be vectored off of an ODP or issued an altitude lower than a published altitude on an ODP until at or above the MVA/MIA, at which time the ODP is canceled.

4. Aircraft instructed to resume a procedure such as a DP or SID which contains speed and/or altitude restrictions, must be:

(a) Issued/reissued all applicable restrictions, or

(b) Advised to comply with restrictions or resume published speed.

EXAMPLE–
"Resume the Solar One departure, comply with restrictions."
"Proceed direct CIROS, resume the Solar One departure, comply with restrictions."

5. A clearance for a SID which contains published altitude restrictions may be issued using the phraseology "climb via." Climb via is an abbreviated clearance that requires compliance with the procedure lateral path, associated speed and altitude restrictions along the cleared route or procedure. Clearance to "climb via" authorizes the pilot to:

(a) When used in the IFR departure clearance, in a PDC, DCL or when cleared to a waypoint depicted on a SID, to join the procedure after departure or to resume the procedure.

(b) When vertical navigation is interrupted and an altitude is assigned to maintain which is not contained on the published procedure, to climb from that previously-assigned altitude at pilot's discretion to the altitude depicted for the next waypoint.

(c) Once established on the depicted departure, to navigate laterally and climb to meet all published or assigned altitude and speed restrictions.

NOTE–
1. *When otherwise cleared along a route or procedure that contains published speed restrictions, the pilot must comply with those speed restrictions independent of a climb via clearance.*

2. *ATC anticipates pilots will begin adjusting speed the minimum distance necessary prior to a published speed restriction so as to cross the waypoint/fix at the published speed. Once at the published speed ATC expects pilots will maintain the published speed until additional adjustment is required to comply with further published or ATC assigned speed restrictions or as required to ensure compliance with 14 CFR Section 91.117.*

3. *If ATC interrupts lateral/vertical navigation while an aircraft is flying a SID, ATC must ensure obstacle clearance. When issuing a "climb via" clearance to join or resume a procedure ATC must ensure obstacle clearance until the aircraft is established on the lateral and vertical path of the SID.*

4. *ATC will assign an altitude to cross if no altitude is depicted at a waypoint/fix or when otherwise necessary/required, for an aircraft on a direct route to a waypoint/fix where the SID will be joined or resumed.*

5. *SIDs will have a "top altitude;" the "top altitude" is the charted "maintain" altitude contained in the procedure description or assigned by ATC.*

REFERENCE–
FAAO 7110.65, Paragraph 5-6-2, Methods
PCG, Climb Via, Top Altitude

EXAMPLE–
1. ***Lateral route clearance:***
"Cleared Loop Six departure."

NOTE–
The aircraft must comply with the SID lateral path, and any published speed restrictions.

2. ***Routing with assigned altitude:***
"Cleared Loop Six departure, climb and maintain four thousand."

NOTE–
The aircraft must comply with the SID lateral path, and any published speed restriction while climbing unrestricted to four thousand.

3. *(A pilot filed a flight plan to the Johnston Airport using the Scott One departure, Jonez transition, then Q-145. The pilot filed for FL350. The Scott One includes altitude restrictions, a top altitude and instructions to expect the filed altitude ten minutes after departure). Before departure ATC uses PDC, DCL or clearance delivery to issue the clearance:*
"Cleared to Johnston Airport, Scott One departure, Jonez transition, Q-OneForty-five. Climb via SID."

NOTE–
In Example 3, the aircraft must comply with the Scott One departure lateral path and any published speed and altitude restrictions while climbing to the SID top altitude.

4. *(Using the Example 3 flight plan, ATC determines the top altitude must be changed to FL180). The clearance will read:*
"Cleared to Johnston Airport, Scott One departure, Jonez transition, Q-One Forty-five, Climb via SID except maintain flight level one eight zero."

NOTE–
In Example 4, the aircraft must comply with the Scott One departure lateral path and any published speed and altitude restrictions while climbing to FL180. The aircraft must stop climb at FL180 until issued further clearance by ATC.

5. *(An aircraft was issued the Suzan Two departure, "climb via SID" in the IFR departure clearance. After departure ATC must change a waypoint crossing restriction). The clearance will be:*
"Climb via SID except cross Mkala at or above seven thousand."

NOTE–
In Example 5, the aircraft will comply with the Suzan Two departure lateral path and any published speed and altitude restrictions and climb so as to cross Mkala at or above 7,000; remainder of the departure must be flown as published.

6. *(An aircraft was issued the Teddd One departure, "climb via SID" in the IFR departure clearance. An interim altitude of 10,000 was issued instead of the published top altitude of FL 230). After departure ATC is able to issue the published top altitude. The clearance will be:*
"Climb via SID."

NOTE–
In Example 6, the aircraft will track laterally and vertically on the Teddd One departure and initially climb to 10,000; Once re-issued the "climb via" clearance the interim altitude is canceled aircraft will continue climb to FL230 while complying with published restrictions.

7. *(An aircraft was issued the Bbear Two departure, "climb via SID" in the IFR departure clearance. An interim altitude of 16,000 was issued instead of the published top altitude of FL 190). After departure, ATC is able to issue a top altitude of FL300 and still requires compliance with the published SID restrictions. The clearance will be:*
"Climb via SID except maintain flight level three zero zero."

NOTE–
In Example 7, the aircraft will track laterally and vertically on the Bbear Two departure and initially climb to 16,000; Once re-issued the "climb via" clearance the interim altitude is canceled and the aircraft will continue climb to FL300 while complying with published restrictions.

8. *(An aircraft was issued the Bizee Two departure, "climb via SID." After departure, ATC vectors the aircraft off of the SID, and then issues a direct routing to rejoin the SID at Rockr waypoint which does not have a published altitude restriction. ATC wants the aircraft to cross at or above 10,000). The clearance will read:*
"Proceed direct Rockr, cross Rockr at or above one-zero thousand, climb via the Bizee Two departure."

NOTE–
In Example 8, the aircraft will join the Bizee Two SID at Rockr at or above 10,000 and then comply with the published lateral path and any published speed or altitude restrictions while climbing to the SID top altitude.

9. *(An aircraft was issued the Suzan Two departure, "climb via SID" in the IFR departure clearance. After departure ATC vectors the aircraft off of the SID, and then clears the aircraft to rejoin the SID at Dvine waypoint, which has a published crossing restriction). The clearance will read:*
"Proceed direct Dvine, Climb via the Suzan Two departure."

NOTE–
In Example 9, the aircraft will join the Suzan Two departure at Dvine, at the published altitude, and then comply with the published lateral path and any published speed or altitude restrictions.

6. Pilots cleared for vertical navigation using the phraseology "climb via" must inform ATC, upon initial contact, of the altitude leaving and any assigned restrictions not published on the procedure.

EXAMPLE–

1. *(Cactus 711 is cleared to climb via the Laura Two departure. The Laura Two has a top altitude of FL190):*
"Cactus Seven Eleven leaving two thousand, climbing via the Laura Two departure."

2. *(Cactus 711 is cleared to climb via the Laura Two departure, but ATC changed the top altitude to16,000):*
"Cactus Seven Eleven leaving two thousand for one-six thousand, climbing via the Laura Two departure."

7. If prior to or after takeoff an altitude restriction is issued by ATC, all previously issued "ATC" altitude restrictions are canceled including those published on a SID. Pilots must still comply with all speed restrictions and lateral path requirements published on the SID unless canceled by ATC.

EXAMPLE–

Prior to takeoff or after departure ATC issues an altitude change clearance to an aircraft cleared to climb via a SID but ATC no longer requires compliance with published altitude restrictions:

"Climb and maintain flight level two four zero."

NOTE–

The published SID altitude restrictions are canceled; The aircraft should comply with the SID lateral path and begin an unrestricted climb to FL240. Compliance with published speed restrictions is still required unless specifically deleted by ATC.

8. Altitude restrictions published on an ODP are necessary for obstacle clearance and/or design constraints. Compliance with these restrictions is mandatory and CANNOT be lowered or cancelled by ATC.

f. RNAV Departure Procedures

All public RNAV SIDs and graphic ODPs are RNAV 1. These procedures generally start with an initial RNAV or heading leg near the departure end of runway (DER). In addition, these procedures require system performance currently met by GPS 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. RNAV 1 procedures must maintain a total system error of not more than 1 NM for 95% of the total flight time.

REFERENCE–

AIM, Global Positioning System (GPS)
Paragraph 1–1–17 k, Impact of Magnetic Variation on PBN Systems

Section 4. Arrival Procedures

5-4-1. Standard Terminal Arrival (STAR) Procedures

a. A STAR is an ATC coded IFR arrival route established for application to arriving IFR aircraft destined for certain airports. STARs simplify clearance delivery procedures, and also facilitate transition between en route and instrument approach procedures.

1. STAR procedures may have mandatory speeds and/or crossing altitudes published. Other STARs may have planning information depicted to inform pilots what clearances or restrictions to "**expect**." "**Expect**" altitudes/speeds are not considered STAR procedures crossing restrictions unless verbally issued by ATC. Published speed restrictions are independent of altitude restrictions and are mandatory unless modified by ATC. Pilots should plan to cross waypoints with a published speed restriction, at the published speed, and should not exceed this speed past the associated waypoint unless authorized by ATC or a published note to do so.

NOTE–
*The "**expect**" altitudes/speeds are published so that pilots may have the information for planning purposes. These altitudes/speeds must not be used in the event of lost communications unless ATC has specifically advised the pilot to expect these altitudes/speeds as part of a further clearance.*

REFERENCE–
14 CFR Section 91.185(c)(2)(iii).

2. Pilots navigating on STAR procedures must maintain last assigned altitude until receiving authorization to descend so as to comply with all published/issued restrictions. This authorization may contain the phraseology "DESCEND VIA." If vectored or cleared to deviate off of a STAR, pilots must consider the STAR canceled, unless the controller adds "expect to resume STAR;" pilots should then be prepared to rejoin the STAR at a subsequent fix or procedure leg. If having received a descent clearance that included a crossing restriction, pilots should expect the controller to issue an altitude to maintain.

(a) Clearance to "descend via" authorizes pilots to:

(1) Descend at pilot's discretion to meet published restrictions and laterally navigate on a STAR.

(2) When cleared to a waypoint depicted on a STAR, to descend from a previously assigned altitude at pilot's discretion to the altitude depicted at that waypoint.

(3) Once established on the depicted arrival, to descend and to meet all published or assigned altitude and/or speed restrictions.

NOTE–
1. *When otherwise cleared along a route or procedure that contains published speed restrictions, the pilot must comply with those speed restrictions independent of any descend via clearance.*

2. *ATC anticipates pilots will begin adjusting speed the minimum distance necessary prior to a published speed restriction so as to cross the waypoint/fix at the published speed. Once at the published speed, ATC expects pilots will maintain the published speed until additional adjustment is required to comply with further published or ATC assigned speed restrictions or as required to ensure compliance with 14 CFR Section 91.117.*

3. *The "descend via" is used in conjunction with STARs to reduce phraseology by not requiring the controller to restate the altitude at the next waypoint/fix to which the pilot has been cleared.*

4. *Air traffic will assign an altitude to cross the waypoint/fix, if no altitude is depicted at the waypoint/fix, for aircraft on a direct routing to a STAR. Air traffic must ensure obstacle clearance when issuing a "descend via" instruction to the pilot.*

5. *Minimum en route altitudes (MEA) are not considered restrictions; however, pilots must remain above all MEAs, unless receiving an ATC instruction to descend below the MEA.*

EXAMPLE–
1. ***Lateral/routing clearance only.***
"Cleared Tyler One arrival."

NOTE–
In Example 1, pilots are cleared to fly the lateral path of the procedure. Compliance with any published speed restrictions is required. No descent is authorized.

2. ***Routing with assigned altitude.***
"Cleared Tyler One arrival, descend and maintain flight level two four zero."
"Cleared Tyler One arrival, descend at pilot's discretion, maintain flight level two four zero."

NOTE–
In Example 2, the first clearance requires the pilot to descend to FL 240 as directed, comply with any published speed restrictions, and maintain FL 240 until cleared for further vertical navigation with a newly assigned altitude or a "descend via" clearance.

The second clearance authorizes the pilot to descend to FL 240 at his discretion, to comply with any published speed restrictions, and then maintain FL 240 until issued further instructions.

3. ***Lateral/routing and vertical navigation clearance.***

"Descend via the Eagul Five arrival."

"Descend via the Eagul Five arrival, except, cross Vnnom at or above one two thousand."

NOTE–
In Example 3, the first clearance authorized the aircraft to descend at pilot's discretion on the Eagul Five arrival; the pilot must descend so as to comply with all published altitude and speed restrictions.

The second clearance authorizes the same, but requires the pilot to descend so as to cross at Vnnom at or above 12,000.

4. ***Lateral/routing and vertical navigation clearance when assigning altitude not published on procedure.***

"Descend via the Eagul Five arrival, except after Geeno, maintain one zero thousand."

"Descend via the Eagul Five arrival, except cross Geeno at one one thousand then maintain seven thousand."

NOTE–
In Example 4, the first clearance authorized the aircraft to track laterally on the Eagul Five Arrival and to descend at pilot's discretion so as to comply with all altitude and speed restrictions until reaching Geeno and then maintain 10,000. Upon reaching 10,000, aircraft should maintain 10,000 until cleared by ATC to continue to descend.

The second clearance requires the same, except the aircraft must cross Geeno at 11,000 and is then authorized to continue descent to and maintain 7,000.

5. ***Direct routing to intercept a STAR and vertical navigation clearance.***

"Proceed direct Leoni, descend via the Leoni One arrival."

"Proceed direct Denis, cross Denis at or above flight level two zero zero, then descend via the Mmell One arrival."

NOTE–
In Example 5, in the first clearance an altitude is published at Leoni; the aircraft proceeds to Leoni, crosses Leoni at the published altitude and then descends via the arrival. If a speed restrictions is published at Leoni, the aircraft will slow to comply with the published speed.

In the second clearance, there is no altitude published at Denis; the aircraft must cross Denis at or above FL200, and then descends via the arrival.

(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 on subscription from the National Aeronautical Charting Office.

e. RNAV STAR.

1. All public RNAV STARs are RNAV1. These procedures require system performance currently met by GPS 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. RNAV1 procedures must maintain a total system error of not more than 1 NM for 95% of the total flight time.

2. For procedures requiring GPS, if the navigation system does not automatically alert the flight crew of a loss of GPS, the operator must develop procedures to verify correct GPS operation.

REFERENCE−
AIM, Global Positioning System (GPS)
Paragraph 1−1−17 k, Impact of Magnetic Variation on PBN Systems

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 facilities and towers, and the update rate is not as fast. Therefore, pilots may be requested to report established on the final approach course.

3. Whether aircraft are vectored to the appropriate final approach course or provide their own navigation on published routes to it, radar service is automatically terminated when the landing is completed or when instructed to change to advisory frequency at uncontrolled airports, whichever occurs first.

5−4−4. Advance Information on Instrument Approach

a. When landing at airports with approach control services and where two or more IAPs are published, pilots will be provided in advance of their arrival with the type of approach to expect or that they may be vectored for a visual approach. This information will be broadcast either by a controller or on ATIS. It will not be furnished when the visibility is three miles or better and the ceiling is at or above the highest initial approach altitude established for any low altitude IAP for the airport.

b. The purpose of this information is to aid the pilot in planning arrival actions; however, it is not an ATC clearance or commitment and is subject to change. Pilots should bear in mind that fluctuating weather, shifting winds, blocked runway, etc., are conditions which may result in changes to approach information previously received. It is important that pilots advise ATC immediately they are unable to execute the approach ATC advised will be used, or if they prefer another type of approach.

c. Aircraft destined to uncontrolled airports, which have automated weather data with broadcast capability, should monitor the ASOS/AWSS/AWOS frequency to ascertain the current weather for the airport. The pilot must advise ATC when he/she has received the broadcast weather and state his/her intentions.

NOTE−

1. *ASOS/AWSS/AWOS should be set to provide one−minute broadcast weather updates at uncontrolled airports that are without weather broadcast capability by a human observer.*

2. *Controllers will consider the long line disseminated weather from an automated weather system at an uncontrolled airport as trend and planning information only and will rely on the pilot for current weather information for the airport. If the pilot is unable to receive the current broadcast weather, the last long line disseminated weather will be issued to the pilot. When receiving IFR services, the pilot/aircraft operator is responsible for determining if weather/visibility is adequate for approach/landing.*

d. When making an IFR approach to an airport not served by a tower or FSS, after ATC advises "CHANGE TO ADVISORY FREQUENCY APPROVED" you should broadcast your intentions, including the type of approach being executed, your position, and when over the final approach fix inbound (nonprecision approach) or when over the outer marker or fix used in lieu of the outer marker inbound (precision approach). Continue to monitor the appropriate frequency (UNICOM, etc.) for reports from other pilots.

5−4−5. Instrument Approach Procedure (IAP) Charts

a. 14 CFR Section 91.175(a), Instrument approaches to civil airports, requires the use of SIAPs prescribed for the airport in 14 CFR Part 97 unless otherwise authorized by the Administrator (including ATC). If there are military procedures published at a civil airport, aircraft operating under 14 CFR Part 91 must use the civil procedure(s). Civil procedures are defined with "FAA" in parenthesis; e.g., (FAA), at the top, center of the procedure chart. DOD procedures are defined using the abbreviation of the applicable military service in parenthesis; e.g., (USAF), (USN), (USA). 14 CFR Section 91.175(g), Military airports, requires civil pilots flying into or out of military airports to comply with the IAPs and takeoff and landing minimums prescribed by the authority having jurisdiction at those airports. Unless an emergency exists, civil aircraft operating at military airports normally require advance authorization, commonly referred to as "Prior Permission Required" or "PPR." Information on obtaining a PPR for a particular military airport can be found in the Chart Supplement U.S.

NOTE−
Civil aircraft may conduct practice VFR approaches using DOD instrument approach procedures when approved by the air traffic controller.

1. IAPs (standard and special, civil and military) are based on joint civil and military criteria contained in the U.S. Standard for TERPS. The design of IAPs based on criteria contained in TERPS, takes into account the interrelationship between airports, facilities, and the surrounding environment, terrain, obstacles, noise sensitivity, etc. Appropriate altitudes, courses, headings, distances, and other limitations are specified and, once approved, the procedures are published and distributed by government and commercial cartographers as instrument approach charts.

2. Not all IAPs are published in chart form. Radar IAPs are established where requirements and facilities exist but they are printed in tabular form in appropriate U.S. Government Flight Information Publications.

3. The navigation equipment required to join and fly an instrument approach procedure is indicated by the title of the procedure and notes on the chart.

(a) Straight−in IAPs are identified by the navigational system providing the final approach guidance and the runway to which the approach is aligned (e.g., VOR RWY 13). Circling only approaches are identified by the navigational system providing final approach guidance and a letter (e.g., VOR A). More than one navigational system separated by a slash indicates that more than one type of equipment must be used to execute the final approach (e.g., VOR/DME RWY 31). More than one navigational system separated by the word "or" indicates either type of equipment may be used to execute the final approach (e.g., VOR or GPS RWY 15).

(b) In some cases, other types of navigation systems including radar may be required to execute other portions of the approach or to navigate to the IAF (e.g., an NDB procedure turn to an ILS, an NDB in the missed approach, or radar required to join the procedure or identify a fix). When radar or other equipment is required for procedure entry from the en route environment, a note will be charted in the planview of the approach procedure chart (e.g., RADAR REQUIRED or ADF REQUIRED). When radar or other equipment is required on portions of the procedure outside the final approach segment, including the missed approach, a note will be charted in the notes box of the pilot briefing portion of the approach chart (e.g., RADAR REQUIRED or DME REQUIRED). Notes are not charted when VOR is required outside the final approach segment. Pilots should ensure that the aircraft is equipped with the required NAVAID(s) in order to execute the approach, including the missed approach.

NOTE−
Some military (i.e., U.S. Air Force and U.S. Navy) IAPs have these "additional equipment required" notes charted only in the planview of the approach procedure and do not conform to the same application standards used by the FAA.

(c) The FAA has initiated a program to provide a new notation for LOC approaches when charted on an ILS approach requiring other navigational aids to fly the final approach course. The

LOC minimums will be annotated with the NAVAID required (e.g., "DME Required" or "RADAR Required"). During the transition period, ILS approaches will still exist without the annotation.

(d) Many ILS approaches having minima based on RVR are eligible for a landing minimum of RVR 1800. Some of these approaches are to runways that have touchdown zone and centerline lights. For many runways that do not have touchdown and centerline lights, it is still possible to allow a landing minimum of RVR 1800. For these runways, the normal ILS minimum of RVR 2400 can be annotated with a single or double asterisk or the dagger symbol "†"; for example "** 696/24 200 (200/1/2)." A note is included on the chart stating "**RVR 1800 authorized with use of FD or AP or HUD to DA." The pilot must use the flight director, or autopilot with an approved approach coupler, or head up display to decision altitude or to the initiation of a missed approach. In the interest of safety, single pilot operators should not fly approaches to 1800 RVR minimums on runways without touchdown and centerline lights using only a flight director, unless accompanied by the use of an autopilot with an approach coupler.

(e) The naming of multiple approaches of the same type to the same runway is also changing. Multiple approaches with the same guidance will be annotated with an alphabetical suffix beginning at the end of the alphabet and working backwards for subsequent procedures (e.g., ILS Z RWY 28, ILS Y RWY 28, etc.). The existing annotations such as ILS 2 RWY 28 or Silver ILS RWY 28 will be phased out and replaced with the new designation. The Cat II and Cat III designations are used to differentiate between multiple ILSs to the same runway unless there are multiples of the same type.

(f) RNAV (GPS) approaches to LNAV, LP, LNAV/VNAV and LPV lines of minima using WAAS and RNAV (GPS) approaches to LNAV and LNAV/VNAV lines of minima using GPS are charted as RNAV (GPS) RWY (Number) (e.g., RNAV (GPS) RWY 21). VOR/DME RNAV approaches will continue to be identified as VOR/DME RNAV RWY (Number) (e.g., VOR/DME RNAV RWY 21). VOR/DME RNAV procedures which can be flown by GPS will be annotated with "or GPS" (e.g., VOR/DME RNAV or GPS RWY 31).

4. Approach minimums are based on the local altimeter setting for that airport, unless annotated otherwise; e.g., Oklahoma City/Will Rogers World approaches are based on having a Will Rogers World altimeter setting. When a different altimeter source is required, or more than one source is authorized, it will be annotated on the approach chart; e.g., use Sidney altimeter setting, if not received, use Scottsbluff altimeter setting. Approach minimums may be raised when a nonlocal altimeter source is authorized. When more than one altimeter source is authorized, and the minima are different, they will be shown by separate lines in the approach minima box or a note; e.g., use Manhattan altimeter setting; when not available use Salina altimeter setting and increase all MDAs 40 feet. When the altimeter must be obtained from a source other than air traffic a note will indicate the source; e.g., Obtain local altimeter setting on CTAF. When the altimeter setting(s) on which the approach is based is not available, the approach is not authorized. Baro−VNAV must be flown using the local altimeter setting only. Where no local altimeter is available, the LNAV/VNAV line will still be published for use by WAAS receivers with a note that Baro−VNAV is not authorized. When a local and at least one other altimeter setting source is authorized and the local altimeter is not available Baro−VNAV is not authorized; however, the LNAV/VNAV minima can still be used by WAAS receivers using the alternate altimeter setting source.

NOTE−

Barometric Vertical Navigation (baro−VNAV). An RNAV system function which uses barometric altitude information from the aircraft's altimeter to compute and present a vertical guidance path to the pilot. The specified vertical path is computed as a geometric path, typically computed between two waypoints or an angle based computation from a single waypoint. Further guidance may be found in Advisory Circular 90−105.

5. A pilot adhering to the altitudes, flight paths, and weather minimums depicted on the IAP chart or vectors and altitudes issued by the radar controller, is assured of terrain and obstruction clearance and runway or airport alignment during approach for landing.

6. IAPs are designed to provide an IFR descent from the en route environment to a point where a safe landing can be made. They are prescribed and approved by appropriate civil or military authority to ensure a safe descent during instrument flight conditions at a specific airport. It is important that pilots understand these procedures and their use prior to attempting to fly instrument approaches.

7. TERPS criteria are provided for the following types of instrument approach procedures:

(a) Precision Approach (PA). An instrument approach based on a navigation system that provides course and glidepath deviation information meeting the precision standards of ICAO Annex 10. For example, PAR, ILS, and GLS are precision approaches.

(b) Approach with Vertical Guidance (APV). An instrument approach based on a navigation system that is not required to meet the precision approach standards of ICAO Annex 10 but provides course and glidepath deviation information. For example, Baro−VNAV, LDA with glidepath, LNAV/VNAV and LPV are APV approaches.

(c) Nonprecision Approach (NPA). An instrument approach based on a navigation system which provides course deviation information, but no glidepath deviation information. For example, VOR, NDB and LNAV. As noted in subparagraph k, Vertical Descent Angle (VDA) on Nonprecision Approaches, some approach procedures may provide a Vertical Descent Angle as an aid in flying a stabilized approach, without requiring its use in order to fly the procedure. This does not make the approach an APV procedure, since it must still be flown to an MDA and has not been evaluated with a glidepath.

b. The method used to depict prescribed altitudes on instrument approach charts differs according to techniques employed by different chart publishers. Prescribed altitudes may be depicted in four different configurations: minimum, maximum, mandatory, and recommended. The U.S. Government distributes charts produced by National Geospatial−Intelligence Agency (NGA) and FAA. Altitudes are depicted on these charts in the profile view with underscore, overscore, both or none to identify them as minimum, maximum, mandatory or recommended.

1. Minimum altitude will be depicted with the altitude value underscored. Aircraft are required to maintain altitude at or above the depicted value, e.g., $\underline{3000}$.

2. Maximum altitude will be depicted with the altitude value overscored. Aircraft are required to maintain altitude at or below the depicted value, e.g., $\overline{4000}$.

3. Mandatory altitude will be depicted with the altitude value both underscored and overscored. Aircraft are required to maintain altitude at the depicted value, e.g., $\overline{\underline{5000}}$.

4. Recommended altitude will be depicted with no overscore or underscore. These altitudes are depicted for descent planning, e.g., 6000.

NOTE−

1. *Pilots are cautioned to adhere to altitudes as prescribed because, in certain instances, they may be used as the basis for vertical separation of aircraft by ATC. When a depicted altitude is specified in the ATC clearance, that altitude becomes mandatory as defined above.*

2. *The ILS glide slope is intended to be intercepted at the published glide slope intercept altitude. This point marks the PFAF and is depicted by the "lightning bolt" symbol on U.S. Government charts. Intercepting the glide slope at this altitude marks the beginning of the final approach segment and ensures required obstacle clearance during descent from the glide slope intercept altitude to the lowest published decision altitude for the approach. Interception and tracking of the glide slope prior to the published glide slope interception altitude does not necessarily ensure that minimum, maximum, and/or mandatory altitudes published for any preceding fixes will be complied with during the descent. If the pilot chooses to track the glide slope prior to the glide slope interception altitude, they remain responsible for complying with published altitudes for any preceding stepdown fixes encountered during the subsequent descent.*

3. *Approaches used for simultaneous (parallel) independent and simultaneous close parallel operations procedurally require descending on the glideslope from the altitude at which the approach clearance is issued (refer to 5-4-15 and 5-4-16). For simultaneous close parallel (PRM) approaches, the Attention All Users Page (AAUP) may publish a note which indicates that descending on the glideslope/glidepath meets all crossing restrictions. However, if no such note is published, and for simultaneous independent approaches (4300 and greater runway separation) where an AAUP is not published, pilots are cautioned to monitor their descent on the glideslope/path outside of the PFAF to ensure compliance with published crossing restrictions during simultaneous operations.*

4. *When parallel approach courses are less than 2500 feet apart and reduced in-trail spacing is authorized for simultaneous dependent operations, a chart note will indicate that simultaneous operations require use of vertical guidance and that the pilot should maintain last* *assigned altitude until established on glide slope. These approaches procedurally require utilization of the ILS glide slope for wake turbulence mitigation. Pilots should not confuse these simultaneous dependent operations with (SOIA) simultaneous close parallel PRM approaches, where PRM appears in the approach title.*

c. Minimum Safe Altitudes (MSA) are published for emergency use on IAP charts. MSAs provide 1,000 feet of clearance over all obstacles, but do not necessarily assure acceptable navigation signal coverage. The MSA depiction on the plan view of an approach chart contains the identifier of the center point of the MSA, the applicable radius of the MSA, a depiction of the sector(s), and the minimum altitudes above mean sea level which provide obstacle clearance. For conventional navigation systems, the MSA is normally based on the primary omnidirectional facility on which the IAP is predicated, but may be based on the airport reference point (ARP) if no suitable facility is available. For RNAV approaches, the MSA is based on an RNAV waypoint. MSAs normally have a 25 NM radius; however, for conventional navigation systems, this radius may be expanded to 30 NM if necessary to encompass the airport landing surfaces. A single sector altitude is normally established, however when the MSA is based on a facility and it is necessary to obtain relief from obstacles, an MSA with up to four sectors may be established.

d. Terminal Arrival Area (TAA)

1. The TAA provides a transition from the en route structure to the terminal environment with little required pilot/air traffic control interface for aircraft equipped with Area Navigation (RNAV) systems. A TAA provides minimum altitudes with standard obstacle clearance when operating within the TAA boundaries. TAAs are primarily used on RNAV approaches but may be used on an ILS approach when RNAV is the sole means for navigation to the IF; however, they are not normally used in areas of heavy concentration of air traffic.

2. The basic design of the RNAV procedure underlying the TAA is normally the "T" design (also called the "Basic T"). The "T" design incorporates two IAFs plus a dual purpose IF/IAF that functions as both an intermediate fix and an initial approach fix. The T configuration continues from the IF/IAF to the final approach fix (FAF) and then to the missed approach point (MAP). The two base leg IAFs are typically aligned in a straight-line perpendicular to the intermediate course connecting at the IF/IAF. A Hold-in-Lieu-of Procedure Turn (HILPT) is anchored at the IF/IAF and depicted on U.S. Government publications using the "hold−in−lieu −of−PT" holding pattern symbol. When the HILPT is necessary for course alignment and/or descent, the dual purpose IF/IAF serves as an IAF during the entry into the pattern. Following entry into the HILPT pattern and when flying a route or sector labeled "NoPT," the dual-purpose fix serves as an IF, marking the beginning of the Intermediate Segment. See FIG 5−4−1 and FIG 5−4−2 for the Basic "T" TAA configuration.

feeder route; i.e., the aircraft would not be expected to overfly the feeder route and return to it. The pilot is expected to commence the approach in a similar manner at the IAF, if the IAF for the procedure is located along the route of flight to the holding fix.

c. If a route of flight directly to the initial approach fix is desired, it should be so stated by the controller with phraseology to include the words "direct . . . ," "proceed direct" or a similar phrase which the pilot can interpret without question. When uncertain of the clearance, immediately query ATC as to what route of flight is desired.

d. The name of an instrument approach, as published, is used to identify the approach, even though a component of the approach aid, such as the glideslope on an Instrument Landing System, is inoperative or unreliable. The controller will use the name of the approach as published, but must advise the aircraft at the time an approach clearance is issued that the inoperative or unreliable approach aid component is unusable, except when the title of the published approach procedures otherwise allows; for example, ILS Rwy 05 or LOC Rwy 05.

e. The following applies to aircraft on radar vectors and/or cleared "direct to" in conjunction with an approach clearance:

1. Maintain the last altitude assigned by ATC until the aircraft is established on a published segment of a transition route, or approach procedure segment, or other published route, for which a lower altitude is published on the chart. If already on an established route, or approach or arrival segment, you may descend to whatever minimum altitude is listed for that route or segment.

2. Continue on the vector heading until intercepting the next published ground track applicable to the approach clearance.

3. Once reaching the final approach fix via the published segments, the pilot may continue on approach to a landing.

4. If proceeding to an IAF with a published course reversal (procedure turn or hold-in-lieu of PT pattern), except when cleared for a straight in approach by ATC, the pilot must execute the procedure turn/hold-in-lieu of PT, and complete the approach.

5. If cleared to an IAF/IF via a NoPT route, or no procedure turn/hold-in-lieu of PT is published, continue with the published approach.

6. In addition to the above, RNAV aircraft may be issued a clearance direct to the IAF/IF at intercept angles not greater than 90 degrees for both conventional and RNAV instrument approaches. Controllers may issue a heading or a course direct to a fix between the IF and FAF at intercept angles not greater than 30 degrees for both conventional and RNAV instrument approaches. In all cases, controllers will assign altitudes that ensure obstacle clearance and will permit a normal descent to the FAF. When clearing aircraft direct to the IF, ATC will radar monitor the aircraft until the IF and will advise the pilot to expect clearance direct to the IF at least 5 miles from the fix. ATC must issue a straight-in approach clearance when clearing an aircraft direct to an IAF/IF with a procedure turn or hold−in−lieu of a procedure turn, and ATC does not want the aircraft to execute the course reversal.

NOTE−
Refer to 14 CFR 91.175 (i).

7. RNAV aircraft may be issued a clearance direct to the FAF that is also charted as an IAF, in which case the pilot is expected to execute the depicted procedure turn or hold-in-lieu of procedure turn. ATC will not issue a straight-in approach clearance. If the pilot desires a straight-in approach, they must request vectors to the final approach course outside of the FAF or fly a published "NoPT" route. When visual approaches are in use, ATC may clear an aircraft direct to the FAF.

NOTE−
1. *In anticipation of a clearance by ATC to any fix published on an instrument approach procedure, pilots of RNAV aircraft are advised to select an appropriate IAF or feeder fix when loading an instrument approach procedure into the RNAV system.*

2. *Selection of "Vectors-to-Final" or "Vectors" option for an instrument approach may prevent approach fixes located outside of the FAF from being loaded into an RNAV system. Therefore, the selection of these options is discouraged due to increased workload for pilots to reprogram the navigation system.*

f. An RF leg is defined as a constant radius circular path around a defined turn center that starts and terminates at a fix. An RF leg may be published as part of a procedure. Since not all aircraft have the capability to fly these leg types, pilots are responsible for knowing if they can conduct an RNAV approach with an RF leg. Requirements for RF legs will be indicated on the approach chart in the notes section or at the applicable initial approach fix. Controllers will clear RNAV-equipped aircraft for instrument approach procedures containing RF legs:

1. Via published transitions, or

2. In accordance with paragraph e6 above, and

3. ATC will not clear aircraft direct to any waypoint beginning or within an RF leg, and will not assign fix/waypoint crossing speeds in excess of charted speed restrictions.

EXAMPLE−
Controllers will not clear aircraft direct to THIRD because that waypoint begins the RF leg, and aircraft cannot be vectored or cleared to TURNN or vectored to intercept the approach segment at any point between THIRD and FORTH because this is the RF leg. (See FIG 5−4−14.)

5−4−7. Instrument Approach Procedures

a. Aircraft approach category means a grouping of aircraft based on a speed of $V_{REF,}$ if specified, or if V_{REF} is not specified, 1.3 V_{SO} at the maximum certified landing weight. $V_{REF,}$ $V_{SO,}$ and the maximum certified landing weight are those values as established for the aircraft by the certification authority of the country of registry. A pilot must use the minima corresponding to the category determined during certification or higher. Helicopters may use Category A minima. If it is necessary to operate at a speed in excess of the upper limit of the speed range for an aircraft's category, the minimums for the higher category must be used. For example, an airplane which fits into Category B, but is circling to land at a speed of 145 knots, must use the approach Category D minimums. As an additional example, a Category A airplane (or helicopter) which is operating at 130 knots on a straight−in approach must use the approach Category C minimums. See the following category limits:

1. Category A: Speed less than 91 knots.

2. Category B: Speed 91 knots or more but less than 121 knots.

3. Category C: Speed 121 knots or more but less than 141 knots.

4. Category D: Speed 141 knots or more but less than 166 knots.

5. Category E: Speed 166 knots or more.

NOTE−
V_{REF} in the above definition refers to the speed used in establishing the approved landing distance under the airworthiness regulations constituting the type certification basis of the airplane, regardless of whether that speed for a particular airplane is 1.3 $V_{SO,}$ 1.23 $V_{SR,}$ or some higher speed required for airplane controllability. This speed, at the maximum certificated landing weight, determines the lowest applicable approach category for all approaches regardless of actual landing weight.

b. When operating on an unpublished route or while being radar vectored, the pilot, when an approach clearance is received, must, in addition to complying with the minimum altitudes for IFR operations (14 CFR Section 91.177), maintain the last assigned altitude unless a different altitude is assigned by ATC, or until the aircraft is established on a segment of a published route or IAP. After the aircraft is so established, published altitudes apply to descent within each succeeding route or approach segment unless a different altitude is assigned by ATC. Notwithstanding this pilot responsibility, for aircraft operating on unpublished routes or while being radar vectored, ATC will, except when conducting a radar approach, issue an IFR approach clearance only after the aircraft is established on a segment of a published route or IAP, or assign an altitude to maintain until the aircraft is established on a segment of a published route or instrument approach procedure. For this purpose, the procedure turn of a published IAP must not be considered a segment of that IAP until the aircraft reaches the initial fix or navigation facility upon which the procedure turn is predicated.

EXAMPLE−
Cross Redding VOR at or above five thousand, cleared VOR runway three four approach.
or
Five miles from outer marker, turn right heading three three zero, maintain two thousand until established on the localizer, cleared ILS runway three six approach.

NOTE−
1. *The altitude assigned will assure IFR obstruction clearance from the point at which the approach clearance is issued until established on a segment of a published route or IAP. If uncertain of the meaning of the clearance, immediately request clarification from ATC.*

2. *An aircraft is not established on an approach while below published approach altitudes. If the MVA/MIA allows, and ATC assigns an altitude below an IF or IAF altitude, the pilot will be issued an altitude to maintain until past a point that the aircraft is established on the approach.*

c. Several IAPs, using various navigation and approach aids may be authorized for an airport. ATC may advise that a particular approach procedure is being used, primarily to expedite traffic. If issued a clearance that specifies a particular approach procedure, notify ATC immediately if a different one is desired. In this event it may be necessary for ATC to withhold clearance for the different approach until such time as traffic conditions permit. However, a pilot involved in an emergency situation will be given priority. If the pilot is not familiar with the specific approach procedure, ATC should be advised and they will provide detailed information on the execution of the procedure.

REFERENCE−
AIM, Paragraph 5−4−4 , Advance Information on Instrument Approach

d. The name of an instrument approach, as published, is used to identify the approach, even though a component of the approach aid, such as the glideslope on an Instrument Landing System, is inoperative or unreliable. The controller will use the name of the approach as published, but must advise the aircraft at the time an approach clearance is issued that the inoperative or unreliable approach aid component is unusable, except when the title of the published approach procedures otherwise allows, for example, ILS or LOC.

e. Except when being radar vectored to the final approach course, when cleared for a specifically prescribed IAP; i.e., "cleared ILS runway one niner approach" or when "cleared approach" i.e., execution of any procedure prescribed for the airport, pilots must execute the entire procedure commencing at an IAF or an associated feeder route as described on the IAP chart unless an appropriate new or revised ATC clearance is received, or the IFR flight plan is canceled.

f. Pilots planning flights to locations which are private airfields or which have instrument approach procedures based on private navigation aids should obtain approval from the owner. In addition, the pilot must be authorized by the FAA to fly special instrument approach procedures associated with private navigation aids (see paragraph 5−4−8). Owners of navigation aids that are not for public use may elect to turn off the signal for whatever reason they may have; for example, maintenance, energy conservation, etc. Air traffic controllers are not required to question pilots to determine if they have permission to land at a private airfield or to use procedures based on privately owned navigation aids, and they may not know the status of the navigation aid. Controllers presume a pilot has obtained approval from the owner and the FAA for use of special instrument approach procedures and is aware of any details of the procedure if an IFR flight plan was filed to that airport.

g. Pilots should not rely on radar to identify a fix unless the fix is indicated as "RADAR" on the IAP. Pilots may request radar identification of an OM, but the controller may not be able to provide the service due either to workload or not having the fix on the video map.

h. If a missed approach is required, advise ATC and include the reason (unless initiated by ATC). Comply with the missed approach instructions for the instrument approach procedure being executed, unless otherwise directed by ATC.

REFERENCE−
AIM, Paragraph 5−4−21 , Missed Approach
AIM, Paragraph 5−5−5 , Missed Approach,

5−4−8. Special Instrument Approach Procedures

Instrument Approach Procedure (IAP) charts reflect the criteria associated with the U.S. Standard for Terminal Instrument [Approach] Procedures (TERPs), which prescribes standardized methods for use in developing IAPs. Standard IAPs are published in the Federal Register (FR) in accordance with Title 14 of the Code of Federal Regulations, Part 97, and are available for use by appropriately qualified pilots operating properly equipped and airworthy aircraft in accordance with operating rules and procedures acceptable to the FAA. Special IAPs are also developed using TERPS but are not given public notice in the FR. The FAA authorizes only certain individual pilots and/or pilots in individual organizations to use special IAPs, and may require additional crew training and/or aircraft equipment or performance, and may also require the use of landing aids, communications, or weather services not available for public use. Additionally, IAPs that service private use airports or heliports are generally special IAPs. FDC NOTAMs for Specials, FDC T-NOTAMs, may also be used to promulgate safety-of-flight information relating to Specials provided the location has a valid landing area identifier and is serviced by the United States NOTAM system. Pilots may access NOTAMs online or through an FAA Flight Service Station (FSS). FSS specialists will not automatically provide NOTAM information to pilots for special IAPs during telephone pre−flight briefings. Pilots who are authorized by the FAA to use special IAPs must specifically request FDC NOTAM information for the particular special IAP they plan to use.

5−4−9. Procedure Turn and Hold−in−lieu of Procedure Turn

a. A procedure turn is the maneuver prescribed when it is necessary to reverse direction to establish the aircraft inbound on an intermediate or final approach course. The procedure turn or hold−in−lieu−of−PT is a required maneuver when it is depicted on the approach chart, unless cleared by ATC for a straight−in approach. Additionally, the procedure turn or hold−in−lieu−of−PT is not permitted when the symbol "No PT" is depicted on the initial segment being used, when a RADAR VECTOR to the final approach course is provided, or when conducting a timed approach from a holding fix. The altitude prescribed for the procedure turn is a minimum altitude until the aircraft is established on the inbound course. The maneuver must be completed within the distance specified in the profile view. For a hold−in−lieu−of−PT, the holding pattern direction must be flown as depicted and the specified leg length/timing must not be exceeded.

NOTE−
The pilot may elect to use the procedure turn or hold−in−lieu−of−PT when it is not required by the procedure, but must first receive an amended clearance from ATC. If the pilot is uncertain whether the ATC clearance intends for a procedure turn to be conducted or to allow for a straight−in approach, the pilot must immediately request clarification from ATC (14 CFR Section 91.123).

1. On U.S. Government charts, a barbed arrow indicates the maneuvering side of the outbound course on which the procedure turn is made. Headings are provided for course reversal using the 45 degree type procedure turn. However, the point at which the turn may be commenced and the type and rate of turn is left to the discretion of the pilot (limited by the charted remain within xx NM distance). Some of the options are the 45 degree procedure turn, the racetrack pattern, the teardrop procedure turn, or the 80 degree ↮ 260 degree course reversal. Racetrack entries should be conducted on the maneuvering side where the majority of protected airspace resides. If an entry places the pilot on the non−maneuvering side of the PT, correction to intercept the outbound course ensures remaining within protected airspace. Some procedure turns are specified by procedural track. These turns must be flown exactly as depicted.

2. Descent to the procedure turn (PT) completion altitude from the PT fix altitude (when one has been published or assigned by ATC) must not begin until crossing over the PT fix or abeam and proceeding outbound. Some procedures contain a note in the chart profile view that says "Maintain (altitude) or above until established outbound for procedure turn" (See FIG 5−4−15). Newer procedures will simply depict an "at or above" altitude at the PT fix without a chart note (See FIG 5−4−16). Both are there to ensure required obstacle clearance is provided in the procedure turn entry zone (See FIG 5−4−17). Absence of a chart note or specified minimum altitude adjacent to the PT fix is an indication that descent to the procedure turn altitude can commence immediately upon crossing over the PT fix, regardless of the direction of flight. This is because the minimum altitudes in the PT entry zone and the PT maneuvering zone are the same.

FIG 5-4-14
Example of an RNAV Approach with RF Leg

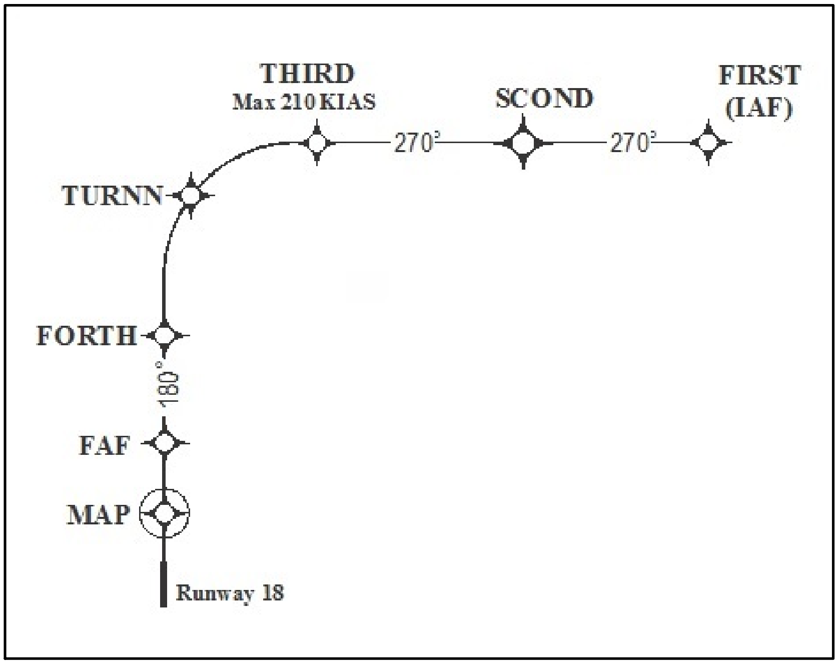


FIG 5-4-15

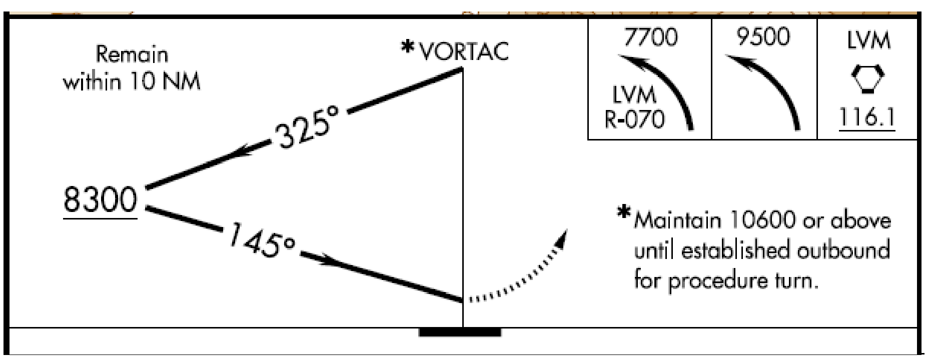


FIG 5-4-16

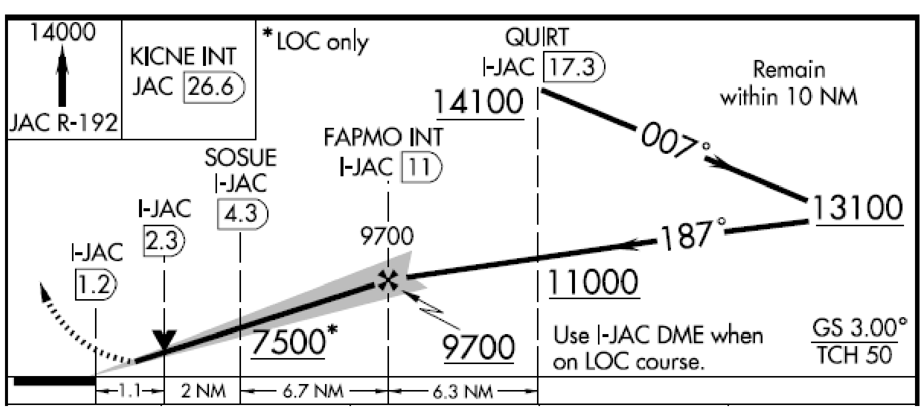
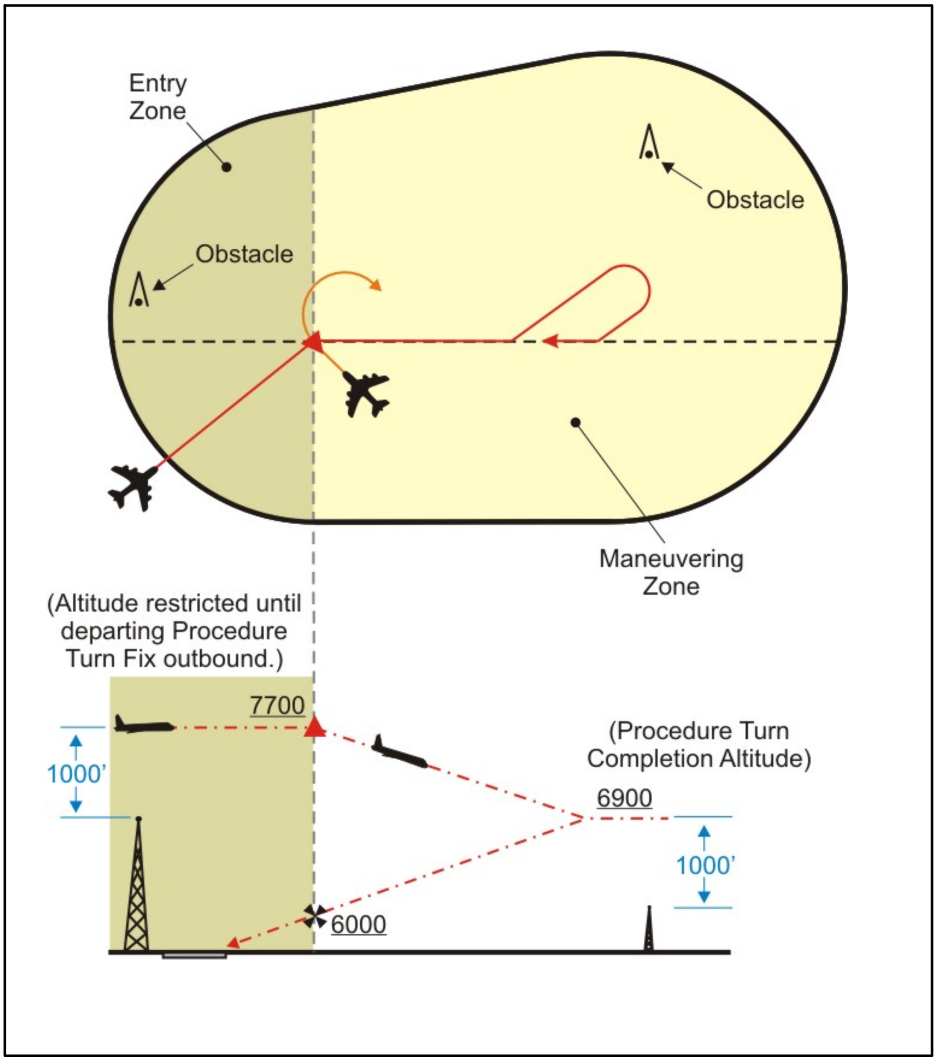


FIG 5-4-17



3. When the approach procedure involves a procedure turn, a maximum speed of not greater than 200 knots (IAS) should be observed from first overheading the course reversal IAF through the procedure turn maneuver to ensure containment within the obstruction clearance area. Pilots should begin the outbound turn immediately after passing the procedure turn fix. The procedure turn maneuver must be executed within the distance specified in the profile view. The normal procedure turn distance is 10 miles. This may be reduced to a minimum of 5 miles where only Category A or helicopter aircraft are to be operated or increased to as much as 15 miles to accommodate high performance aircraft.

4. A teardrop procedure or penetration turn may be specified in some procedures for a required course reversal. The teardrop procedure consists of departure from an initial approach fix on an outbound course followed by a turn toward and intercepting the inbound course at or prior to the intermediate fix or point. Its purpose is to permit an aircraft to reverse direction and lose considerable altitude within reasonably limited airspace. Where no fix is available to mark the beginning of the intermediate segment, it must be assumed to commence at a point 10 miles prior to the final approach fix. When the facility is located on the airport, an aircraft is considered to be on final approach upon completion of the penetration turn. However, the final approach segment begins on the final approach course 10 miles from the facility.

121.5 MHz or 243.0 MHz ELT's onboard will have to depend upon either a nearby Air Traffic Control facility receiving the alert signal or an overflying aircraft monitoring 121.5 MHz or 243.0 MHz detecting the alert. To ensure adequate monitoring of these frequencies and timely alerts after 2009, all airborne pilots should periodically monitor these frequencies to try and detect an activated 121.5/243.0 MHz ELT.

b. Testing.

1. ELTs should be tested in accordance with the manufacturer's instructions, preferably in a shielded or screened room or specially designed test container to prevent the broadcast of signals which could trigger a false alert.

2. When this cannot be done, aircraft operational testing is authorized as follows:

(a) Analog 121.5/243 MHz ELTs should only be tested during the first 5 minutes after any hour. If operational tests must be made outside of this period, they should be coordinated with the nearest FAA Control Tower. Tests should be no longer than three audible sweeps. If the antenna is removable, a dummy load should be substituted during test procedures.

(b) Digital 406 MHz ELTs should only be tested in accordance with the unit's manufacturer's instructions.

(c) Airborne tests are not authorized.

c. False Alarms.

1. Caution should be exercised to prevent the inadvertent activation of ELTs in the air or while they are being handled on the ground. Accidental or unauthorized activation will generate an emergency signal that cannot be distinguished from the real thing, leading to expensive and frustrating searches. A false ELT signal could also interfere with genuine emergency transmissions and hinder or prevent the timely location of crash sites. Frequent false alarms could also result in complacency and decrease the vigorous reaction that must be attached to all ELT signals.

2. Numerous cases of inadvertent activation have occurred as a result of aerobatics, hard landings, movement by ground crews and aircraft maintenance. These false alarms can be minimized by monitoring 121.5 MHz and/or 243.0 MHz as follows:

(a) In flight when a receiver is available.

(b) Before engine shut down at the end of each flight.

(c) When the ELT is handled during installation or maintenance.

(d) When maintenance is being performed near the ELT.

(e) When a ground crew moves the aircraft.

(f) If an ELT signal is heard, turn off the aircraft's ELT to determine if it is transmitting. If it has been activated, maintenance might be required before the unit is returned to the "ARMED" position. You should contact the nearest Air Traffic facility and notify it of the inadvertent activation.

d. Inflight Monitoring and Reporting.

1. Pilots are encouraged to monitor 121.5 MHz and/or 243.0 MHz while inflight to assist in identifying possible emergency ELT transmissions. On receiving a signal, report the following information to the nearest air traffic facility:

(a) Your position at the time the signal was first heard.

(b) Your position at the time the signal was last heard.

(c) Your position at maximum signal strength.

(d) Your flight altitudes and frequency on which the emergency signal was heard: 121.5 MHz or 243.0 MHz. If possible, positions should be given relative to a navigation aid. If the aircraft has homing equipment, provide the bearing to the emergency signal with each reported position.

6−2−5. FAA K−9 Explosives Detection Team Program

a. The FAA's Office of Civil Aviation Security Operations manages the FAA K−9 Explosives Detection Team Program which was established in 1972. Through a unique agreement with law enforcement agencies and airport authorities, the FAA has strategically placed FAA−certified K−9 teams (a team is one handler and one dog) at airports throughout the country. If a bomb threat is received while an aircraft is in flight, the aircraft can be directed to an airport with this capability. The FAA provides initial and refresher training for all handlers, provides single purpose explosive detector dogs, and requires that each team is annually evaluated in five areas for FAA certification: aircraft (widebody and narrowbody), vehicles, terminal, freight (cargo), and luggage. **If you desire this service, notify your company or an FAA air traffic control facility.**

b. The following list shows the locations of current FAA K−9 teams:

TBL 6−2−1
FAA Sponsored Explosives Detection Dog/Handler Team Locations

Airport Symbol	Location
ATL	Atlanta, Georgia
BHM	Birmingham, Alabama
BOS	Boston, Massachusetts
BUF	Buffalo, New York
CLT	Charlotte, North Carolina
ORD	Chicago, Illinois
CVG	Cincinnati, Ohio
DFW	Dallas, Texas
DEN	Denver, Colorado
DTW	Detroit, Michigan
IAH	Houston, Texas
JAX	Jacksonville, Florida
MCI	Kansas City, Missouri
LAX	Los Angeles, California
MEM	Memphis, Tennessee
MIA	Miami, Florida
MKE	Milwaukee, Wisconsin
MSY	New Orleans, Louisiana
MCO	Orlando, Florida
PHX	Phoenix, Arizona
PIT	Pittsburgh, Pennsylvania
PDX	Portland, Oregon
SLC	Salt Lake City, Utah
SFO	San Francisco, California
SJU	San Juan, Puerto Rico
SEA	Seattle, Washington
STL	St. Louis, Missouri
TUS	Tucson, Arizona
TUL	Tulsa, Oklahoma

c. If due to weather or other considerations an aircraft with a suspected hidden explosive problem were to land or intended to land at an airport other than those listed in b above, it is recommended that they call the FAA's Washington Operations Center (telephone 202−267−3333, if appropriate) or have an air traffic facility with which you can communicate contact the above center requesting assistance.

6−2−6. Search and Rescue

a. General. SAR is a lifesaving service provided through the combined efforts of the federal agencies signatory to the National SAR Plan, and the agencies responsible for SAR within each state. Operational resources are provided by the U.S. Coast Guard, DOD components, the Civil Air Patrol, the Coast Guard Auxiliary, state, county and local law enforcement and other public safety agencies, and private volunteer organizations. Services include search for missing aircraft, survival aid, rescue, and emergency medical help for the occupants after an accident site is located.

b. National Search and Rescue Plan. By federal interagency agreement, the National Search and Rescue Plan provides for the effective use of all available facilities in all types of SAR missions. These facilities include aircraft, vessels, pararescue and ground rescue teams, and emergency radio fixing. Under the plan, the U.S. Coast Guard is responsible for the coordination of SAR in the Maritime Region, and the USAF is responsible in the Inland Region. To carry out these responsibilities, the Coast Guard and the Air Force have established Rescue Coordination Centers (RCCs) to direct SAR activities within their regions. For aircraft emergencies, distress, and urgency, information normally will be passed to the appropriate RCC through an ARTCC or FSS.

c. Coast Guard Rescue Coordination Centers. (See TBL 6−2−2.)

Section 3. Distress and Urgency Procedures

6-3-1. Distress and Urgency Communications

a. A pilot who encounters a *distress* or *urgency* condition can obtain assistance simply by contacting the air traffic facility or other agency in whose area of responsibility the aircraft is operating, stating the nature of the difficulty, pilot's intentions and assistance desired. *Distress* and *urgency* communications procedures are prescribed by the International Civil Aviation Organization (ICAO), however, and have decided advantages over the informal procedure described above.

b. *Distress* and *urgency* communications procedures discussed in the following paragraphs relate to the use of air ground voice communications.

c. The initial communication, and if considered necessary, any subsequent transmissions by an aircraft in *distress* should begin with the signal MAYDAY, preferably repeated three times. The signal PAN-PAN should be used in the same manner for an *urgency* condition.

d. *Distress* communications have absolute priority over all other communications, and the word MAYDAY commands radio silence on the frequency in use. *Urgency* communications have priority over all other communications except *distress,* and the word PAN-PAN warns other stations not to interfere with *urgency* transmissions.

e. Normally, the station addressed will be the air traffic facility or other agency providing air traffic services, on the frequency in use at the time. If the pilot is not communicating and receiving services, the station to be called will normally be the air traffic facility or other agency in whose area of responsibility the aircraft is operating, on the appropriate assigned frequency. If the station addressed does not respond, or if time or the situation dictates, the *distress* or *urgency* message may be broadcast, or a collect call may be used, addressing "Any Station (Tower)(Radio)(Radar)."

f. The station addressed should immediately acknowledge a *distress* or *urgency* message, provide assistance, coordinate and direct the activities of assisting facilities, and alert the appropriate search and rescue coordinator if warranted. Responsibility will be transferred to another station only if better handling will result.

g. All other stations, aircraft and ground, will continue to listen until it is evident that assistance is being provided. If any station becomes aware that the station being called either has not received a *distress* or *urgency* message, or cannot communicate with the aircraft in difficulty, it will attempt to contact the aircraft and provide assistance.

h. Although the frequency in use or other frequencies assigned by ATC are preferable, the following emergency frequencies can be used for distress or urgency communications, if necessary or desirable:

121.5 MHz and 243.0 MHz. Both have a range generally limited to line of sight. 121.5 MHz is guarded by direction finding stations and some military and civil aircraft. 243.0 MHz is guarded by military aircraft. Both 121.5 MHz and 243.0 MHz are guarded by military towers, most civil towers, and radar facilities. Normally ARTCC emergency frequency capability does not extend to radar coverage limits. If an ARTCC does not respond when called on 121.5 MHz or 243.0 MHz, call the nearest tower.

6-3-2. Obtaining Emergency Assistance

a. A pilot in any *distress* or *urgency* condition should *immediately* take the following action, not necessarily in the order listed, to obtain assistance:

1. Climb, if possible, for improved communications, and better radar and direction finding detection. However, it must be understood that unauthorized climb or descent under IFR conditions within controlled airspace is prohibited, except as permitted by 14 CFR Section 91.3(b).

2. If equipped with a radar beacon transponder (civil) or IFF/SIF (military):

(a) Continue squawking assigned Mode A/3 discrete code/VFR code and Mode C altitude encoding when in radio contact with an air traffic facility or other agency providing air traffic services, unless instructed to do otherwise.

(b) If unable to immediately establish communications with an air traffic facility/agency, squawk Mode A/3, Code 7700/Emergency and Mode C.

3. Transmit a *distress* or *urgency* message consisting of *as many* as necessary of the following elements, preferably in the order listed:

(a) If distress, MAYDAY, MAYDAY, MAY−DAY; if *urgency*, PAN−PAN, PAN−PAN, PAN−PAN.

(b) Name of station addressed.

(c) Aircraft identification and type.

(d) Nature of *distress* or *urgency*.

(e) Weather.

(f) Pilots intentions and request.

(g) Present position, and heading; or if *lost*, last known position, time, and heading since that position.

(h) Altitude or flight level.

(i) Fuel remaining in minutes.

(j) Number of people on board.

(k) Any other useful information.

REFERENCE−
Pilot/Controller Glossary Term− Fuel Remaining.

b. After establishing radio contact, comply with advice and instructions received. Cooperate. Do not hesitate to ask questions or clarify instructions when you do not understand or if you cannot comply with clearance. Assist the ground station to control communications on the frequency in use. Silence interfering radio stations. Do not change frequency or change to another ground station unless absolutely necessary. If you do, advise the ground station of the new frequency and station name prior to the change, transmitting in the blind if necessary. If two−way communications cannot be established on the new frequency, return immediately to the frequency or station where two−way communications last existed.

c. When in a distress condition with bailout, crash landing or ditching imminent, take the following additional actions to assist search and rescue units:

1. Time and circumstances permitting, transmit as many as necessary of the message elements in subparagraph a3 above, and any of the following that you think might be helpful:

(a) ELT status.

(b) Visible landmarks.

(c) Aircraft color.

(d) Number of persons on board.

(e) Emergency equipment on board.

2. Actuate your ELT if the installation permits.

3. For bailout, and for crash landing or ditching if risk of fire is not a consideration, set your radio for continuous transmission.

4. If it becomes necessary to ditch, make every effort to ditch near a surface vessel. If time permits, an FAA facility should be able to get the position of the nearest commercial or Coast Guard vessel from a Coast Guard Rescue Coordination Center.

5. After a crash landing, unless you have good reason to believe that you will not be located by search aircraft or ground teams, it is best to remain with your aircraft and prepare means for signaling search aircraft.

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; the Aviation Weather Center (AWC) in Kansas City, MO, the Alaska Aviation Weather Unit (AAWU) in Anchorage, AK, and the WFO in Honolulu, HI. Both the AWC and the AAWU issue area forecasts (FA) 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 Advisory Circular 00-45, Aviation Weather Services.

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) (both government and contract via 1-800-WX-BRIEF) and via the Internet, through CSC Direct User Access Terminal System (DUATS) and Lockheed Martin Flight Services (DUATS II).

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.

c. Other Sources of Weather Information

1. Telephone Information Briefing Service (TIBS) (FSS); and in Alaska, Transcribed Weather Broadcast (TWEB) locations, and telephone access to the TWEB (TEL−TWEB) provide continuously updated recorded weather information for short or local flights. Separate paragraphs in this section give additional information regarding these services.

REFERENCE−
AIM, Paragraph 7−1−7, Telephone Information Briefing Service (TIBS)
AIM, Paragraph 7−1−8 , Transcribed Weather Broadcast (TWEB) (Alaska Only)

2. Weather and aeronautical information are also available from numerous private industry sources on an individual or contract pay basis. Information on how to obtain this service should be available from local pilot organizations.

3. Pilots with a current medical certificate can access the DUATS and Lockheed Martin Flight Services via the Internet. Pilots can receive preflight weather data and file domestic VFR and IFR flight plans. The following are the FAA contract vendors:

Computer Sciences Corporation (CSC)
Internet Access: http://www.duats.com
For customer service: (800) 345−3828

Lockheed Martin Flight Services
Internet Access: http://www.1800wxbrief.com
For customer service: (866) 936−6826

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, Direct User Access Terminal System (DUATS), Lockheed Martin Flight Services, 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

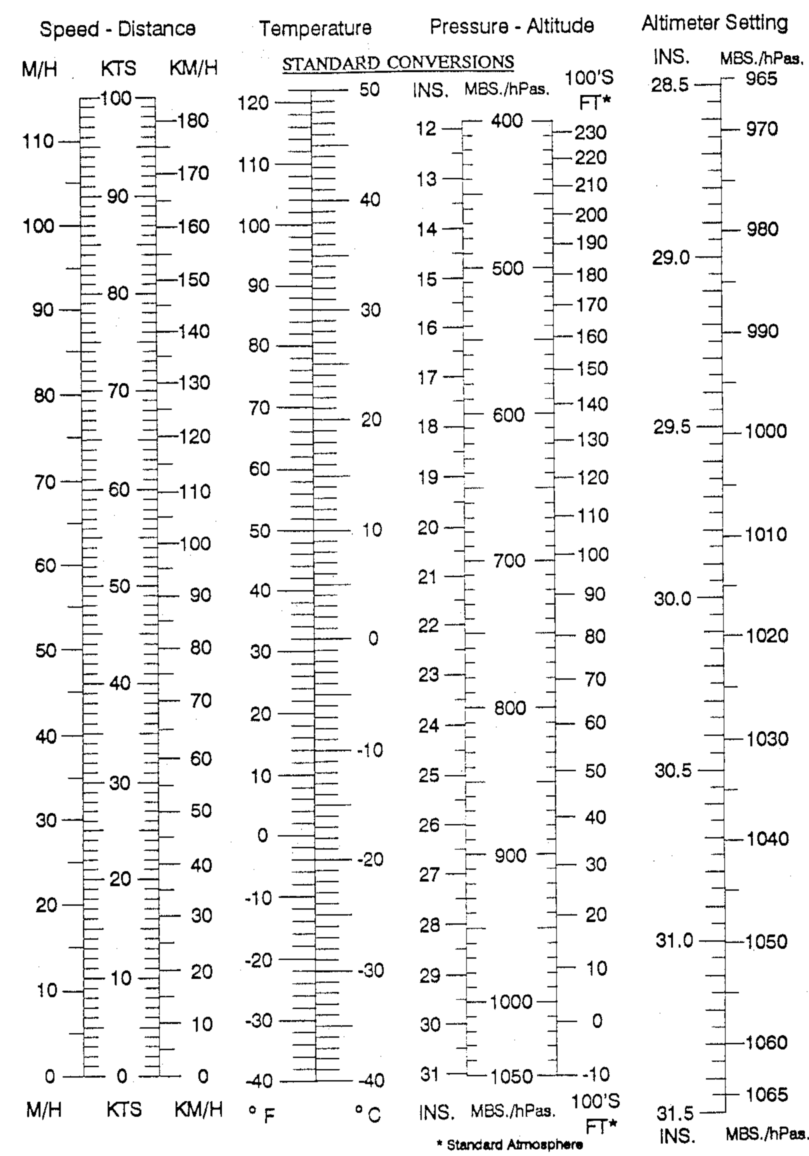
Eastern + 5 hr = UTC
Central + 6 hr = UTC
Mountain + 7 hr = UTC
Pacific + 8 hr = UTC
Alaskan + 9 hr = UTC
Hawaii & Aleutian Islands + 10 hr = UTC

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 (such as the DUATS and Lockheed Martin Flight Services DUATS II) 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 over whelming amount of weather information and data that support self-briefing. FAA AC 00-45 (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 the Aviation Weather Services Advisory Circular 00−45 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. Preflight Briefing

a. Flight Service Stations (FSSs) are the primary source for obtaining preflight briefings and inflight weather information. Flight Service Specialists are qualified and certificated by the NWS as Pilot Weather Briefers. They are not authorized to make original forecasts, but are authorized to translate and interpret available forecasts and reports directly into terms describing the weather conditions which you can expect along your flight route and at your destination. Available aviation weather reports, forecasts and aviation weather charts are displayed at each FSS, for pilot use. Pilots should feel free to use these self briefing displays where available, or to ask for a briefing or assistance from the specialist on duty. Three basic types of preflight briefings are available to serve your specific needs. These are: Standard Briefing, Abbreviated Briefing, and Outlook Briefing. You should specify to the briefer the type of briefing you want, along with your appropriate background information. This will enable the briefer to tailor the information to your intended flight. The following paragraphs describe the types of briefings available and the information provided in each briefing.

REFERENCE−
AIM, Paragraph 5−1−1 , Preflight Preparation, for items that are required.

b. Standard Briefing. You should request a Standard Briefing any time you are planning a flight and you have not received a previous briefing or have not received preliminary information through mass dissemination media; e.g., TIBS, TWEB (Alaska only), etc. International data may be inaccurate or incomplete. If you are planning a flight outside of U.S. controlled airspace, the briefer will advise you to check data as soon as practical after entering foreign airspace, unless you advise that you have the international cautionary advisory. The briefer will automatically provide the following information in the sequence listed, except as noted, when it is applicable to your proposed flight.

1. Adverse Conditions. Significant meteorological and/or aeronautical information that might influence the pilot to alter or cancel the proposed flight; for example, hazardous weather conditions, airport closures, air traffic delays, etc. Pilots should be especially alert for current or forecast weather that could reduce flight minimums below VFR or IFR conditions. Pilots should also be alert for any reported or forecast icing if the aircraft is not certified for operating in icing conditions. Flying into areas of icing or weather below minimums could have disastrous results.

2. VFR Flight Not Recommended. When VFR flight is proposed and sky conditions or visibilities are present or forecast, surface or aloft, that, in the briefer's judgment, would make flight under VFR doubtful, the briefer will describe the conditions, describe the affected locations, and use the phrase *"VFR flight not recommended."* This recommendation is advisory in nature. The final decision as to whether the flight can be conducted safely rests solely with the pilot. Upon receiving a "*VFR flight not recommended*" statement, the non-IFR rated pilot will need to make a "go or no go" decision. This decision should be based on weighing the current and forecast weather conditions against the pilot's experience and ratings. The aircraft's equipment, capabilities and limitations should also be considered.

NOTE-
Pilots flying into areas of minimal VFR weather could encounter unforecasted lowering conditions that place the aircraft outside the pilot's ratings and experience level. This could result in spatial disorientation and/or loss of control of the aircraft.

3. Synopsis. A brief statement describing the type, location and movement of weather systems and/or air masses which might affect the proposed flight.

NOTE-
These first 3 elements of a briefing may be combined in any order when the briefer believes it will help to more clearly describe conditions.

4. Current Conditions. Reported weather conditions applicable to the flight will be summarized from all available sources; e.g., METARs/ SPECIs, PIREPs, RAREPs. This element will be omitted if the proposed time of departure is beyond 2 hours, unless the information is specifically requested by the pilot.

5. En Route Forecast. Forecast en route conditions for the proposed route are summarized in logical order; i.e., departure/climbout, en route, and descent. (Heights are MSL, unless the contractions "AGL" or "CIG" are denoted indicating that heights are above ground.)

6. Destination Forecast. The destination forecast for the planned ETA. Any significant changes within 1 hour before and after the planned arrival are included.

7. Winds Aloft. Forecast winds aloft will be provided using degrees of the compass. The briefer will interpolate wind directions and speeds between levels and stations as necessary to provide expected conditions at planned altitudes. (Heights are MSL.) Temperature information will be provided on request.

8. Notices to Airmen (NOTAMs).

(a) Available NOTAM (D) information pertinent to the proposed flight, including special use airspace (SUA) NOTAMs for restricted areas, aerial refueling, and night vision goggles (NVG).

NOTE-
Other SUA NOTAMs (D), such as military operations area (MOA), military training route (MTR), and warning area NOTAMs, are considered "upon request" briefing items as indicated in paragraph 7-1-4b10(a).

(b) Prohibited Areas P-40, P-49, P-56, and the special flight rules area (SFRA) for Washington, DC.

(c) 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.

NOTE-
1. *NOTAM information may be combined with current conditions when the briefer believes it is logical to do so.*

2. *NOTAM (D) information and FDC NOTAMs which have been published in the Notices to Airmen Publication are not included in pilot briefings unless a review of this publication is specifically requested by the pilot. For complete flight information you are urged to review the printed NOTAMs in the Notices to Airmen Publication and the Chart Supplement U.S. in addition to obtaining a briefing.*

9. ATC Delays. Any known ATC delays and flow control advisories which might affect the proposed flight.

10. Pilots may obtain the following from flight service station briefers upon request:

(a) Information on SUA and SUA-related airspace, except those listed in paragraph 7-1-4b8.

NOTE-
1. *For the purpose of this paragraph, SUA and related airspace includes the following types of airspace: alert*

area, military operations area (MOA), warning area, and air traffic control assigned airspace (ATCAA). MTR data includes the following types of airspace: IFR training routes (IR), VFR training routes (VR), and slow training routes (SR).

2. *Pilots are encouraged to request updated information from ATC facilities while in flight.*

(b) A review of the Notices to Airmen Publication for pertinent NOTAMs and Special Notices.

(c) Approximate density altitude data.

(d) Information regarding such items as air traffic services and rules, customs/immigration procedures, ADIZ rules, search and rescue, etc.

(e) GPS RAIM availability for 1 hour before to 1 hour after ETA or a time specified by the pilot.

(f) Other assistance as required.

c. Abbreviated Briefing. Request an Abbreviated Briefing when you need information to supplement mass disseminated data, update a previous briefing, or when you need only one or two specific items. Provide the briefer with appropriate background information, the time you received the previous information, and/or the specific items needed. You should indicate the source of the information already received so that the briefer can limit the briefing to the information that you have not received, and/or appreciable changes in meteorological/aeronautical conditions since your previous briefing. To the extent possible, the briefer will provide the information in the sequence shown for a Standard Briefing. If you request only one or two specific items, the briefer will advise you if adverse conditions are present or forecast. (Adverse conditions contain both meteorological and/or aeronautical information.) Details on these conditions will be provided at your request. International data may be inaccurate or incomplete. If you are planning a flight outside of U.S. controlled airspace, the briefer will advise you to check data as soon as practical after entering foreign airspace, unless you advise that you have the international cautionary advisory.

d. Outlook Briefing. You should request an Outlook Briefing whenever your proposed time of departure is six or more hours from the time of the briefing. The briefer will provide available forecast data applicable to the proposed flight. This type of briefing is provided for planning purposes only. You should obtain a Standard or Abbreviated Briefing prior to departure in order to obtain such items as adverse conditions, current conditions, updated forecasts, winds aloft and NOTAMs, etc.

e. When filing a flight plan only, you will be asked if you require the latest information on adverse conditions pertinent to the route of flight.

f. Inflight Briefing. You are encouraged to obtain your preflight briefing by telephone or in person before departure. In those cases where you need to obtain a preflight briefing or an update to a previous briefing by radio, you should contact the nearest FSS to obtain this information. After communications have been established, advise the specialist of the type briefing you require and provide appropriate background information. You will be provided information as specified in the above paragraphs, depending on the type of briefing requested. En Route advisories tailored to the phase of flight that begins after climb-out and ends with descent to land are provided upon pilot request. Pilots are encouraged to provide a continuous exchange of information on weather, winds, turbulence, flight visibility, icing, etc., between pilots and inflight specialists. Pilots should report good weather as well as bad, and confirm expected conditions as well as unexpected. Remember that weather conditions can change rapidly and that a "go or no go" decision, as mentioned in paragraph 7-1-4b2, should be assessed at all phases of flight.

g. Following any briefing, feel free to ask for any information that you or the briefer may have missed or are not understood. This way, the briefer is able to present the information in a logical sequence, and lessens the chance of important items being overlooked.

7−1−5. Inflight Aviation Weather Advisories

a. Background

1. Inflight Aviation Weather Advisories are forecasts to advise en route aircraft of development of potentially hazardous weather. Inflight aviation weather advisories in the conterminous U.S. are issued by the Aviation Weather Center (AWC) in Kansas City, MO, as well as 20 Center Weather Service Units (CWSU) associated with ARTCCs. AWC also issues advisories for portions of the Gulf of Mexico, Atlantic and Pacific Oceans, which are under the control of ARTCCs with Oceanic flight information regions (FIRs). The Weather Forecast Office (WFO) in Honolulu issues advisories for the Hawaiian Islands and a large portion of the Pacific Ocean. In Alaska, the Alaska Aviation Weather Unit (AAWU) issues inflight aviation weather advisories along with the Anchorage CWSU. All heights are referenced MSL, except in the case of ceilings (CIG) which indicate AGL.

2. There are four types of inflight aviation weather advisories: the SIGMET, the Convective SIGMET, the AIRMET (text or graphical product), and the Center Weather Advisory (CWA). All of these advisories use the same location identifiers (either VORs, airports, or well−known geographic areas) to describe the hazardous weather areas.

3. The Severe Weather Watch Bulletins (WWs), (with associated Alert Messages) (AWW) supplements these Inflight Aviation Weather Advisories.

b. SIGMET (WS)/AIRMET (WA or G−AIRMET)

SIGMETs/AIRMET text (WA) products are issued corresponding to the Area Forecast (FA) areas described in FIG 7−1−2 and FIG 7−1−3. The maximum forecast period is 4 hours for SIGMETs and 6 hours for AIRMETs. The G−AIRMET is issued over the CONUS every 6 hours, valid at 3−hour increments through 12 hours with optional forecasts possible during the first 6 hours. The first 6 hours of the G−AIRMET correspond to the 6−hour period of the AIRMET. SIGMETs and AIRMETs are considered "widespread" because they must be either affecting or be forecasted to affect an area of at least 3,000 square miles at any one time. However, if the total area to be affected during the forecast period is very large, it could be that in actuality only a small portion of this total area would be affected at any one time.

1. SIGMETs/AIRMET (or G−AIRMET) for the conterminous U.S. (CONUS)

SIGMETs/AIRMET text products for the CONUS are issued corresponding to the areas in FIG 7−1−2. The maximum forecast period for a CONUS SIGMET is 4 hours and 6 hours for CONUS AIRMETs. The G−AIRMET is issued over the CONUS every 6 hours, valid at 3−hour increments through 12 hours with optional forecasts possible during the first 6 hours. The first 6 hours of the G−AIRMET correspond to the 6−hour period of the AIRMET. SIGMETs and AIRMETs are considered "widespread" because they must be either affecting or be forecasted to affect an area of at least 3,000 square miles at any one time. However, if the total area to be affected during the forecast period is very large, it could be that in actuality only a small portion of this total area would be affected at any one time. Only SIGMETs for the CONUS are for non-convective weather. The U.S. issues a special category of SIGMETs for convective weather called Convective SIGMETs.

2. SIGMETs/AIRMETs for Alaska

Alaska SIGMETs are valid for up to 4 hours, except for Volcanic Ash Cloud SIGMETs which are valid for up to 6 hours. Alaska AIRMETs are valid for up to 8 hours.

3. SIGMETs/AIRMETs for Hawaii and U.S. FIRs in the Gulf of Mexico, Caribbean, Western Atlantic and Eastern and Central Pacific Oceans

These SIGMETs are valid for up to 4 hours, except SIGMETs for Tropical Cyclones and Volcanic Ash Clouds, which are valid for up to 6 hours. AIRMETs are issued for the Hawaiian Islands and are valid for up to 6 hours. No AIRMETs are issued for U.S. FIRs in the the Gulf of Mexico, Caribbean, Western Atlantic and Pacific Oceans.

c. SIGMET

A SIGMET advises of weather that is potentially hazardous to all aircraft. SIGMETs are unscheduled products that are valid for 4 hours. However, SIGMETs associated with tropical cyclones and volcanic ash clouds are valid for 6 hours. Unscheduled updates and corrections are issued as necessary.

1. In the CONUS, SIGMETs are issued when the following phenomena occur or are expected to occur:

(a) Severe icing not associated with thunderstorms.

(b) Severe or extreme turbulence or clear air turbulence (CAT) not associated with thunderstorms.

(c) Widespread dust storms or sandstorms lowering surface visibilities to below 3 miles.

(d) Volcanic ash.

2. In Alaska and Hawaii, SIGMETs are also issued for:

(a) Tornadoes.

(b) Lines of thunderstorms.

(c) Embedded thunderstorms.

(d) Hail greater than or equal to $^3/_4$ inch in diameter.

3. SIGMETs are identified by an alphabetic designator from November through Yankee excluding Sierra and Tango. (Sierra, Tango, and Zulu are reserved for AIRMET text [WA] products; G−AIRMETS do not use the Sierra, Tango, or Zulu designators.) The first issuance of a SIGMET will be labeled as UWS (Urgent Weather SIGMET). Subsequent issuances are at the forecaster's discretion. Issuance for the same phenomenon will be sequentially numbered, using the original designator until the phenomenon ends. For example, the first issuance in the Chicago (CHI) FA area for phenomenon moving from the Salt Lake City (SLC) FA area will be SIGMET Papa 3, if the previous two issuances, Papa 1 and Papa 2, had been in the SLC FA area. Note that no two different phenomena across the country can have the same alphabetic designator at the same time.

EXAMPLE−
Example of a SIGMET:
BOSR WS 050600
SIGMET ROMEO 2 VALID UNTIL 051000
ME NH VT
FROM CAR TO YSJ TO CON TO MPV TO CAR
OCNL SEV TURB BLW 080 EXP DUE TO STG NWLY FLOW. CONDS CONTG BYD 1000Z.

d. Convective SIGMET (WST)

1. Convective SIGMETs are issued in the conterminous U.S. for any of the following:

(a) Severe thunderstorm due to:

(1) Surface winds greater than or equal to 50 knots.

(2) Hail at the surface greater than or equal to $^3/_4$ inches in diameter.

(3) Tornadoes.

(b) Embedded thunderstorms.

(c) A line of thunderstorms.

(d) Thunderstorms producing precipitation greater than or equal to heavy precipitation affecting 40 percent or more of an area at least 3,000 square miles.

2. Any convective SIGMET implies severe or greater turbulence, severe icing, and low−level wind shear. A convective SIGMET may be issued for any convective situation that the forecaster feels is hazardous to all categories of aircraft.

3. Convective SIGMET bulletins are issued for the western (W), central (C), and eastern (E) United States. (Convective SIGMETs are not issued for Alaska or Hawaii.) The areas are separated at 87 and 107 degrees west longitude with sufficient overlap to cover most cases when the phenomenon crosses the boundaries. Bulletins are issued hourly at H+55. Special bulletins are issued at any time as required and updated at H+55. If no criteria meeting convective SIGMET requirements are observed or forecasted, the message "CONVECTIVE SIGMET... NONE" will be issued for each area at H+55. Individual convective SIGMETs for each area (W, C, E) are numbered sequentially from number one each day, beginning at 00Z. A convective SIGMET for a continuing phenomenon will be reissued every hour at H+55 with a new number. The text of the bulletin consists of either an observation and a forecast or just a forecast. The forecast is valid for up to 2 hours.

EXAMPLE−
CONVECTIVE SIGMET 44C
VALID UNTIL 1455Z
AR TX OK
FROM 40NE ADM-40ESE MLC-10W TXK-50WNW LFK-40ENE SJT-40NE ADM
AREA TS MOV FROM 26025KT. TOPS ABV FL450.
OUTLOOK VALID 061455-061855
FROM 60WSW OKC-MLC-40N TXK-40WSW IGB-VUZ-MGM-HRV-60S BTR-40N IAH-60SW SJT-40ENE LBB-60WSW OKC
WST ISSUANCES EXPD. REFER TO MOST RECENT ACUS01 KWNS FROM STORM PREDICTION CENTER

FOR SYNOPSIS AND METEOROLOGICAL DETAILS

FIG 7−1−2
SIGMET and AIRMET Locations − Conterminous United States

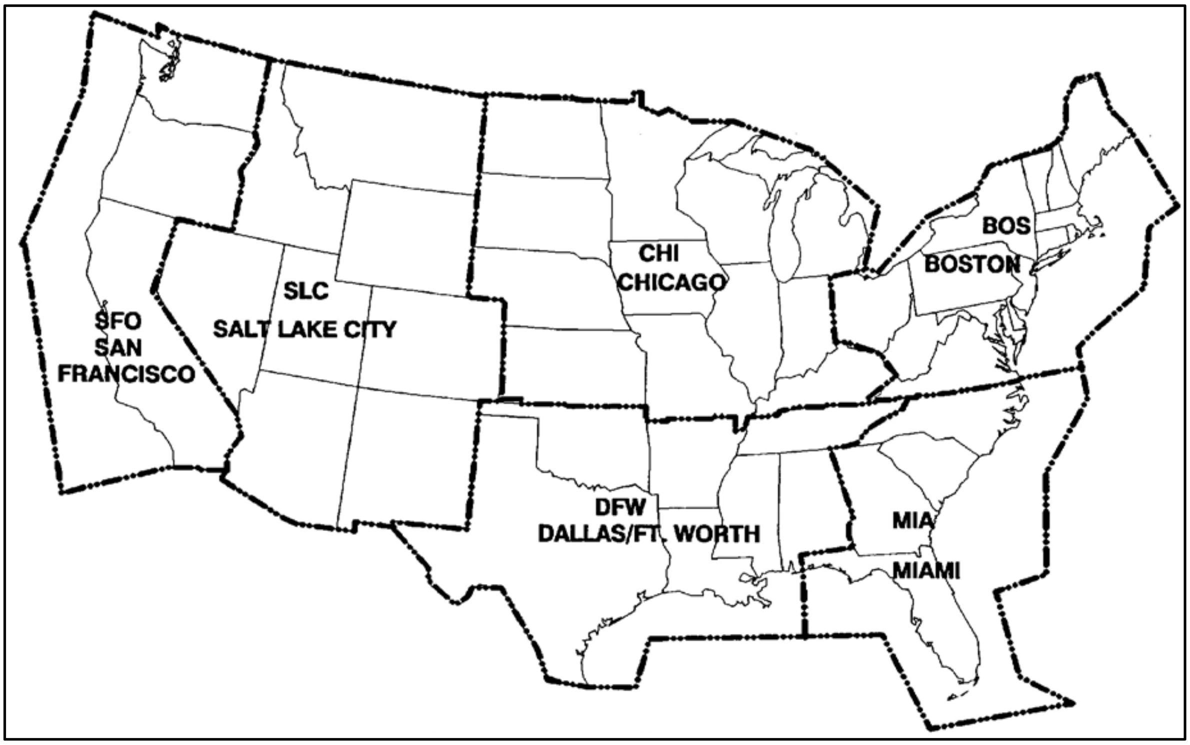
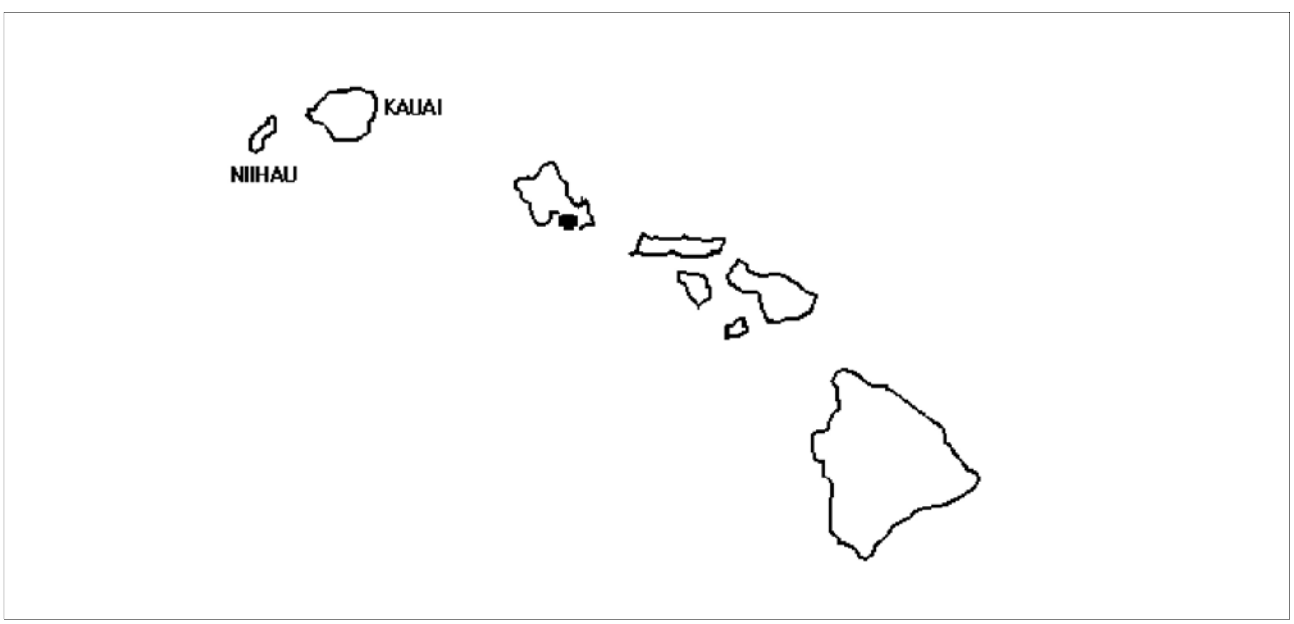


FIG 7−1−3
Hawaii Area Forecast Locations



e. SIGMET Outside the CONUS

1. Three NWS offices have been designated by ICAO as Meteorological Watch Offices (MWOs). These offices are responsible for issuing SIGMETs for designated areas outside the CONUS that include Alaska, Hawaii, portions of the Atlantic and Pacific Oceans, and the Gulf of Mexico.

2. The offices which issue international SIGMETs are:

(a) The AWC in Kansas City, Missouri.

(b) The AAWU in Anchorage, Alaska.

(c) The WFO in Honolulu, Hawaii.

3. SIGMETs for outside the CONUS are issued for 6 hours for volcanic ash clouds, 6 hours for tropical cyclones (e.g. hurricanes and tropical storms), and 4 hours for all other events. Like the CONUS SIGMETs, SIGMETs for outside the CONUS are also identified by an alphabetic designator from Alpha through Mike and are numbered sequentially until that weather phenomenon ends. The criteria for an international SIGMET are:

(a) Thunderstorms occurring in lines, embedded in clouds, or in large areas producing tornadoes or large hail.

(b) Tropical cyclones.

(c) Severe icing.

(d) Severe or extreme turbulence.

(e) Dust storms and sandstorms lowering visibilities to less than 3 miles.

(f) Volcanic ash.

EXAMPLE−
Example of SIGMET Outside the U.S.:
WSNT06 KKCI 022014
SIGA0F
KZMA KZNY TJZS SIGMET FOXTROT 3 VALID 022015/030015 KKCI− MIAMI OCEANIC FIR NEW YORK OCEANIC FIR SAN JUAN FIR FRQ TS WI AREA BOUNDED BY 2711N6807W 2156N6654W 2220N7040W 2602N7208W 2711N6807W. TOPS TO FL470. MOV NE 15KT. WKN. BASED ON SAT AND LTG OBS.
MOSHER

f. AIRMET

1. AIRMETs (WAs) are advisories of significant weather phenomena but describe conditions at intensities lower than those which require the issuance of SIGMETs. AIRMETs are intended for dissemination to all pilots in the preflight and en route phase of flight to enhance safety. AIRMET information is available in two formats: text bulletins (WA) and graphics (G−AIRMET). Both formats meet the criteria of paragraph 7−1−3i1 and are issued on a scheduled basis every 6 hours beginning at 0245 UTC. Unscheduled updates and corrections are issued as necessary. AIRMETs contain details about IFR, extensive mountain obscuration, turbulence, strong surface winds, icing, and freezing levels.

2. There are three AIRMETs: Sierra, Tango, and Zulu. After the first issuance each day, scheduled or unscheduled bulletins are numbered sequentially for easier identification.

(a) AIRMET Sierra describes IFR conditions and/or extensive mountain obscurations.

(b) AIRMET Tango describes moderate turbulence, sustained surface winds of 30 knots or greater, and/or nonconvective low−level wind shear.

(c) AIRMET Zulu describes moderate icing and provides freezing level heights.

EXAMPLE−
Example of AIRMET Sierra issued for the Chicago FA area:
CHIS WA 131445
AIRMET SIERRA UPDT 2 FOR IFR AND MTN OBSCN VALID UNTIL 132100.
AIRMET IFR...KY
FROM 20SSW HNN TO HMV TO 50ENE DYR TO20SSW HNN
CIG BLW 010/VIS BLW 3SM PCPN/BR/FG. CONDS ENDG BY 18Z.
.
AIRMET IFR....MN LS
FROM INL TO 70W YQT TO 40ENE DLH TO 30WNW DLH TO 50SE GFK TO 20 ENE GFK TO INL
CIG BLW 010/VIS BLW 3SM BR. CONDS ENDG 15−18Z.
.
AIRMET IFR....KS
FROM 30N SLN TO 60E ICT TO 40S ICT TO 50W LBL TO 30SSW GLD TO 30N SLN
CIG BLW 010/VIS BLW 3SM PCPN/BR/FG. CONDS ENDG 15−18Z.
.
AIRMET MTN OBSCN...KY TN
FROM HNN TO HMV TO GQO TO LOZ TO HNN
MTN OBSC BY CLDS/PCPN/BR. CONDS CONTG

BYD 21Z THRU 03Z.
.....

EXAMPLE−
Example of AIRMET Tango issued for the Salt Lake City FA area:
SLCT WA 131445
AIRMET TANGO UPDT 2 FOR TURB VALID UNTIL 132100.
AIRMET TURB...MT
FROM 40NW HVR TO 50SE BIL TO 60E DLN TO 60SW YQL TO 40NW HVR
MOD TURB BLW 150. CONDS DVLPG 18−21Z.
CONDS CONTG BYD 21Z THRU 03Z.
.
AIRMET TURB....ID MT WY NV UT CO
FROM 100SE MLS TO 50SSW BFF TO 20SW BTY TO 40SW BAM TO 100SE MLS
MOD TURB BTN FL310 AND FL410. CONDS CONTG BYD 21Z ENDG 21−00Z.
.
AIRMET TURB...NV AZ NM CA AND CSTL WTRS
FROM 100WSW ENI TO 40W BTY TO 40S LAS TO 30ESE TBE TO INK TO ELP TO 50S TUS TO BZA TO 20S MZB TO 150SW PYE TO 100WSW ENI
MOD TURB BTWN FL210 AND FL380. CONDS CONTG BYD 21Z THRU 03Z.
....

EXAMPLE−
Example of AIRMET Zulu issued for the San Francisco FA area:
SFOZ WA 131445
AIRMET ZULU UPDT 2 FOR ICE AND FRZLVL VALID UNTIL 132100.
NO SGFNT ICE EXP OUTSIDE OF CNVTV ACT.
.
FRZLVL....RANGING FROM SFC−105 ACRS AREA
MULT FRZLVL BLW 080 BOUNDED BY 40SE YDC−60NNW GEG−60SW MLP−30WSW BKE−20SW BAM−70W BAM−40SW YKM−40E HUH−40SE YDC
SFC ALG 20NNW HUH−30SSE HUH−60S SEA 50NW LKV−60WNWOAL−30SW OAL
040 ALG 40W HUH−30W HUH−30NNW SEA−40N PDX−20NNW DSD
080 ALG 160NW FOT−80SW ONP−50SSW EUG 40SSE OED−50SSE CZQ−60E EHF−40WSW LAS
....

3. Graphical AIRMETs (G−AIRMETs), found on the Aviation Weather Center webpage at http://aviationweather.gov, are graphical forecasts of en−route weather hazards valid at discrete times no more than 3 hours apart for a period of up to 12 hours into the future (for example, 00, 03, 06, 09, and 12 hours). Additional forecasts may be inserted during the first 6 hours (for example, 01, 02, 04, and 05). 00 hour represents the initial conditions, and the subsequent graphics depict the area affected by the particular hazard at that valid time. Forecasts valid at 00 through 06 hours correspond to the text AIRMET bulletin. Forecasts valid at 06 through 12 hours correspond to the text bulletin outlook. G−AIRMET depicts the following en route aviation weather hazards:

(a) Instrument flight rule conditions (ceiling < 1000’ and/or surface visibility <3 miles)

(b) Mountain obscuration

(c) Icing

(d) Freezing level

(e) Turbulence

(f) Low level wind shear (LLWS)

(g) Strong surface winds

G−AIRMETs are snap shots at discrete time intervals as defined above. The text AIRMET is the result of the production of the G−AIRMET but provided in a time smear for a 6hr valid period. G−AIRMETs provide a higher forecast resolution than text AIRMET products. Since G−AIRMETs and text AIRMETs are created from the same forecast “production” process, there exists perfect consistency between the two. Using the two together will provide clarity of the area impacted by the weather hazard and improve situational awareness and decision making.

Interpolation of time periods between G−AIRMET valid times: Users must keep in mind when using the G−AIRMET that if a 00 hour forecast shows no significant weather and a 03 hour forecast shows hazardous weather, they must assume a change is occurring during the period between the two forecasts. It should be taken into consideration that the hazardous weather starts immediately after the 00 hour forecast unless there is a defined initiation or ending time for the hazardous weather. The same would apply after the 03 hour forecast. The user should assume the hazardous weather condition is occurring between the snap shots unless informed otherwise. For example, if a 00 hour forecast shows no hazard, a 03 hour forecast shows the presence of hazardous weather, and a 06 hour forecast shows no hazard, the user should assume the hazard exists from the 0001 hour to the 0559 hour time period.

EXAMPLE–
See FIG 7–1–4 for an example of the G–AIRMET graphical product.

g. Watch Notification Messages

The Storm Prediction Center (SPC) in Norman, OK, issues Watch Notification Messages to provide an area threat alert for forecast organized severe thunderstorms that may produce tornadoes, large hail, and/or convective damaging winds within the CONUS. SPC issues three types of watch notification messages: Aviation Watch Notification Messages, Public Severe Thunderstorm Watch Notification Messages, and Public Tornado Watch Notification Messages.

It is important to note the difference between a Severe Thunderstorm (or Tornado) Watch and a Severe Thunderstorm (or Tornado) Warning. A watch means severe weather is possible during the next few hours, while a warning means that severe weather has been observed, or is expected within the hour. Only the SPC issues Severe Thunderstorm and Tornado Watches, while only NWS Weather Forecasts Offices issue Severe Thunderstorm and Tornado Warnings.

1. The Aviation Watch Notification Message. The Aviation Watch Notification Message product is an approximation of the area of the Public Severe Thunderstorm Watch or Public Tornado Watch. The area may be defined as a rectangle or parallelogram using VOR navigational aides as coordinates.

The Aviation Watch Notification Message was formerly known as the Alert Severe Weather Watch Bulletin (AWW). The NWS no longer uses that title or acronym for this product. The NWS uses the acronym SAW for the Aviation Watch Notification Message, but retains AWW in the product header for processing by weather data systems.

EXAMPLE–
Example of an Aviation Watch Notification Message:
WWUS30 KWNS 271559
SAW2
SPC AWW 271559
WW 568 TORNADO AR LA MS 271605Z - 280000Z
AXIS..65 STATUTE MILES EAST AND WEST OF LINE..
45ESE HEZ/NATCHEZ MS/ - 50N TUP/TUPELO MS/
..AVIATION COORDS.. 55NM E/W /18WNW MCB - 60E MEM/
HAIL SURFACE AND ALOFT..3 INCHES. WIND GUSTS..70 KNOTS. MAX TOPS TO 550. MEAN STORM MOTION VECTOR 26030.
LAT...LON 31369169 34998991 34998762 31368948
THIS IS AN APPROXIMATION TO THE WATCH AREA. FOR A COMPLETE DEPICTION OF THE WATCH SEE WOUS64 KWNS FOR WOU2.

2. Public Severe Thunderstorm Watch Notification Messages describe areas of expected severe thunderstorms. (Severe thunderstorm criteria are 1-inch hail or larger and/or wind gusts of 50 knots [58 mph] or greater). A Public Severe Thunderstorm Watch Notification Message contains the area description and axis, the watch expiration time, a description of hail size and thunderstorm wind gusts expected, the definition of the watch, a call to action statement, a list of other valid watches, a brief discussion of meteorological reasoning and technical information for the aviation community.

3. Public Tornado Watch Notification Messages describe areas where the threat of tornadoes exists. A Public Tornado Watch Notification Message contains the area description and axis, watch expiration time, the term "damaging tornadoes," a description of the largest hail size and strongest thunderstorm wind gusts expected, the definition of the watch, a call to action statement, a list of other valid watches, a brief discussion of meteorological reasoning and technical information for the aviation community. SPC may enhance a Public Tornado Watch Notification Message by using the words "THIS IS A PARTICULARLY DANGEROUS SITUATION" when there is a likelihood of multiple strong (damage of EF2 or EF3) or violent (damage of EF4 or EF5) tornadoes.

4. Public severe thunderstorm and tornado watch notification messages were formerly known as the Severe Weather Watch Bulletins (WW). The NWS no longer uses that title or acronym for this product but retains WW in the product header for processing by weather data systems.

EXAMPLE–
Example of a Public Tornado Watch Notification Message:
WWUS20 KWNS 050550
SEL2
SPC WW 051750
URGENT - IMMEDIATE BROADCAST REQUESTED
TORNADO WATCH NUMBER 243
NWS STORM PREDICTION CENTER NORMAN OK
1250 AM CDT MON MAY 5 2011
THE NWS STORM PREDICTION CENTER HAS ISSUED A
**TORNADO WATCH FOR PORTIONS OF*
WESTERN AND CENTRAL ARKANSAS

SOUTHERN MISSOURI
FAR EASTERN OKLAHOMA
**EFFECTIVE THIS MONDAY MORNING FROM 1250 AM UNTIL 600 AM CDT.*
...THIS IS A PARTICULARLY DANGEROUS SITUATION...
**PRIMARY THREATS INCLUDE*
NUMEROUS INTENSE TORNADOES LIKELY
NUMEROUS SIGNIFICANT DAMAGING WIND GUSTS TO 80 MPH LIKELY
NUMEROUS VERY LARGE HAIL TO 4 INCHES IN DIAMETER LIKELY
THE TORNADO WATCH AREA IS APPROXIMATELY ALONG AND 100 STATUTE MILES EAST AND WEST OF A LINE FROM 15 MILES WEST NORTHWEST OF FORT LEONARD WOOD MISSOURI TO 45 MILES SOUTHWEST OF HOT SPRINGS ARKANSAS. FOR A COMPLETE DEPICTION OF THE WATCH SEE THE ASSOCIATED WATCH OUTLINE UPDATE (WOUS64 KWNS WOU2).
REMEMBER...A TORNADO WATCH MEANS CONDITIONS ARE FAVORABLE FOR TORNADOES AND SEVERE THUNDERSTORMS IN AND CLOSE TO THE WATCH AREA. PERSONS IN THESE AREAS SHOULD BE ON THE LOOKOUT FOR THREATENING WEATHER CONDITIONS AND LISTEN FOR LATER STATEMENTS AND POSSIBLE WARNINGS.
OTHER WATCH INFORMATION...THIS TORNADO WATCH REPLACES TORNADO WATCH NUMBER 237. WATCH NUMBER 237 WILL NOT BE IN EFFECT AFTER
1250 AM CDT. CONTINUE...WW 239...WW 240...WW 241...WW 242...
DISCUSSION...SRN MO SQUALL LINE EXPECTED TO CONTINUE EWD...WHERE LONG/HOOKED HODOGRAPHS SUGGEST THREAT FOR EMBEDDED SUPERCELLS/POSSIBLE TORNADOES. FARTHER S...MORE WIDELY SCATTERED
SUPERCELLS WITH A THREAT FOR TORNADOES WILL PERSIST IN VERY STRONGLY DEEP SHEARED/LCL ENVIRONMENT IN AR.
AVIATION...TORNADOES AND A FEW SEVERE THUNDERSTORMS WITH HAIL SURFACE AND ALOFT TO 4 INCHES. EXTREME TURBULENCE AND SURFACE WIND GUSTS TO 70 KNOTS. A FEW CUMULONIMBI WITH MAXIMUM TOPS TO 500. MEAN STORM MOTION VECTOR 26045.

5. Status reports are issued as needed to show progress of storms and to delineate areas no longer under the threat of severe storm activity. Cancellation bulletins are issued when it becomes evident that no severe weather will develop or that storms have subsided and are no longer severe.

h. Center Weather Advisories (CWAs)

1. CWAs are unscheduled inflight, flow control, air traffic, and air crew advisory. By nature of its short lead time, the CWA is not a flight planning product. It is generally a nowcast for conditions beginning within the next two hours. CWAs will be issued:

(a) As a supplement to an existing SIGMET, Convective SIGMET or AIRMET.

(b) When an Inflight Advisory has not been issued but observed or expected weather conditions meet SIGMET/AIRMET criteria based on current pilot reports and reinforced by other sources of information about existing meteorological conditions.

(c) When observed or developing weather conditions do not meet SIGMET, Convective SIGMET, or AIRMET criteria; e.g., in terms of intensity or area coverage, but current pilot reports or other weather information sources indicate that existing or anticipated meteorological phenomena will adversely affect the safe flow of air traffic within the ARTCC area of responsibility.

2. The following example is a CWA issued from the Kansas City, Missouri, ARTCC. The "3" after ZKC in the first line denotes this CWA has been issued for the third weather phenomena to occur for the day. The "301" in the second line denotes the phenomena number again (3) and the issuance number (01) for this phenomena. The CWA was issued at 2140Z and is valid until 2340Z.

EXAMPLE−
ZKC3 CWA 032140
ZKC CWA 301 VALID UNTIL 032340
ISOLD SVR TSTM over KCOU MOVG SWWD 10 KTS ETC.

7−1−6. Categorical Outlooks

a. Categorical outlook terms, describing general ceiling and visibility conditions for advanced planning purposes are used only in area forecasts and are defined as follows:

1. LIFR (Low IFR). Ceiling less than 500 feet and/or visibility less than 1 mile.

2. IFR. Ceiling 500 to less than 1,000 feet and/or visibility 1 to less than 3 miles.

3. MVFR (Marginal VFR). Ceiling 1,000 to 3,000 feet and/or visibility 3 to 5 miles inclusive.

4. VFR. Ceiling greater than 3,000 feet and visibility greater than 5 miles; includes sky clear.

b. The cause of LIFR, IFR, or MVFR is indicated by either ceiling or visibility restrictions or both. The contraction "CIG" and/or weather and obstruction to vision symbols are used. If winds or gusts of 25 knots or greater are forecast for the outlook period, the word "WIND" is also included for all categories including VFR.

EXAMPLE−

1. *LIFR CIG−low IFR due to low ceiling.*

2. *IFR FG−IFR due to visibility restricted by fog.*

3. *MVFR CIG HZ FU−marginal VFR due to both ceiling and visibility restricted by haze and smoke.*

4. *IFR CIG RA WIND−IFR due to both low ceiling and visibility restricted by rain; wind expected to be 25 knots or greater.*

7−1−7. Telephone Information Briefing Service (TIBS)

a. TIBS, provided by FSS, is a system of automated telephone recordings of meteorological and aeronautical information available throughout the United States. Based on the specific needs of each area, TIBS provides route and/or area briefings in addition to airspace procedures and special announcements concerning aviation interests that may be available. Depending on user demand, other items may be provided; for example, surface weather observations, terminal forecasts, wind and temperatures aloft forecasts, etc.

b. TIBS is not intended to be a substitute for specialist−provided preflight briefings from FSS. TIBS is recommended as a preliminary briefing and often will be valuable in helping you to make a "go" or "no go" decision.

c. Pilots are encouraged to utilize TIBS, which can be accessed by dialing the FSS toll−free telephone number, 1−800−WX−BRIEF (992−7433) or specific published TIBS telephone numbers in certain areas. Consult the "FSS Telephone Numbers" section of the Chart Supplement U.S. or the Chart Supplement Alaska or Pacific.

NOTE−

A touch−tone telephone is necessary to fully utilize TIBS.

7−1−8. Transcribed Weather Broadcast (TWEB) (Alaska Only)

Equipment is provided in Alaska by which meteorological and aeronautical data are recorded on tapes and broadcast continuously over selected L/MF and VOR facilities. Broadcasts are made from a series of individual tape recordings, and changes, as they occur, are transcribed onto the tapes. The information provided varies depending on the type equipment available. Generally, the broadcast contains a summary of adverse conditions, surface weather observations, pilot weather reports, and a density altitude statement (if applicable). At the discretion of the broadcast facility, recordings may also include a synopsis, winds aloft forecast, en route and terminal forecast data, and radar reports. At selected locations, telephone access to the TWEB has been provided (TEL−TWEB). Telephone numbers for this service are found in the Chart Supplement Alaska. These broadcasts are made available primarily for preflight and inflight planning, and as such, should not be considered as a substitute for specialist−provided preflight briefings.

7−1−9. Inflight Weather Broadcasts

a. Weather Advisory Broadcasts. ARTCCs broadcast a Severe Weather Forecast Alert (AWW), Convective SIGMET, SIGMET, or CWA alert once on all frequencies, except emergency, when any part of the area described is within 150 miles of the airspace under their jurisdiction. These broadcasts contain SIGMET or CWA (identification) and a brief description of the weather activity and general area affected.

EXAMPLE−

1. *Attention all aircraft, SIGMET Delta Three, from Myton to Tuba City to Milford, severe turbulence and severe clear icing below one zero thousand feet. Expected to continue beyond zero three zero zero zulu.*

2. *Attention all aircraft, convective SIGMET Two Seven Eastern. From the vicinity of Elmira to Phillipsburg. Scattered embedded thunderstorms moving east at one zero knots. A few intense level five cells, maximum tops four five zero.*

3. *Attention all aircraft, Kansas City Center weather advisory one zero three. Numerous reports of moderate to severe icing from eight to niner thousand feet in a three zero mile radius of St. Louis. Light or negative icing reported from four thousand to one two thousand feet remainder of Kansas City Center area.*

NOTE–

1. *Terminal control facilities have the option to limit the AWW, convective SIGMET, SIGMET, or CWA broadcast as follows: local control and approach control positions may opt to broadcast SIGMET or CWA alerts only when any part of the area described is within 50 miles of the airspace under their jurisdiction.*

2. *In areas where HIWAS is available, ARTCC, Terminal ATC, and FSS facilities no longer broadcast Inflight Weather Advisories as described above in paragraph a. See paragraphs b1 and b2 below.*

b. Hazardous Inflight Weather Advisory Service (HIWAS). HIWAS is an automated, continuous broadcast of inflight weather advisories, provided by FSS over select VOR outlets, which include the following weather products: AWW, SIGMET, Convective SIGMET, CWA, AIRMET (text [WA] or graphical [G–AIRMET] products), and urgent PIREP. HIWAS is available throughout the conterminous United States as an additional source of hazardous weather information. HIWAS does not replace preflight or inflight weather briefings from FSS. Pilots should call FSS if there are any questions about weather that is different than forecasted or if the HIWAS broadcast appears to be in error.

1. Where HIWAS is available, ARTCC and terminal ATC facilities will broadcast, upon receipt, a HIWAS alert once on all frequencies, except emergency frequencies. Included in the broadcast will be an alert announcement, frequency instruction, number, and type of advisory updated; for example, AWW, SIGMET, Convective SIGMET, or CWA.

EXAMPLE–

Attention all aircraft. Hazardous weather information (SIGMET, Convective SIGMET, AIRMET (text [WA] or graphical [G–AIRMET] product), Urgent Pilot Weather Report [UUA], or Center Weather Advisory [CWA], Number or Numbers) for (geographical area) available on HIWAS or Flight Service frequencies.

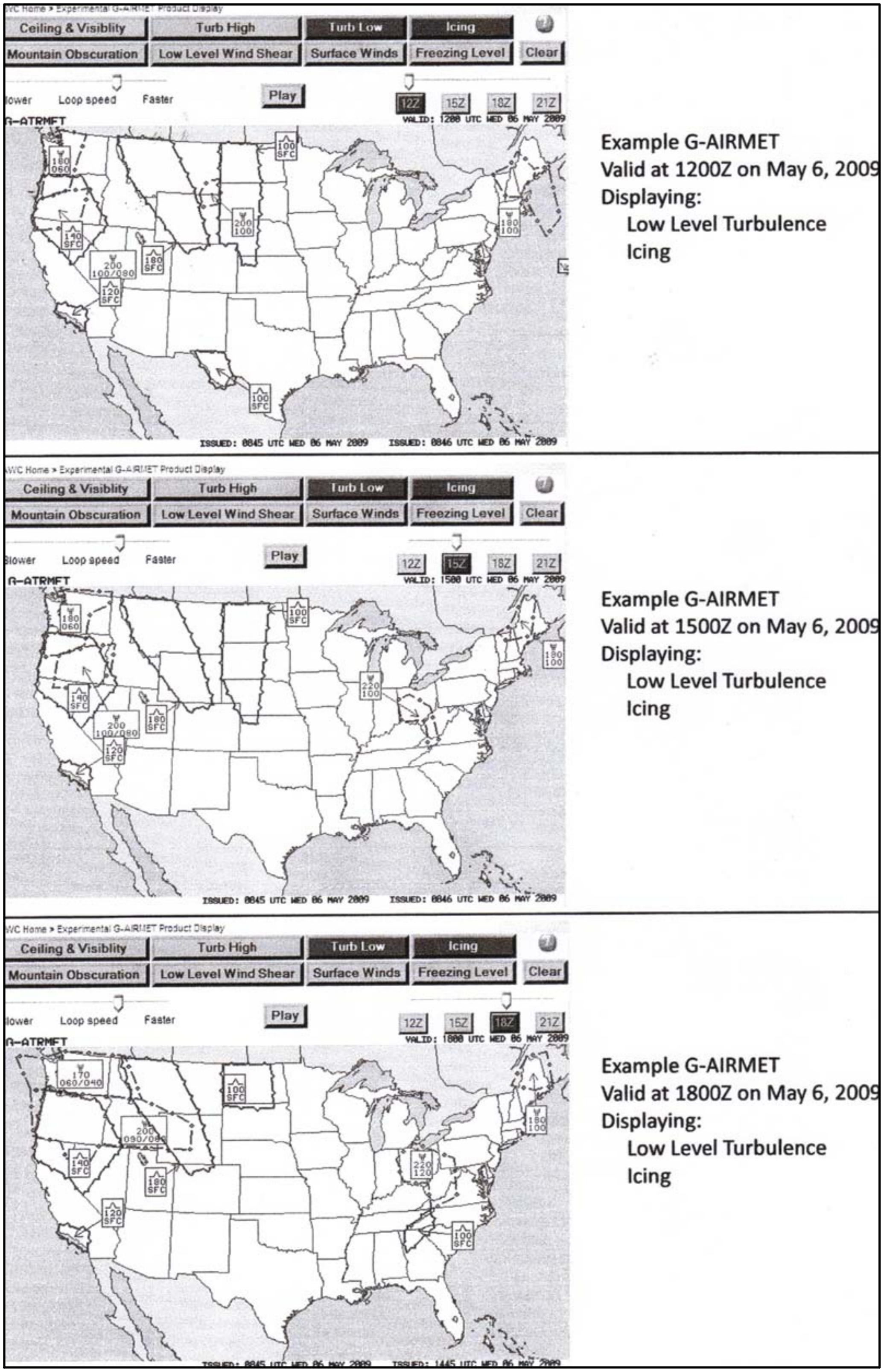
2. Upon notification of an update to HIWAS, FSS will broadcast a HIWAS update announcement once on all frequencies except emergency frequencies. Included in the broadcast will be the type of advisory updated; for example, AWW, SIGMET, Convective SIGMET, CWA, etc.

EXAMPLE–

Attention all aircraft. Hazardous weather information for (geographical area) available from Flight Service.

3. HIWAS availability is notated with VOR listings in the Chart Supplement U.S., and is shown by symbols on IFR Enroute Low Altitude Charts and VFR Sectional Charts. The symbol depiction is identified in the chart legend.

FIG 7−1−4
G−AIRMET Graphical Product



7−1−10. Flight Information Services (FIS)

a. FIS. FIS is a method of disseminating meteorological (MET) and aeronautical information (AI) to displays in the cockpit in order to enhance pilot situational awareness, provide decision support tools, and improve safety. FIS augments traditional pilot voice communication with Flight Service Stations (FSSs), ATC facilities, or Airline Operations Control Centers (AOCCs). FIS is not intended to replace traditional pilot and controller/flight service specialist/aircraft dispatcher preflight briefings or inflight voice communications. FIS, however, can provide textual and graphical information that can help abbreviate and improve the usefulness of such communications. FIS enhances pilot situational awareness and improves safety.

1. Data link Service Providers (DLSP) - DLSP deploy and maintain airborne, ground-based, and, in some cases, space-based infrastructure that supports the transmission of AI/MET information over one or more physical links. DLSP may provide a free of charge or for-fee service that permits end users to uplink and downlink AI/MET and other information. The following are examples of DLSP:

(a) FAA FIS-B. A ground-based broadcast service provided through the ADS-B Universal Access Transceiver (UAT) network. The service provides users with a 978 MHz data link capability when operating within range and line-of-sight of a transmitting ground station. FIS-B enables users of properly equipped aircraft to receive and display a suite of broadcast weather and aeronautical information products.

(b) Non-FAA FIS Systems. Several commercial vendors provide customers with FIS data over both the aeronautical spectrum and on other frequencies using a variety of data link protocols. Services available from these providers vary greatly and may include tier based subscriptions. Advancements in bandwidth technology permits preflight as well as inflight access to the same MET and AI information available on the ground. Pilots and operators using non-FAA FIS for MET and AI information should be knowledgeable regarding the weather services being provided as some commercial vendors may be repackaging NWS sourced weather, while other commercial vendors may alter the weather information to produce vendor−tailored or vendor−specific weather reports and forecasts.

2. Three Data Link Modes. There are three data link modes that may be used for transmitting AI and MET information to aircraft. The intended use of the AI and/or MET information will determine the most appropriate data link service.

(a) Broadcast Mode: A one-way interaction in which AI and/or MET updates or changes applicable to a designated geographic area are continuously transmitted (or transmitted at repeated periodic intervals) to all aircraft capable of receiving the broadcast within the service volume defined by the system network architecture.

(b) Contract/Demand Mode: A two-way interaction in which AI and/or MET information is transmitted to an aircraft in response to a specific request.

(c) Contract/Update Mode: A two-way interaction that is an extension of the Demand Mode. Initial AI and/or MET report(s) are sent to an aircraft and subsequent updates or changes to the AI and/or MET information that meet the contract criteria are automatically or manually sent to an aircraft.

3. To ensure airman compliance with Federal Aviation Regulations, manufacturer's operating manuals should remind airmen to contact ATC controllers, FSS specialists, operator dispatchers, or airline operations control centers for general and mission critical aviation weather information and/or NAS status conditions (such as NOTAMs, Special Use Airspace status, and other government flight information). If FIS products are systemically modified (for example, are displayed as abbreviated plain text and/or graphical depictions), the modification process and limitations of the resultant product should be clearly described in the vendor's user guidance.

4. Operational Use of FIS. Regardless of the type of FIS system being used, several factors must be considered when using FIS:

(a) Before using FIS for inflight operations, pilots and other flight crewmembers should become familiar with the operation of the FIS system to be used, the airborne equipment to be used, including its system architecture, airborne system components, coverage service volume and other limitations of the particular system, modes of operation and indications of various system failures. Users should also be familiar with the specific content and format of the services available from the FIS provider(s). Sources of information that may provide this specific guidance include manufacturer's manuals, training programs, and reference guides.

(b) FIS should not serve as the sole source of aviation weather and other operational information. ATC, FSSs, and, if applicable, AOCC VHF/HF voice remain as a redundant method of communicating aviation weather, NOTAMs, and other operational information to aircraft in flight. FIS augments these traditional ATC/FSS/AOCC services and, for some products, offers the advantage of being displayed as graphical information. By using FIS for orientation, the usefulness of information received from conventional means may be enhanced. For example, FIS may alert the pilot to specific areas of concern that will more accurately focus requests made to FSS or AOCC for inflight updates or similar queries made to ATC.

(c) The airspace and aeronautical environment is constantly changing. These changes occur quickly and without warning. Critical operational decisions should be based on use of the most current and appropriate data available. When differences exist between FIS and information obtained by voice communication with ATC, FSS, and/or AOCC (if applicable), pilots are cautioned to use the most recent data from the most authoritative source.

(d) FIS aviation weather products (for example, graphical ground−based radar precipitation depictions) are not appropriate for tactical (typical timeframe of less than 3 minutes) avoidance of severe weather such as negotiating a path through a weather hazard area. FIS supports strategic (typical timeframe of 20 minutes or more) weather decisionmaking such as route selection to avoid a weather hazard area in its entirety. The misuse of information beyond its applicability may place the pilot and aircraft in jeopardy. In addition, FIS should never be used in lieu of an individual preflight weather and flight planning briefing.

(e) DLSP offer numerous MET and AI products with information that can be layered on top of each other. Pilots need to be aware that too much information can have a negative effect on their cognitive work load. Pilots need to manage the amount of information to a level that offers the most pertinent information to that specific flight without creating a cockpit distraction. Pilots may need to adjust the amount of information based on numerous factors including, but not limited to, the phase of flight, single pilot operation, autopilot availability, class of airspace, and the weather conditions encountered.

(f) FIS NOTAM products, including Temporary Flight Restriction (TFR) information, are advisory−use information and are intended for situational awareness purposes only. Cockpit displays of this information are not appropriate for tactical navigation − pilots should stay clear of any geographic area displayed as a TFR NOTAM. Pilots should contact FSSs and/or ATC while en route to obtain updated information and to verify the cockpit display of NOTAM information.

(g) FIS supports better pilot decisionmaking by increasing situational awareness. Better decision−making is based on using information from a variety of sources. In addition to FIS, pilots should take advantage of other weather/NAS status sources, including, briefings from Flight Service Stations, data from other air traffic control facilities, airline operation control centers, pilot reports, as well as their own observations.

(h) FAA's Flight Information Service−Broadcast (FIS−B).

(1) FIS−B is a ground−based broadcast service provided through the FAA's Automatic Dependent Surveillance−Broadcast (ADS−B) Services Universal Access Transceiver (UAT) network. The service provides users with a 978 MHz data link capability when operating within range and line−of−sight of a transmitting ground station. FIS−B enables users of properly−equipped aircraft to receive and display a suite of broadcast weather and aeronautical information products.

(2) The following list represents the initial suite of text and graphical products available through FIS−B and provided free−of−charge. Detailed information concerning FIS−B meteorological products can be found in Advisory Circular 00−45, Aviation Weather Services, and AC 00-63, Use of Cockpit Displays of Digital Weather and Aeronautical Information. Information on Special Use Airspace (SUA), Temporary Flight Restriction (TFR), and Notice to Airmen (NOTAM) products can be found in Chapters 3, 4 and 5 of this manual.

[a] Text: Aviation Routine Weather Report (METAR) and Special Aviation Report (SPECI);

[b] Text: Pilot Weather Report (PIREP);

[c] Text: Winds and Temperatures Aloft;

[d] Text: Terminal Aerodrome Forecast (TAF) and amendments;

[e] Text: Notice to Airmen (NOTAM) Distant and Flight Data Center;

[f] Text/Graphic: Airmen's Meteorological Conditions (AIRMET);

[g] Text/Graphic: Significant Meteorological Conditions (SIGMET);

[h] Text/Graphic: Convective SIGMET;

[i] Text/Graphic: Special Use Airspace (SUA);

[j] Text/Graphic: Temporary Flight Restriction (TFR) NOTAM; and

[k] Graphic: NEXRAD Composite Reflectivity Products (Regional and National).

(3) Users of FIS−B should familiarize themselves with the operational characteristics and limitations of the system, including: system architecture; service environment; product lifecycles; modes of operation; and indications of system failure.

(4) FIS−B products are updated and transmitted at specific intervals based primarily on product issuance criteria. Update intervals are defined as the rate at which the product data is available from the source for transmission. Transmission intervals are defined as the amount of time within which a new or updated product transmission must be completed and/or the rate or repetition interval at which the product is rebroadcast. Update and transmission intervals for each product are provided in TBL 7−1−1.

(5) Where applicable, FIS−B products include a look−ahead range expressed in nautical miles (NM) for three service domains: Airport Surface; Terminal Airspace; and Enroute/Gulf−of−Mexico (GOMEX). TBL 7−1−2 provides service domain availability and look−ahead ranging for each FIS−B product.

(6) Prior to using this capability, users should familiarize themselves with the operation of FIS−B avionics by referencing the applicable User's Guides. Guidance concerning the interpretation of information displayed should be obtained from the appropriate avionics manufacturer.

(7) FIS−B malfunctions not attributed to aircraft system failures or covered by active NOTAM should be reported by radio or telephone to the nearest FSS facility.

b. Non−FAA FIS Systems. Several commercial vendors also provide customers with FIS data over both the aeronautical spectrum and on other frequencies using a variety of data link protocols. In some cases, the vendors provide only the communications system that carries customer messages, such as the Aircraft Communications Addressing and Reporting System (ACARS) used by many air carrier and other operators.

1. Operators using non−FAA FIS data for inflight weather and other operational information should ensure that the products used conform to FAA/NWS standards. Specifically, aviation weather and NAS status information should meet the following criteria:

(a) The products should be either FAA/NWS "accepted" aviation weather reports or products, or based on FAA/NWS accepted aviation weather reports or products. If products are used which do not meet this criteria, they should be so identified. The operator must determine the applicability of such products to their particular flight operations.

(b) In the case of a weather product which is the result of the application of a process which alters the form, function or content of the base FAA/NWS accepted weather product(s), that process, and any limitations to the application of the resultant product, should be described in the vendor's user guidance material.

2. An example would be a NEXRAD radar composite/mosaic map, which has been modified by changing the scaling resolution. The methodology of assigning reflectivity values to the resultant image components should be described in the vendor's guidance material to ensure that the user can accurately interpret the displayed data.

TBL 7−1−1

FIS−B Over UAT Product Update and Transmission Intervals

Product	FIS-B Over UAT Service Update Intervals[1]	FIS-B Service Transmission Intervals[2]
AIRMET	As Available	5 minutes
Convective SIGMET	As Available	5 minutes
METARs/SPECIs	1 minute/As Available	5 minutes
NEXRAD Composite Reflectivity (CONUS)	15 minutes	15 minutes
NEXRAD Composite Reflectivity (Regional)	5 minutes	2.5 minutes
NOTAMs-D/FDC/TFR	As Available	10 minutes
PIREP	As Available	10 minutes
SIGMET	As Available	5 minutes
SUA Status	As Available	10 minutes
TAF/AMEND	8 Hours/As Available	10 minutes
Temperatures Aloft	12 Hours	10 minutes
Winds Aloft	12 Hours	10 minutes

[1] *The Update Interval is the rate at which the product data is available from the source.*

[2] *The Transmission Interval is the amount of time within which a new or updated product transmission must be completed and the rate or repetition interval at which the product is rebroadcast.*

TBL 7−1−2

Product Parameters for Low/Medium/High Altitude Tier Radios

Product	Surface Radios	Low Altitude Tier	Medium Altitude Tier	High Altitude Tier
CONUS NEXRAD	N/A	CONUS NEXRAD not provided	CONUS NEXRAD imagery	CONUS NEXRAD imagery
Winds & Temps Aloft	500 NM look−ahead range	500 NM look−ahead range	750 NM look−ahead range	1,000 NM look−ahead range
METAR	100 NM look−ahead range	250 NM look−ahead range	375 NM look−ahead range	CONUS: CONUS Class B & C airport METARs and 500 NM look−ahead range Outside of CONUS: 500 NM look-ahead range
TAF	100 NM look−ahead range	250 NM look−ahead range	375 NM look−ahead range	CONUS: CONUS Class B & C airport TAFs and 500 NM look−ahead range Outside of CONUS: 500 NM look-ahead range
AIRMET, SIGMET, PIREP, and SUA/SAA	100 NM look−ahead range. PIREP/SUA/SAA is N/A.	250 NM look−ahead range	375 NM look−ahead range	500 NM look−ahead range
Regional NEXRAD	150 NM look−ahead range	150 NM look−ahead range	200 NM look−ahead range	250 NM look−ahead range
NOTAMs D, FDC, and TFR	100 NM look−ahead range	100 NM look−ahead range	100 NM look−ahead range	100 NM look−ahead range

7−1−11. Weather Observing Programs

a. Manual Observations. With only a few exceptions, these reports are from airport locations staffed by FAA personnel who manually observe, perform calculations, and enter these observations into the (WMSCR) communication system. The format and coding of these observations are contained in Paragraph 7−1−29 , Key to Aviation Routine Weather Report (METAR) and Aerodrome Forecasts (TAF).

b. Automated Weather Observing System (AWOS).

1. Automated weather reporting systems are increasingly being installed at airports. These systems consist of various sensors, a processor, a computer-generated voice subsystem, and a transmitter to broadcast local, minute-by-minute weather data directly to the pilot.

NOTE−
When the barometric pressure exceeds 31.00 inches Hg., see Paragraph 7−2−2 , Procedures, for the altimeter setting procedures.

2. The AWOS observations will include the prefix "AUTO" to indicate that the data are derived from an automated system. Some AWOS locations will be augmented by certified observers who will provide weather and obstruction to vision information in the remarks of the report when the reported visibility is less than 7 miles. These sites, along with the hours of augmentation, are to be published in the Chart Supplement U.S. Augmentation is identified in the observation as "OBSERVER WEATHER." The AWOS wind speed, direction and gusts, temperature, dew point, and altimeter setting are exactly the same as for manual observations. The AWOS will also report density altitude when it exceeds the field elevation by more than 1,000 feet. The reported visibility is derived from a sensor near the touchdown of the primary instrument runway. The visibility sensor output is converted to a visibility value using a 10−minute harmonic average. The reported sky condition/ceiling is derived from the ceilometer located next to the visibility sensor. The AWOS algorithm integrates the last 30 minutes of ceilometer data to derive cloud layers and heights. This output may also differ from the observer sky condition in that the AWOS is totally dependent upon the cloud advection over the sensor site.

3. These real-time systems are operationally classified into nine basic levels:

(a) AWOS−A only reports altimeter setting;

NOTE−
Any other information is advisory only.

(b) AWOS−AV reports altimeter and visibility;

NOTE−
Any other information is advisory only.

(c) AWOS−l usually reports altimeter setting, wind data, temperature, dew point, and density altitude;

(d) AWOS−2 provides the information provided by AWOS−l plus visibility; and

(e) AWOS−3 provides the information provided by AWOS−2 plus cloud/ceiling data.

(f) AWOS− 3P provides reports the same as the AWOS 3 system, plus a precipitation identification sensor.

(g) AWOS− 3PT reports the same as the AWOS 3P System, plus thunderstorm/lightning reporting capability.

(h) AWOS− 3T reports the same as AWOS 3 system and includes a thunderstorm/lightning reporting capability.

(i) AWOS− 4 reports the same as the AWOS 3 system, plus precipitation occurrence, type and accumulation, freezing rain, thunderstorm, and runway surface sensors.

4. The information is transmitted over a discrete VHF radio frequency or the voice portion of a local NAVAID. AWOS transmissions on a discrete VHF radio frequency are engineered to be receivable to a maximum of 25 NM from the AWOS site and a maximum altitude of 10,000 feet AGL. At many locations, AWOS signals may be received on the surface of the airport, but local conditions may limit the maximum AWOS reception distance and/or altitude. The system transmits a 20 to 30 second weather message updated each minute. Pilots should monitor the designated frequency for the automated weather broadcast. A description of the broadcast is contained in subparagraph c. There is no two-way communication capability. Most AWOS sites also have a dial-up capability so that the minute-by-minute weather messages can be accessed via telephone.

5. AWOS information (system level, frequency, phone number, etc.) concerning specific locations is published, as the systems become operational, in the Chart Supplement U.S., and where applicable, on published Instrument Approach Procedures. Selected individual systems may be incorporated into nationwide data collection and dissemination networks in the future.

c. AWOS Broadcasts. Computer-generated voice is used in AWOS to automate the broadcast of the minute-by-minute weather observations. In addition, some systems are configured to permit the addition of an operator-generated voice message; e.g., weather remarks following the automated parameters. The phraseology used generally follows that used for other weather broadcasts. Following are explanations and examples of the exceptions.

1. Location and Time. The location/name and the phrase "AUTOMATED WEATHER OBSERVATION," followed by the time are announced.

(a) If the airport's specific location is included in the airport's name, the airport's name is announced.

EXAMPLE−
"Bremerton National Airport automated weather observation, one four five six zulu;"
"Ravenswood Jackson County Airport automated weather observation, one four five six zulu."

(b) If the airport's specific location is not included in the airport's name, the location is announced followed by the airport's name.

EXAMPLE–
"Sault Ste. Marie, Chippewa County International Airport automated weather observation;"
"Sandusky, Cowley Field automated weather observation."

(c) The word "TEST" is added following "OBSERVATION" when the system is not in commissioned status.

EXAMPLE–
"Bremerton National Airport automated weather observation test, one four five six zulu."

(d) The phrase "TEMPORARILY INOPERATIVE" is added when the system is inoperative.

EXAMPLE–
"Bremerton National Airport automated weather observing system temporarily inoperative."

2. Visibility.

(a) The lowest reportable visibility value in AWOS is "less than $^1/_4$." It is announced as "VISIBILITY LESS THAN ONE QUARTER."

(b) A sensor for determining visibility is not included in some AWOS. In these systems, visibility is not announced. "VISIBILITY MISSING" is announced only if the system is configured with a visibility sensor and visibility information is not available.

3. Weather. In the future, some AWOSs are to be configured to determine the occurrence of precipitation. However, the type and intensity may not always be determined. In these systems, the word "PRECIPITATION" will be announced if precipitation is occurring, but the type and intensity are not determined.

4. Ceiling and Sky Cover.

(a) Ceiling is announced as either "CEILING" or "INDEFINITE CEILING." With the exception of indefinite ceilings, all automated ceiling heights are measured.

EXAMPLE–
"Bremerton National Airport automated weather observation, one four five six zulu. Ceiling two thousand overcast;"

"Bremerton National Airport automated weather observation, one four five six zulu. Indefinite ceiling two hundred, sky obscured."

(b) The word "Clear" is not used in AWOS due to limitations in the height ranges of the sensors. No clouds detected is announced as "NO CLOUDS BELOW XXX" or, in newer systems as "CLEAR BELOW XXX" (where XXX is the range limit of the sensor).

EXAMPLE–
"No clouds below one two thousand."
"Clear below one two thousand."

(c) A sensor for determining ceiling and sky cover is not included in some AWOS. In these systems, ceiling and sky cover are not announced. "SKY CONDITION MISSING" is announced only if the system is configured with a ceilometer and the ceiling and sky cover information is not available.

5. Remarks. If remarks are included in the observation, the word "REMARKS" is announced following the altimeter setting.

(a) Automated "Remarks."

(1) Density Altitude.

(2) Variable Visibility.

(3) Variable Wind Direction.

(b) Manual Input Remarks. Manual input remarks are prefaced with the phrase "OBSERVER WEATHER." As a general rule the manual remarks are limited to:

(1) Type and intensity of precipitation.

(2) Thunderstorms and direction; and

(3) Obstructions to vision when the visibility is 3 miles or less.

EXAMPLE–
"Remarks ... density altitude, two thousand five hundred ... visibility variable between one and two ... wind direction variable between two four zero and three one zero ...observed weather ... thunderstorm moderate rain showers and fog ... thunderstorm overhead."

(c) If an automated parameter is "missing" and no manual input for that parameter is available, the parameter is announced as "MISSING." For example, a report with the dew point "missing" and no manual input available, would be announced as follows:

EXAMPLE–
"Ceiling one thousand overcast ... visibility three ... precipitation ... temperature three zero, dew point missing ... wind calm ... altimeter three zero zero one."

(d) "REMARKS" are announced in the following order of priority:

(1) Automated "REMARKS."

[a] Density Altitude.

[b] Variable Visibility.

[c] Variable Wind Direction.

(2) Manual Input "REMARKS."

[a] Sky Condition.

[b] Visibility.

[c] Weather and Obstructions to Vision.

[d] Temperature.

[e] Dew Point.

[f] Wind; and

[g] Altimeter Setting.

EXAMPLE–
"Remarks ... density altitude, two thousand five hundred ... visibility variable between one and two ... wind direction variable between two four zero and three one zero ... observer ceiling estimated two thousand broken ... observer temperature two, dew point minus five."

d. Automated Surface Observing System (ASOS)/Automated Weather Sensor System (AWSS). The ASOS/AWSS is the primary surface weather observing system of the U.S. (See Key to Decode an ASOS/AWSS (METAR) Observation, FIG 7−1−5 and FIG 7−1−6.) The program to install and operate these systems throughout the U.S. is a joint effort of the NWS, the FAA and the Department of Defense. AWSS is a follow−on program that provides identical data as ASOS. ASOS/AWSS is designed to support aviation operations and weather forecast activities. The ASOS/AWSS will provide continuous minute-by-minute observations and perform the basic observing functions necessary to generate an aviation routine weather report (METAR) and other aviation weather information. The information may be transmitted over a discrete VHF radio frequency or the voice portion of a local NAVAID. ASOS/AWSS transmissions on a discrete VHF radio frequency are engineered to be receivable to a maximum of 25 NM from the ASOS/AWSS site and a maximum altitude of 10,000 feet AGL. At many locations, ASOS/AWSS signals may be received on the surface of the airport, but local conditions may limit the maximum reception distance and/or altitude. While the automated system and the human may differ in their methods of data collection and interpretation, both produce an observation quite similar in form and content. For the "objective" elements such as pressure, ambient temperature, dew point temperature, wind, and precipitation accumulation, both the automated system and the observer use a fixed location and time-averaging technique. The quantitative differences between the observer and the automated observation of these elements are negligible. For the "subjective" elements, however, observers use a fixed time, spatial averaging technique to describe the visual elements (sky condition, visibility and present weather), while the automated systems use a fixed location, time averaging technique. Although this is a fundamental change, the manual and automated techniques yield remarkably similar results within the limits of their respective capabilities.

1. System Description.

(a) The ASOS/AWSS at each airport location consists of four main components:

(1) Individual weather sensors.

(2) Data collection and processing units.

(3) Peripherals and displays.

(b) The ASOS/AWSS sensors perform the basic function of data acquisition. They continuously sample and measure the ambient environment, derive raw sensor data and make them available to the collection and processing units.

2. Every ASOS/AWSS will contain the following basic set of sensors:

(a) Cloud height indicator (one or possibly three).

(b) Visibility sensor (one or possibly three).

(c) Precipitation identification sensor.

(d) Freezing rain sensor (at select sites).

(e) Pressure sensors (two sensors at small airports; three sensors at large airports).

(f) Ambient temperature/Dew point temperature sensor.

(g) Anemometer (wind direction and speed sensor).

(h) Rainfall accumulation sensor.

3. The ASOS/AWSS data outlets include:

(a) Those necessary for on-site airport users.

(b) National communications networks.

(c) Computer-generated voice (available through FAA radio broadcast to pilots, and dial-in telephone line).

NOTE−
Wind direction broadcast over FAA radios is in reference to magnetic north.

4. An ASOS/AWOS/AWSS report without human intervention will contain only that weather data capable of being reported automatically. The modifier for this METAR report is "AUTO." When an observer augments or backs−up an ASOS/AWOS/AWSS site, the "AUTO" modifier disappears.

5. There are two types of automated stations, AO1 for automated weather reporting stations without a precipitation discriminator, and AO2 for automated stations with a precipitation discriminator. As appropriate, "AO1" and "AO2" must appear in remarks. (A precipitation discriminator can determine the difference between liquid and frozen/freezing precipitation).

NOTE−
To decode an ASOS/AWSS report, refer to FIG 7−1−5 and FIG 7−1−6.

REFERENCE−
A complete explanation of METAR terminology is located in AIM, Paragraph 7−1−29 , Key to Aerodrome Forecast (TAF) and Aviation Routine Weather Report (METAR).

FIG 7-1-5

Key to Decode an ASOS/AWSS (METAR) Observation (Front)

METAR KABC 121755Z AUTO 21016G24KT 180V240 1SM R11/P6000FT -RA BR BKN015 OVC025 06/04 A2990
RMK A02 PK WND 20032/25 WSHFT 1715 VIS 3/4V1 1/2 VIS 3/4 RWY11 RAB07 CIG 013V017 CIG 017 RWY11 PRESFR
SLP125 P0003 6009 T00640036 10066 21012 58033 TSNO $

TYPE OF REPORT	METAR: hourly (scheduled report; SPECI: special (unscheduled) report.	METAR
STATION IDENTIFIER	Four alphabetic characters; ICAO location identifiers.	KABC
DATE/TIME	All dates and times in UTC using a 24-hour clock; two-digit date and four-digit time; always appended with Z to indicate UTC.	121755Z
REPORT MODIFIER	Fully automated report, no human intervention; removed when observer signed-on.	AUTO
WIND DIRECTION AND SPEED	Direction in tens of degrees from true north (first three digits); next two digits: speed in whole knots; as needed Gusts (character) followed by maximum observed speed; always appended with KT to indicate knots; 00000KT for calm; if direction varies by 60° or more a Variable wind direction group is reported.	21016G24KT 108V240
VISIBILITY	Prevailing visibility in statute miles and fractions (space between whole miles and fractions); always appended with SM to indicate statute miles.	1SM
RUNWAY VISUAL RANGE	10-minute RVR value in hundreds of feet; reported if prevailing visibility is ≤ one mile or RVR ≤6000 feet; always appended with FT to indicate feet; value prefixed with M or P to indicate value is lower or higher than the reportable RVR value.	R11/P6000FT
WEATHER PHENOMENA	RA: liquid precipitation that does not freeze; SN: frozen precipitation other than hail; UP: precipitation of unknown type; intensity prefixed to precipitation: light (-), moderate (no sign), heavy (+); FG: fog; FZFG: freezing fog (temperature below 0°C); BR: mist; HZ: haze; SQ: squall; maximum of three groups reported; augmented by observer: FC (funnel cloud/tornado/waterspout); TS(thunderstorm); GR (hail); GS (small hail; <1/4 inch); FZRA (intensity; freezing rain); VA (volcanic ash).	-RA BR
SKY CONDITION	Cloud amount and height: CLR (no clouds detected below 12000 feet); FEW (few); SCT (scattered); BKN (broken); OVC (overcast); followed by 3-digit height in hundreds of feet; or vertical visibility (VV) followed by height for indefinite ceiling.	BKN015 OVC025
TEMPERATURE/DEW POINT	Each is reported in whole degrees Celsius using two digits; values are separated by a solidus; sub-zero values are prefixed with an M (minus).	06/04
ALTIMETER	Altimeter always prefixed with an A indicating inches of mercury; reported using four digits: tens, units, tenths, and hundredths.	A2990

FIG 7-1-6

Key to Decode an ASOS/AWSS (METAR) Observation (Back)

REMARKS IDENTIFIER: RMK	RMK
TORNADIC ACTIVITY: Augmented; report should include TORNADO, FUNNEL CLOUD, or WATERSPOUT, time begin/end, location, movement; e.;g., TORNADO B25 N MOV E.	
TYPE OF AUTOMATED STATION: AO2; automated station with precipitation discriminator.	AO2
PEAK WIND: PK WND dddff(f)/(hh)mm; direction in tens of degrees, speed in whole knots, and time.	PK WND 20032/25
WIND SHIFT: WSHFT (hh)mm	WSHFT 1715
TOWER OR SURFACE VISIBILITY: TWR VIS vvvvv: visibility reported by tower personnel, e.g., TWR VIS 2; SFC VIS vvvvv: visibility reported by ASOS, e.g., SFC VIS 2.	
VARIABLE PREVAILING VISIBILITY: VIS v_n v_n v_n v_n v_nV$v_x v_x v_x v_x v_x$; reported if prevailing visibility is <3 miles and variable.	VIS 3/4V1 1/2
VISIBILITY AT SECOND LOCATION: VIS vvvvv [LOC]; reported if different than the reported prevailing visibility in body of report.	VIS 3/4 RWY11
LIGHTNING: [FREQ] LTG [LOC]; when detected the frequency and location is reported, e.g., FRQ LTG NE.	
BEGINNING AND ENDING OF PRECIPITATION AND THUNDERSTORMS: w'w'B(hh)mmE(hh)mm; TSB(hh)mmE(hh)mm	RAB07
VIRGA: Augmented; precipitation not reaching the ground, e.g., VIRGA.	
VARIABLE CEILING HEIGHT: CIG h_n h_n h_nV$h_x h_x h_x$; reported if ceiling in body of report is <3000 feet and variable.	CIG 013V017
CEILING HEIGHT AT SECOND LOCATION: CIG hhh [LOC]; Ceiling height reported if secondary ceilometer site is different than the ceiling height in the body of the report.	CIG 017 RWY11
PRESSURE RISING OR FALLING RAPIDLY: PRESRR or PRESFR; pressure rising or falling rapidly at time of observation.	PRESFR
SEA-LEVEL PRESSURE: SLPppp; tens, units, and tenths of SLP in hPa.	SLP125
HOURLY PRECIPITATION AMOUNT: Prrrr; in .01 inches since last METAR; a trace is P0000.	P0003
3- AND 6-HOUR PRECIPITATION AMOUNT: 6RRRR; precipitation amount in .01 inches for past 6 hours reported in 00, 06, 12, and 18 UTC observations and for past 3 hours in 03, 09, 15, and 21 UTC observations; a trace is 60000.	60009
24-HOUR PRECIPITATION AMOUNT: 7R_{24} R_{24} R_{24} R_{24}; precipitation amount in .01 inches for past 24 hours reported in 12 UTC observation, e.g., 70015.	
HOURLY TEMPERATURE AND DEW POINT: T$s_n T_a T_a T_a s_n T'_a T'_a T'_a$; tenth of degree Celsius; s_n: 1 if temperature below 0° C and 0 if temperature 0°C or higher.	T00640036
6-HOUR MAXIMUM TEMPERATURE: 1$s_n T_x T_x T_x$; tenth of degree Celsius; 00, 06, 12, 18 UTC; s_n: 1 if temperature below 0°C and 0 if temperature 0°C or higher.	10066
6-HOUR MINIMUM TEMPERATURE: 2$s_n T_n T_n T_n$; tenth of degree Celsius; 00, 06, 12, 18 UTC; s_n: 1 if temperature below 0°C and 0 if temperature 0°C or higher.	21012
24-HOUR MAXIMUM AND MINIMUM TEMPERATURE: 4$s_n T_x T_x T_x s_n T_n T_n T_n$; tenth of degree Celsius; reported at midnight local standard time; 1 if temperature below 0°C and 0 if temperature 0°C or higher, e.g., 400461006.	
PRESSURE TENDENCY: 5appp; the character (a) and change in pressure (ppp; tenths of hPa) the past 3 hours.	58033
SENSOR STATUS INDICATORS: RVRNO: RVR missing; PWINO: precipitation identifier information not available; PNO: precipitation amount not available; FZRANO: freezing rain information not available; TSNO: thunderstorm information not available; VISNO [LOC]: visibility at secondary location not available, e.g., VISNO RWY06; CHINO [LOC]: (cloud-height-indicator) sky condition at secondary location not available, e.g., CHINO RWY06.	TSNO
MAINTENANCE CHECK INDICATOR: Maintenance needed on the system.	$
If an element or phenomena does not occur, is missing, or cannot be observed, the corresponding group and space are omitted (body and/or remarks) from that particular report, except for Sea-Level Pressure (SLPppp). SLPNO shall be reported in a METAR when the SLP is not available.	

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e. TBL 7−1−3 contains a comparison of weather observing programs and the elements reported.

f. Service Standards. During 1995, a government/industry team worked to comprehensively reassess the requirements for surface observations at the nation's airports. That work resulted in agreement on a set of service standards, and the FAA and NWS ASOS sites to which the standards would apply. The term "Service Standards" refers to the level of detail in weather observation. The service standards consist of four different levels of service (A, B, C, and D) as described below. Specific observational elements included in each service level are listed in TBL 7−1−4.

1. Service Level D defines the minimum acceptable level of service. It is a completely automated service in which the ASOS/AWSS observation will constitute the entire observation, i.e., no additional weather information is added by a human observer. This service is referred to as a stand alone D site.

2. Service Level C is a service in which the human observer, usually an air traffic controller, augments or adds information to the automated observation. Service Level C also includes backup of ASOS/AWSS elements in the event of an ASOS/AWSS malfunction or an unrepresentative ASOS/AWSS report. In backup, the human observer inserts the correct or missing value for the automated ASOS/AWSS elements. This service is provided by air traffic controllers under the Limited Aviation Weather Reporting Station (LAWRS) process, FSS and NWS observers, and, at selected sites, Non−Federal Observation Program observers.

Two categories of airports require detail beyond Service Level C in order to enhance air traffic control efficiency and increase system capacity. Services at these airports are typically provided by contract weather observers, NWS observers, and, at some locations, FSS observers.

3. Service Level B is a service in which weather observations consist of all elements provided under Service Level C, plus augmentation of additional data beyond the capability of the ASOS/AWSS. This category of airports includes smaller hubs or special airports in other ways that have worse than average bad weather operations for thunderstorms and/or freezing/frozen precipitation, and/or that are remote airports.

4. Service Level A, the highest and most demanding category, includes all the data reported in Service Standard B, plus additional requirements as specified. Service Level A covers major aviation hubs and/or high volume traffic airports with average or worse weather.

TBL 7−1−3

Weather Observing Programs

Element Reported / Type	Wind	Visibility	Temperature Dew Point	Altimeter	Density Altimeter	Cloud/Ceiling	Precipitation Identification	Thunderstorm/ Lightning	Precipitation Occurrence	Rainfall Accumulation	Runway Surface Condition	Freezing Rain Occurrence	Remarks
AWSS	X	X	X	X	X	X	X			X		X	X
ASOS	X	X	X	X	X	X	X			X		X	X
AWOS−A				X									
AWOS−A/V		X		X									
AWOS−1	X		X	X	X								
AWOS−2	X	X	X	X	X								
AWOS−3	X	X	X	X	X	X							
AWOS−3P	X	X	X	X	X	X	X						
AWOS−3T	X	X	X	X	X	X		X					
AWOS−3P/T	X	X	X	X	X	X	X	X					
AWOS−4	X	X	X	X	X	X	X	X	X	X	X	X	
Manual	X	X	X	X		X	X						X
REFERENCE− FAA Order 7900.5B, Surface Weather Observing, for element reporting.													

TBL 7-1-4

SERVICE LEVEL A	
Service Level A consists of all the elements of Service Levels B, C and D plus the elements listed to the right, if observed.	10 minute longline RVR at precedented sites or additional visibility increments of 1/8, 1/16 and 0 Sector visibility Variable sky condition Cloud layers above 12,000 feet and cloud types Widespread dust, sand and other obscurations Volcanic eruptions
SERVICE LEVEL B	
Service Level B consists of all the elements of Service Levels C and D plus the elements listed to the right, if observed.	Longline RVR at precedented sites (may be instantaneous readout) Freezing drizzle versus freezing rain Ice pellets Snow depth & snow increasing rapidly remarks Thunderstorm and lightning location remarks Observed significant weather not at the station remarks
SERVICE LEVEL C	
Service Level C consists of all the elements of Service Level D plus augmentation and backup by a human observer or an air traffic control specialist on location nearby. Backup consists of inserting the correct value if the system malfunctions or is unrepresentative. Augmentation consists of adding the elements listed to the right, if observed. During hours that the observing facility is closed, the site reverts to Service Level D.	Thunderstorms Tornadoes Hail Virga Volcanic ash Tower visibility Operationally significant remarks as deemed appropriate by the observer
SERVICE LEVEL D	
This level of service consists of an ASOS or AWSS continually measuring the atmosphere at a point near the runway. The ASOS or AWSS senses and measures the weather parameters listed to the right.	Wind Visibility Precipitation/Obstruction to vision Cloud height Sky cover Temperature Dew point Altimeter

7-1-12. Weather Radar Services

a. The National Weather Service operates a network of radar sites for detecting coverage, intensity, and movement of precipitation. The network is supplemented by FAA and DOD radar sites in the western sections of the country. Local warning radar sites augment the network by operating on an as needed basis to support warning and forecast programs.

b. Scheduled radar observations are taken hourly and transmitted in alpha-numeric format on weather telecommunications circuits for flight planning purposes. Under certain conditions, special radar reports are issued in addition to the hourly transmittals. Data contained in the reports are also collected by the National Center for Environmental Prediction and used to prepare national radar summary charts for dissemination on facsimile circuits.

c. A clear radar display (no echoes) does not mean that there is no significant weather within the coverage of the radar site. Clouds and fog are not detected by the radar. However, when echoes are present, turbulence can be implied by the intensity of the precipitation, and icing is implied by the presence of the precipitation at temperatures at or below zero degrees Celsius. Used in conjunction with other weather products, radar provides invaluable information for weather avoidance and flight planning.

FIG 7−1−7
NEXRAD Coverage

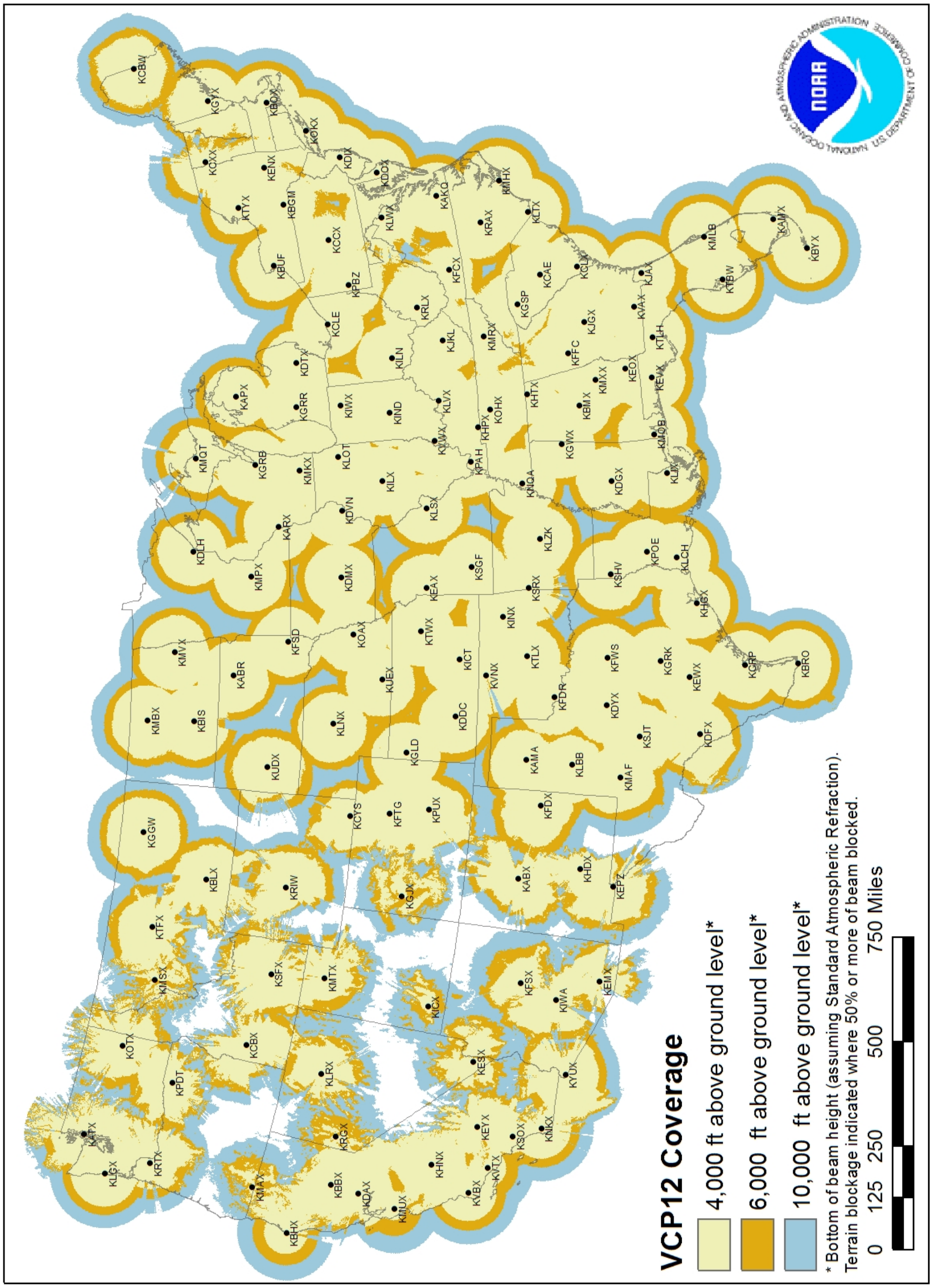


FIG 7-1-8
NEXRAD Coverage

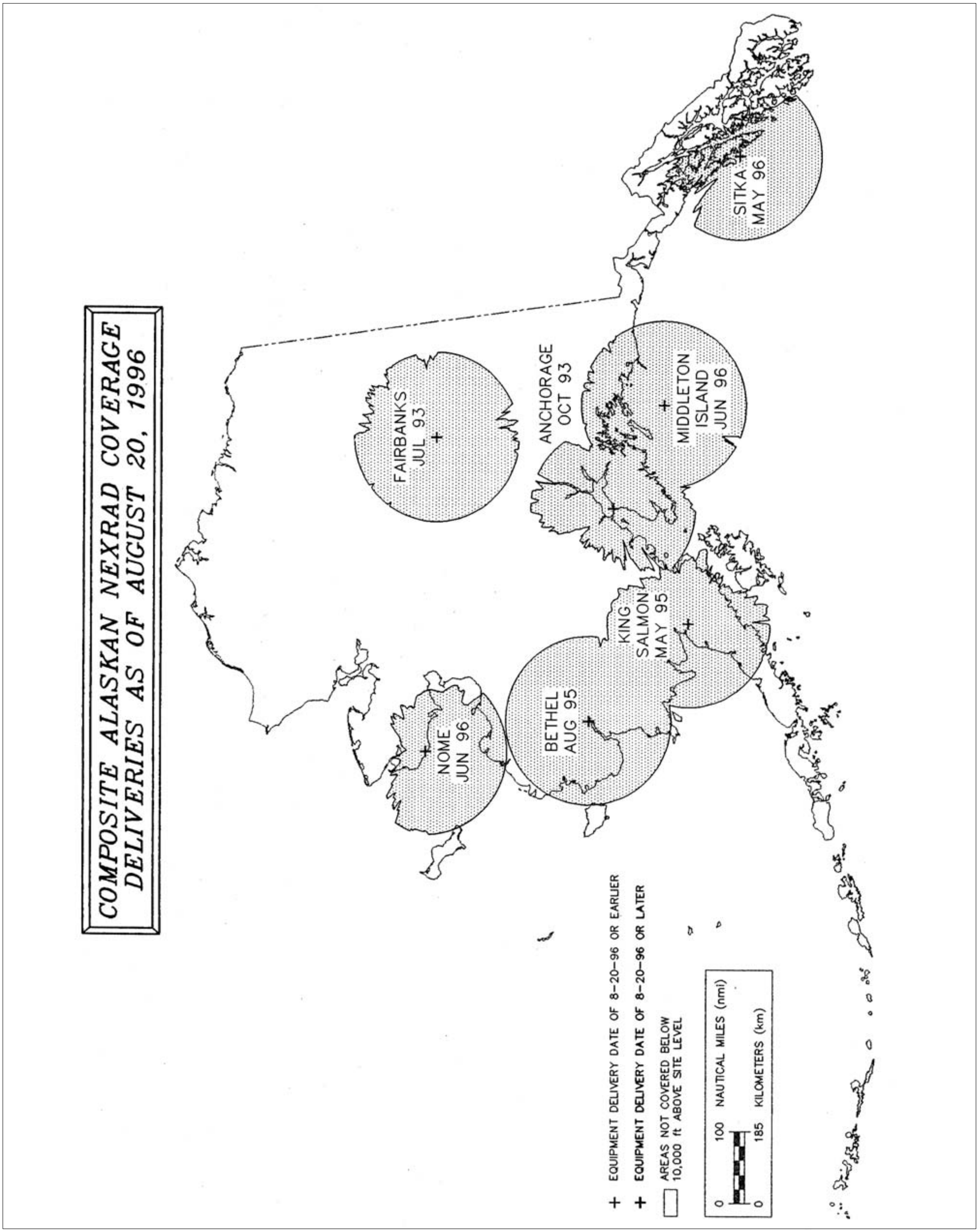
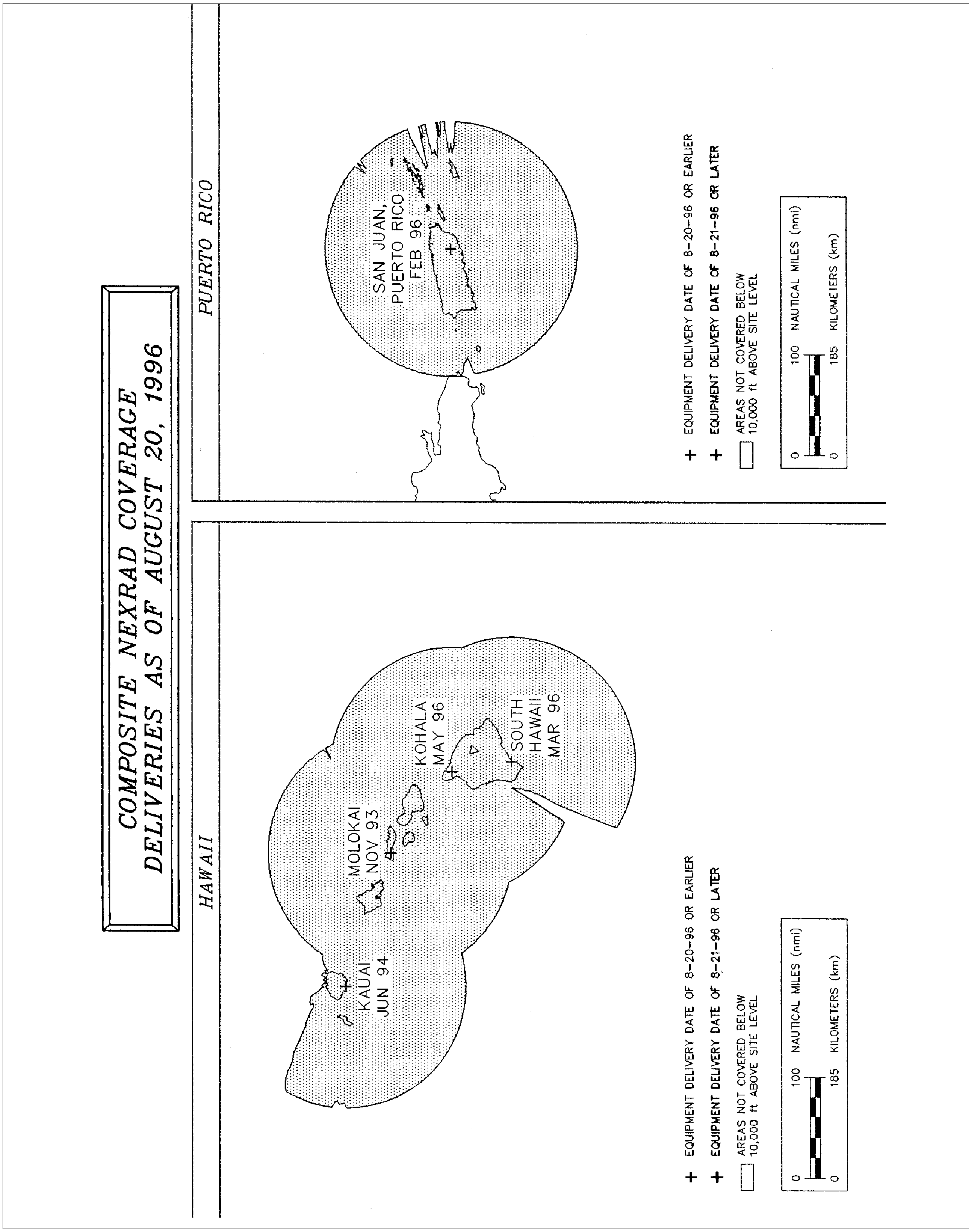


FIG 7-1-9
NEXRAD Coverage



d. All En Route Flight Advisory Service facilities and FSSs have equipment to directly access the radar displays from the individual weather radar sites. Specialists at these locations are trained to interpret the display for pilot briefing and inflight advisory services. The Center Weather Service Units located in ARTCCs also have access to weather radar displays and provide support to all air traffic facilities within their center's area.

e. Additional information on weather radar products and services can be found in AC 00−45, Aviation Weather Services.

REFERENCE−
Pilot/Controller Glossary Term− Precipitation Radar Weather Descriptions.
AIM, Paragraph 7−1−27 , Thunderstorms
Chart Supplement U.S., Charts, NWS Upper Air Observing Stations and Weather Network for the location of specific radar sites.

7−1−13. ATC Inflight Weather Avoidance Assistance

a. ATC Radar Weather Display.

1. ATC radars are able to display areas of precipitation by sending out a beam of radio energy that is reflected back to the radar antenna when it strikes an object or moisture which may be in the form of rain drops, hail, or snow. The larger the object is, or the more dense its reflective surface, the stronger the return will be presented. Radar weather processors indicate the intensity of reflective returns in terms of decibels (dBZ). ATC systems cannot detect the presence or absence of clouds. The ATC systems can often determine the intensity of a precipitation area, but the specific character of that area (snow, rain, hail, VIRGA, etc.) cannot be determined. For this reason, ATC refers to all weather areas displayed on ATC radar scopes as "precipitation."

2. All ATC facilities using radar weather processors with the ability to determine precipitation intensity, will describe the intensity to pilots as:

(a) "LIGHT" (< 30 dBZ)

(b) "MODERATE" (30 to 40 dBZ)

(c) "HEAVY" (> 40 to 50 dBZ)

(d) "EXTREME" (> 50 dBZ)

NOTE−
Enroute ATC radar's Weather and Radar Processor (WARP) does not display light precipitation intensity.

3. ATC facilities that, due to equipment limitations, cannot display the intensity levels of precipitation, will describe the location of the precipitation area by geographic position, or position relative to the aircraft. Since the intensity level is not available, the controller will state "INTENSITY UNKNOWN."

4. ARTCC facilities normally use a Weather and Radar Processor (WARP) to display a mosaic of data obtained from multiple NEXRAD sites. There is a time delay between actual conditions and those displayed to the controller. For example, the precipitation data on the ARTCC controller's display could be up to 6 minutes old. When the WARP is not available, a second system, the narrowband Air Route Surveillance Radar (ARSR) can display two distinct levels of precipitation intensity that will be described to pilots as "MODERATE" (30 to 40 dBZ) and "HEAVY TO EXTREME" (> 40 dBZ). The WARP processor is only used in ARTCC facilities.

5. *ATC radar is not able to detect turbulence.* Generally, turbulence can be expected to occur as the rate of rainfall or intensity of precipitation increases. Turbulence associated with greater rates of rainfall/ precipitation will normally be more severe than any associated with lesser rates of rainfall/precipitation. Turbulence should be expected to occur near convective activity, even in clear air. Thunderstorms are a form of convective activity that imply severe or greater turbulence. Operation within 20 miles of thunderstorms should be approached with great caution, as the severity of turbulence can be markedly greater than the precipitation intensity might indicate.

b. Weather Avoidance Assistance.

1. To the extent possible, controllers will issue pertinent information on weather or chaff areas and assist pilots in avoiding such areas when requested. Pilots should respond to a weather advisory by either acknowledging the advisory or by acknowledging the advisory and requesting an alternative course of action as follows:

(a) Request to deviate off course by stating a heading or degrees, direction of deviation, and approximate number of miles. In this case, when the requested deviation is approved, navigation is at the pilot's prerogative, but must maintain the altitude assigned, and remain within the lateral restrictions issued by ATC.

(b) An approval for lateral deviation authorizes the pilot to maneuver left or right within the limits specified in the clearance.

NOTE–

1. *It is often necessary for ATC to restrict the amount of lateral deviation ("twenty degrees right," "up to fifteen degrees left," "up to ten degrees left or right of course").*

2. *The term "when able, proceed direct," in an ATC weather deviation clearance, refers to the pilot's ability to remain clear of the weather when returning to course/route.*

(c) Request a new route to avoid the affected area.

(d) Request a change of altitude.

(e) Request radar vectors around the affected areas.

2. For obvious reasons of safety, an IFR pilot must not deviate from the course or altitude or flight level without a proper ATC clearance. When weather conditions encountered are so severe that an immediate deviation is determined to be necessary and time will not permit approval by ATC, the pilot's emergency authority may be exercised.

3. When the pilot requests clearance for a route deviation or for an ATC radar vector, the controller must evaluate the air traffic picture in the affected area, and coordinate with other controllers (if ATC jurisdictional boundaries may be crossed) before replying to the request.

4. It should be remembered that the controller's primary function is to provide safe separation between aircraft. Any additional service, such as weather avoidance assistance, can only be provided to the extent that it does not derogate the primary function. It's also worth noting that the separation workload is generally greater than normal when weather disrupts the usual flow of traffic. ATC radar limitations and frequency congestion may also be a factor in limiting the controller's capability to provide additional service.

5. It is very important, therefore, that the request for deviation or radar vector be forwarded to ATC as far in advance as possible. Delay in submitting it may delay or even preclude ATC approval or require that additional restrictions be placed on the clearance. Insofar as possible the following information should be furnished to ATC when requesting clearance to detour around weather activity:

(a) Proposed point where detour will commence.

(b) Proposed route and extent of detour (direction and distance).

(c) Point where original route will be resumed.

(d) Flight conditions (IFR or VFR).

(e) Any further deviation that may become necessary as the flight progresses.

(f) Advise if the aircraft is equipped with functioning airborne radar.

6. To a large degree, the assistance that might be rendered by ATC will depend upon the weather information available to controllers. Due to the extremely transitory nature of severe weather situations, the controller's weather information may be of only limited value if based on weather observed on radar only. Frequent updates by pilots giving specific information as to the area affected, altitudes, intensity and nature of the severe weather can be of considerable value. Such reports are relayed by radio or phone to other pilots and controllers and also receive widespread teletypewriter dissemination.

7. Obtaining IFR clearance or an ATC radar vector to circumnavigate severe weather can often be accommodated more readily in the en route areas away from terminals because there is usually less congestion and, therefore, offer greater freedom of action. In terminal areas, the problem is more acute because of traffic density, ATC coordination requirements, complex departure and arrival routes, adjacent airports, etc. As a consequence, controllers are less likely to be able to accommodate all requests for weather detours in a terminal area or be in a position to volunteer such routing to the pilot. Nevertheless, pilots should not hesitate to advise controllers of any observed severe weather and should specifically advise controllers if they desire circumnavigation of observed weather.

c. Procedures for Weather Deviations and Other Contingencies in Oceanic Controlled Airspace.

1. When the pilot initiates communications with ATC, rapid response may be obtained by stating "WEATHER DEVIATION REQUIRED" to indicate priority is desired on the frequency and for ATC response.

2. The pilot still retains the option of initiating the communications using the urgency call "PAN–PAN" 3 times to alert all listening parties of a special handling condition which will receive ATC priority for issuance of a clearance or assistance.

3. ATC will:

(a) Approve the deviation.

(b) Provide vertical separation and then approve the deviation; or

(c) If ATC is unable to establish vertical separation, ATC must advise the pilot that standard separation cannot be applied; provide essential traffic information for all affected aircraft, to the extent practicable; and if possible, suggest a course of action. ATC may suggest that the pilot climb or descend to a contingency altitude (1,000 feet above or below that assigned if operating above FL 290; 500 feet above or below that assigned if operating at or below FL 290).

PHRASEOLOGY–
STANDARD SEPARATION NOT AVAILABLE, DEVIATE AT PILOT'S DISCRETION; SUGGEST CLIMB (or descent) TO (appropriate altitude); TRAFFIC (position and altitude); REPORT DEVIATION COMPLETE.

4. The pilot will follow the ATC advisory altitude when approximately 10 NM from track as well as execute the procedures detailed in paragraph 7–1–13c5.

5. If contact cannot be established or revised ATC clearance or advisory is not available and deviation from track is required, the pilot must take the following actions:

(a) If possible, deviate away from an organized track or route system.

(b) Broadcast aircraft position and intentions on the frequency in use, as well as on frequency 121.5 MHz at suitable intervals stating: flight identification (operator call sign), flight level, track code or ATS route designator, and extent of deviation expected.

(c) Watch for conflicting traffic both visually and by reference to TCAS (if equipped).

(d) Turn on aircraft exterior lights.

(e) Deviations of less than 10 NM or operations within COMPOSITE (NOPAC and CEPAC) Airspace, should REMAIN at ASSIGNED altitude. Otherwise, when the aircraft is approximately 10 NM from track, initiate an altitude change based on the following criteria:

TBL 7–1–5

Route Centerline/Track	Deviations >10 NM	Altitude Change
East 000 – 179°M	Left Right	Descend 300 Feet Climb 300 Feet
West 180–359°M	Left Right	Climb 300 Feet Descend 300 Feet
Pilot Memory Slogan: "East right up, West right down."		

(f) When returning to track, be at assigned flight level when the aircraft is within approximately 10 NM of centerline.

(g) If contact was not established prior to deviating, continue to attempt to contact ATC to obtain a clearance. If contact was established, continue to keep ATC advised of intentions and obtain essential traffic information.

7–1–14. Runway Visual Range (RVR)

There are currently two configurations of RVR in the NAS commonly identified as Taskers and New Generation RVR. The Taskers are the existing configuration which uses transmissometer technology. The New Generation RVRs were deployed in November 1994 and use forward scatter technology. The New Generation RVRs are currently being deployed in the NAS to replace the existing Taskers.

a. RVR values are measured by transmissometers mounted on 14–foot towers along the runway. A full RVR system consists of:

1. Transmissometer projector and related items.

2. Transmissometer receiver (detector) and related items.

3. Analog

4. recorder.

5. Signal data converter and related items.

6. Remote digital or remote display programmer.

b. The transmissometer projector and receiver are mounted on towers 250 feet apart. A known intensity of light is emitted from the projector and is measured by the receiver. Any obscuring matter such as rain, snow, dust, fog, haze or smoke reduces the light intensity arriving at the receiver. The resultant intensity measurement is then converted to an RVR value by the signal data converter. These values are displayed by readout equipment in the associated air traffic facility and updated approximately once every minute for controller issuance to pilots.

c. The signal data converter receives information on the high intensity runway edge light setting in use (step 3, 4, or 5); transmission values from the transmissometer and the sensing of day or night conditions. From the three data sources, the system will compute appropriate RVR values.

d. An RVR transmissometer established on a 250 foot baseline provides digital readouts to a minimum of 600 feet, which are displayed in 200 foot increments to 3,000 feet and in 500 foot increments from 3,000 feet to a maximum value of 6,000 feet.

e. RVR values for Category IIIa operations extend down to 700 feet RVR; however, only 600 and 800 feet are reportable RVR increments. The 800 RVR reportable value covers a range of 701 feet to 900 feet and is therefore a valid minimum indication of Category IIIa operations.

f. Approach categories with the corresponding minimum RVR values. (See TBL 7−1−6.)

TBL 7−1−6

Approach Category/Minimum RVR Table

Category	Visibility (RVR)
Nonprecision	2,400 feet
Category I	1,800 feet*
Category II	1,000 feet
Category IIIa	700 feet
Category IIIb	150 feet
Category IIIc	0 feet

* 1,400 feet with special equipment and authorization

g. Ten minute maximum and minimum RVR values for the designated RVR runway are reported in the body of the aviation weather report when the prevailing visibility is less than one mile and/or the RVR is 6,000 feet or less. ATCTs report RVR when the prevailing visibility is 1 mile or less and/or the RVR is 6,000 feet or less.

h. Details on the requirements for the operational use of RVR are contained in FAA AC 97−1, "Runway Visual Range (RVR)." Pilots are responsible for compliance with minimums prescribed for their class of operations in the appropriate CFRs and/or operations specifications.

i. RVR values are also measured by forward scatter meters mounted on 14−foot frangible fiberglass poles. A full RVR system consists of:

1. Forward scatter meter with a transmitter, receiver and associated items.

2. A runway light intensity monitor (RLIM).

3. An ambient light sensor (ALS).

4. A data processor unit (DPU).

5. Controller display (CD).

j. The forward scatter meter is mounted on a 14−foot frangible pole. Infrared light is emitted from the transmitter and received by the receiver. Any obscuring matter such as rain, snow, dust, fog, haze or smoke increases the amount of scattered light reaching the receiver. The resulting measurement along with inputs from the runway light intensity monitor and the ambient light sensor are forwarded to the DPU which calculates the proper RVR value. The RVR values are displayed locally and remotely on controller displays.

k. The runway light intensity monitors both the runway edge and centerline light step settings (steps 1 through 5). Centerline light step settings are used for CAT IIIb operations. Edge Light step settings are used for CAT I, II, and IIIa operations.

l. New Generation RVRs can measure and display RVR values down to the lowest limits of Category IIIb operations (150 feet RVR). RVR values are displayed in 100 feet increments and are reported as follows:

1. 100−feet increments for products below 800 feet.

2. 200−feet increments for products between 800 feet and 3,000 feet.

3. 500−feet increments for products between 3,000 feet and 6,500 feet.

4. 25−meter increments for products below 150 meters.

5. 50−meter increments for products between 150 meters and 800 meters.

6. 100−meter increments for products between 800 meters and 1,200 meters.

7. 200−meter increments for products between 1,200 meters and 2,000 meters.

7−1−15. Reporting of Cloud Heights

a. Ceiling, by definition in the CFRs and as used in aviation weather reports and forecasts, is the height above ground (or water) level of the lowest layer of clouds or obscuring phenomenon that is reported as "broken," "overcast," or "obscuration," e.g., an aerodrome forecast (TAF) which reads "BKN030" refers to height above ground level. An area forecast which reads "BKN030" indicates that the height is above mean sea level.

REFERENCE−
AIM, Paragraph 7−1−29, Key to Aerodrome Forecast (TAF) and Aviation Routine Weather Report (METAR), defines "broken," "overcast," and "obscuration."

b. Pilots usually report height values above MSL, since they determine heights by the altimeter. This is taken in account when disseminating and otherwise applying information received from pilots. ("Ceiling" heights are always above ground level.) In reports disseminated as PIREPs, height references are given the same as received from pilots, that is, above MSL.

c. In area forecasts or inflight advisories, ceilings are denoted by the contraction "CIG" when used with sky cover symbols as in "LWRG TO CIG OVC005," or the contraction "AGL" after, the forecast cloud height value. When the cloud base is given in height above MSL, it is so indicated by the contraction "MSL" or "ASL" following the height value. The heights of clouds tops, freezing level, icing, and turbulence are always given in heights above ASL or MSL.

7−1−16. Reporting Prevailing Visibility

a. Surface (horizontal) visibility is reported in METAR reports in terms of statute miles and increments thereof; e.g., $^1/_{16}$, $^1/_8$, $^3/_{16}$, $^1/_4$, $^5/_{16}$, $^3/_8$, $^1/_2$, $^5/_8$, $^3/_4$, $^7/_8$, 1, 1 $^1/_8$, etc. (Visibility reported by an unaugmented automated site is reported differently than in a manual report, i.e., ASOS/AWSS: 0, $^1/_{16}$, $^1/_8$, $^1/_4$, $^1/_2$, $^3/_4$, 1, 1 $^1/_4$, 1 $^1/_2$, 1 $^3/_4$, 2, 2 $^1/_2$, 3, 4, 5, etc., AWOS: M$^1/_4$, $^1/_4$, $^1/_2$, $^3/_4$, 1, 1 $^1/_4$, 1 $^1/_2$, 1 $^3/_4$, 2, 2 $^1/_2$, 3, 4, 5, etc.) Visibility is determined through the ability to see and identify preselected and prominent objects at a known distance from the usual point of observation. Visibilities which are determined to be less than 7 miles, identify the obscuring atmospheric condition; e.g., fog, haze, smoke, etc., or combinations thereof.

b. Prevailing visibility is the greatest visibility equaled or exceeded throughout at least one half of the horizon circle, not necessarily contiguous. Segments of the horizon circle which may have a significantly different visibility may be reported in the remarks section of the weather report; i.e., the southeastern quadrant of the horizon circle may be determined to be 2 miles in mist while the remaining quadrants are determined to be 3 miles in mist.

c. When the prevailing visibility at the usual point of observation, or at the tower level, is less than 4 miles, certificated tower personnel will take visibility observations in addition to those taken at the usual point of observation. The lower of these two values will be used as the prevailing visibility for aircraft operations.

7−1−17. Estimating Intensity of Rain and Ice Pellets

a. Rain

1. Light. From scattered drops that, regardless of duration, do not completely wet an exposed surface up to a condition where individual drops are easily seen.

2. Moderate. Individual drops are not clearly identifiable; spray is observable just above pavements and other hard surfaces.

3. Heavy. Rain seemingly falls in sheets; individual drops are not identifiable; heavy spray to height of several inches is observed over hard surfaces.

b. Ice Pellets

1. Light. Scattered pellets that do not completely cover an exposed surface regardless of duration. Visibility is not affected.

2. Moderate. Slow accumulation on ground. Visibility reduced by ice pellets to less than 7 statute miles.

3. Heavy. Rapid accumulation on ground. Visibility reduced by ice pellets to less than 3 statute miles.

7−1−18. Estimating Intensity of Snow or Drizzle (Based on Visibility)

a. Light. Visibility more than $^1/_2$ statute mile.

b. Moderate. Visibility from more than $^1/_4$ statute mile to $^1/_2$ statute mile.

c. Heavy. Visibility $^1/_4$ statute mile or less.

7−1−19. Pilot Weather Reports (PIREPs)

a. FAA air traffic facilities are required to solicit PIREPs when the following conditions are reported or forecast: ceilings at or below 5,000 feet; visibility at or below 5 miles (surface or aloft); thunderstorms and related phenomena; icing of light degree or greater; turbulence of moderate degree or greater; wind shear and reported or forecast volcanic ash clouds.

b. Pilots are urged to cooperate and promptly volunteer reports of these conditions and other atmospheric data such as: cloud bases, tops and layers; flight visibility; precipitation; visibility restrictions such as haze, smoke and dust; wind at altitude; and temperature aloft.

c. PIREPs should be given to the ground facility with which communications are established; i.e., FSS, ARTCC, or terminal ATC. One of the primary duties of the Inflight position is to serve as a collection point for the exchange of PIREPs with en route aircraft.

d. If pilots are not able to make PIREPs by radio, reporting upon landing of the inflight conditions encountered to the nearest FSS or Weather Forecast Office will be helpful. Some of the uses made of the reports are:

1. The ATCT uses the reports to expedite the flow of air traffic in the vicinity of the field and for hazardous weather avoidance procedures.

2. The FSS uses the reports to brief other pilots, to provide inflight advisories, and weather avoidance information to en route aircraft.

3. The ARTCC uses the reports to expedite the flow of en route traffic, to determine most favorable altitudes, and to issue hazardous weather information within the center's area.

4. The NWS uses the reports to verify or amend conditions contained in aviation forecast and advisories. In some cases, pilot reports of hazardous conditions are the triggering mechanism for the issuance of advisories. They also use the reports for pilot weather briefings.

5. The NWS, other government organizations, the military, and private industry groups use PIREPs for research activities in the study of meteorological phenomena.

6. All air traffic facilities and the NWS forward the reports received from pilots into the weather distribution system to assure the information is made available to all pilots and other interested parties.

e. The FAA, NWS, and other organizations that enter PIREPs into the weather reporting system use the format listed in TBL 7−1−7. Items 1 through 6 are included in all transmitted PIREPs along with one or more of items 7 through 13. Although the PIREP should be as complete and concise as possible, pilots should not be overly concerned with strict format or phraseology. The important thing is that the information is relayed so other pilots may benefit from your observation. If a portion of the report needs clarification, the ground station will request the information. Completed PIREPs will be transmitted to weather circuits as in the following examples:

EXAMPLE−
1. *KCMH UA /OV APE 230010/TM 1516/FL085/TP BE20/SK BKN065/WX FV03SM HZ FU/TA 20/TB LGT*

NOTE−
1. *One zero miles southwest of Appleton VOR; time 1516 UTC; altitude eight thousand five hundred; aircraft type BE200; bases of the broken cloud layer is six thousand five hundred; flight visibility 3 miles with haze and smoke; air temperature 20 degrees Celsius; light turbulence.*

EXAMPLE−
2. *KCRW UV /OV KBKW 360015−KCRW/TM 1815/FL120//TP BE99/SK IMC/WX RA/TA M08 /WV 290030/TB LGT−MDT/IC LGT RIME/RM MDT MXD ICG DURC KROA NWBND FL080−100 1750Z*

NOTE−
2. *From 15 miles north of Beckley VOR to Charleston VOR; time 1815 UTC; altitude 12,000 feet; type aircraft, BE−99; in clouds; rain; temperature minus 8 Celsius; wind 290 degrees magnetic at 30 knots; light to moderate turbulence; light rime icing during climb northwestbound from Roanoke, VA, between 8,000 and 10,000 feet at 1750 UTC.*

TBL 7−1−7

PIREP Element Code Chart

	PIREP ELEMENT	PIREP CODE	CONTENTS
1.	3−letter station identifier	XXX	Nearest weather reporting location to the reported phenomenon
2.	Report type	UA or UUA	Routine or Urgent PIREP
3.	Location	/OV	In relation to a VOR
4.	Time	/TM	Coordinated Universal Time
5.	Altitude	/FL	Essential for turbulence and icing reports
6.	Type Aircraft	/TP	Essential for turbulence and icing reports
7.	Sky cover	/SK	Cloud height and coverage (sky clear, few, scattered, broken, or overcast)
8.	Weather	/WX	Flight visibility, precipitation, restrictions to visibility, etc.
9.	Temperature	/TA	Degrees Celsius
10.	Wind	/WV	Direction in degrees magnetic north and speed in knots
11.	Turbulence	/TB	See AIM paragraph 7−1−22
12.	Icing	/IC	See AIM paragraph 7−1−20
13.	Remarks	/RM	For reporting elements not included or to clarify previously reported items

7−1−20. PIREPs Relating to Airframe Icing

a. The effects of ice on aircraft are cumulative-thrust is reduced, drag increases, lift lessens, and weight increases. The results are an increase in stall speed and a deterioration of aircraft performance. In extreme cases, 2 to 3 inches of ice can form on the leading edge of the airfoil in less than 5 minutes. It takes but $^1/_2$ inch of ice to reduce the lifting power of some aircraft by 50 percent and increases the frictional drag by an equal percentage.

b. A pilot can expect icing when flying in visible precipitation, such as rain or cloud droplets, and the temperature is between +02 and −10 degrees Celsius. When icing is detected, a pilot should do one of two things, particularly if the aircraft is not equipped with deicing equipment; get out of the area of precipitation; or go to an altitude where the temperature is above freezing. This "warmer" altitude may not always be a lower altitude. Proper preflight action includes obtaining information on the freezing level and the above freezing levels in precipitation areas. Report icing to ATC, and if operating IFR, request new routing or altitude if icing will be a hazard. Be sure to give the type of aircraft to ATC when reporting icing. The following describes how to report icing conditions.

1. Trace. Ice becomes perceptible. Rate of accumulation slightly greater than sublimation. Deicing/anti-icing equipment is not utilized unless encountered for an extended period of time (over 1 hour).

2. Light. The rate of accumulation may create a problem if flight is prolonged in this environment (over 1 hour). Occasional use of deicing/anti-icing equipment removes/prevents accumulation. It does not present a problem if the deicing/anti-icing equipment is used.

3. Moderate. The rate of accumulation is such that even short encounters become potentially hazardous and use of deicing/anti-icing equipment or flight diversion is necessary.

4. Severe. The rate of accumulation is such that ice protection systems fail to remove the accumulation of ice, or ice accumulates in locations not normally prone to icing, such as areas aft of protected surfaces and any other areas identified by the manufacturer. Immediate exit from the condition is necessary.

NOTE−
Severe icing is aircraft dependent, as are the other categories of icing intensity. Severe icing may occur at any accumulation rate.

EXAMPLE−
Pilot report: give aircraft identification, location, time (UTC), intensity of type, altitude/FL, aircraft type, indicated air speed (IAS), and outside air temperature (OAT).

NOTE−
1. *Rime ice. Rough, milky, opaque ice formed by the instantaneous freezing of small supercooled water droplets.*

2. *Clear ice. A glossy, clear, or translucent ice formed by the relatively slow freezing of large supercooled water droplets.*

3. *The OAT should be requested by the FSS or ATC if not included in the PIREP.*

7−1−21. Definitions of Inflight Icing Terms

See TBL 7−1−8, Icing Types, and TBL 7−1−9, Icing Conditions.

TBL 7−1−8
Icing Types

Clear Ice	See Glaze Ice.
Glaze Ice	Ice, sometimes clear and smooth, but usually containing some air pockets, which results in a lumpy translucent appearance. Glaze ice results from supercooled drops/droplets striking a surface but not freezing rapidly on contact. Glaze ice is denser, harder, and sometimes more transparent than rime ice. Factors, which favor glaze formation, are those that favor slow dissipation of the heat of fusion (i.e., slight supercooling and rapid accretion). With larger accretions, the ice shape typically includes “horns” protruding from unprotected leading edge surfaces. It is the ice shape, rather than the clarity or color of the ice, which is most likely to be accurately assessed from the cockpit. The terms “clear” and “glaze” have been used for essentially the same type of ice accretion, although some reserve “clear” for thinner accretions which lack horns and conform to the airfoil.
Intercycle Ice	Ice which accumulates on a protected surface between actuation cycles of a deicing system.
Known or Observed or Detected Ice Accretion	Actual ice observed visually to be on the aircraft by the flight crew or identified by on−board sensors.
Mixed Ice	Simultaneous appearance or a combination of rime and glaze ice characteristics. Since the clarity, color, and shape of the ice will be a mixture of rime and glaze characteristics, accurate identification of mixed ice from the cockpit may be difficult.
Residual Ice	Ice which remains on a protected surface immediately after the actuation of a deicing system.
Rime Ice	A rough, milky, opaque ice formed by the rapid freezing of supercooled drops/droplets after they strike the aircraft. The rapid freezing results in air being trapped, giving the ice its opaque appearance and making it porous and brittle. Rime ice typically accretes along the stagnation line of an airfoil and is more regular in shape and conformal to the airfoil than glaze ice. It is the ice shape, rather than the clarity or color of the ice, which is most likely to be accurately assessed from the cockpit.
Runback Ice	Ice which forms from the freezing or refreezing of water leaving protected surfaces and running back to unprotected surfaces.
Note− *Ice types are difficult for the pilot to discern and have uncertain effects on an airplane in flight. Ice type definitions will be included in the AIM for use in the “Remarks” section of the PIREP and for use in forecasting.*	

TBL 7−1−9

Icing Conditions

Appendix C Icing Conditions	Appendix C (14 CFR, Part 25 and 29) is the certification icing condition standard for approving ice protection provisions on aircraft. The conditions are specified in terms of altitude, temperature, liquid water content (LWC), representative droplet size (mean effective drop diameter [MED]), and cloud horizontal extent.
Forecast Icing Conditions	Environmental conditions expected by a National Weather Service or an FAA−approved weather provider to be conducive to the formation of inflight icing on aircraft.
Freezing Drizzle (FZDZ)	Drizzle is precipitation at ground level or aloft in the form of liquid water drops which have diameters less than 0.5 mm and greater than 0.05 mm. Freezing drizzle is drizzle that exists at air temperatures less than 0°C (supercooled), remains in liquid form, and freezes upon contact with objects on the surface or airborne.
Freezing Precipitation	Freezing precipitation is freezing rain or freezing drizzle falling through or outside of visible cloud.
Freezing Rain (FZRA)	Rain is precipitation at ground level or aloft in the form of liquid water drops which have diameters greater than 0.5 mm. Freezing rain is rain that exists at air temperatures less than 0°C (supercooled), remains in liquid form, and freezes upon contact with objects on the ground or in the air.
Icing in Cloud	Icing occurring within visible cloud. Cloud droplets (diameter < 0.05 mm) will be present; freezing drizzle and/or freezing rain may or may not be present.
Icing in Precipitation	Icing occurring from an encounter with freezing precipitation, that is, supercooled drops with diameters exceeding 0.05 mm, within or outside of visible cloud.
Known Icing Conditions	Atmospheric conditions in which the formation of ice is observed or detected in flight. ***Note−*** *Because of the variability in space and time of atmospheric conditions, the existence of a report of observed icing does not assure the presence or intensity of icing conditions at a later time, nor can a report of no icing assure the absence of icing conditions at a later time.*
Potential Icing Conditions	Atmospheric icing conditions that are typically defined by airframe manufacturers relative to temperature and visible moisture that may result in aircraft ice accretion on the ground or in flight. The potential icing conditions are typically defined in the Airplane Flight Manual or in the Airplane Operation Manual.
Supercooled Drizzle Drops (SCDD)	Synonymous with freezing drizzle aloft.
Supercooled Drops or /Droplets	Water drops/droplets which remain unfrozen at temperatures below 0 °C. Supercooled drops are found in clouds, freezing drizzle, and freezing rain in the atmosphere. These drops may impinge and freeze after contact on aircraft surfaces.
Supercooled Large Drops (SLD)	Liquid droplets with diameters greater than 0.05 mm at temperatures less than 0°C, i.e., freezing rain or freezing drizzle.

7-1-22. PIREPs Relating to Turbulence

a. When encountering turbulence, pilots are urgently requested to report such conditions to ATC as soon as practicable. PIREPs relating to turbulence should state:

1. Aircraft location.

2. Time of occurrence in UTC.

3. Turbulence intensity.

4. Whether the turbulence occurred in or near clouds.

5. Aircraft altitude or flight level.

6. Type of aircraft.

7. Duration of turbulence.

EXAMPLE-

1. *Over Omaha, 1232Z, moderate turbulence in clouds at Flight Level three one zero, Boeing 707.*

2. *From five zero miles south of Albuquerque to three zero miles north of Phoenix, 1250Z, occasional moderate chop at Flight Level three three zero, DC8.*

b. Duration and classification of intensity should be made using TBL 7-1-10.

TBL 7-1-10

Turbulence Reporting Criteria Table

<table>
<tr><th>Intensity</th><th>Aircraft Reaction</th><th>Reaction Inside Aircraft</th><th>Reporting Term-Definition</th></tr>
<tr><td>Light</td><td>Turbulence that momentarily causes slight, erratic changes in altitude and/or attitude (pitch, roll, yaw). Report as Light Turbulence; [1]
or
Turbulence that causes slight, rapid and somewhat rhythmic bumpiness without appreciable changes in altitude or attitude. Report as Light Chop.</td><td>Occupants may feel a slight strain against seat belts or shoulder straps. Unsecured objects may be displaced slightly. Food service may be conducted and little or no difficulty is encountered in walking.</td><td>Occasional-Less than $^{1}/_{3}$ of the time.

Intermittent-$^{1}/_{3}$ to $^{2}/_{3}$.

Continuous-More than $^{2}/_{3}$.</td></tr>
<tr><td>Moderate</td><td>Turbulence that is similar to Light Turbulence 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. Report as Moderate Turbulence; [1]
or
Turbulence that is similar to Light Chop but of greater intensity. It causes rapid bumps or jolts without appreciable changes in aircraft altitude or attitude. Report as Moderate Chop.[1]</td><td>Occupants feel definite strains against seat belts or shoulder straps. Unsecured objects are dislodged. Food service and walking are difficult.</td><td rowspan="3">NOTE
1. Pilots should report location(s), time (UTC), intensity, whether in or near clouds, altitude, type of aircraft and, when applicable, duration of turbulence.

2. Duration may be based on time between two locations or over a single location. All locations should be readily identifiable.

EXAMPLES:
a. Over Omaha. 1232Z, Moderate Turbulence, in cloud, Flight Level 310, B707.

b. From 50 miles south of Albuquerque to 30 miles north of Phoenix, 1210Z to 1250Z, occasional Moderate Chop, Flight Level 330, DC8.</td></tr>
<tr><td>Severe</td><td>Turbulence that causes large, abrupt changes in altitude and/or attitude. It usually causes large variations in indicated airspeed. Aircraft may be momentarily out of control. Report as Severe Turbulence. [1]</td><td>Occupants are forced violently against seat belts or shoulder straps. Unsecured objects are tossed about. Food Service and walking are impossible.</td></tr>
<tr><td>Extreme</td><td>Turbulence in which the aircraft is violently tossed about and is practically impossible to control. It may cause structural damage. Report as Extreme Turbulence. [1]</td><td></td></tr>
<tr><td colspan="4">[1] High level turbulence (normally above 15,000 feet ASL) not associated with cumuliform cloudiness, including thunderstorms, should be reported as CAT (clear air turbulence) preceded by the appropriate intensity, or light or moderate chop.</td></tr>
</table>

7−1−23. Wind Shear PIREPs

a. Because unexpected changes in wind speed and direction can be hazardous to aircraft operations at low altitudes on approach to and departing from airports, pilots are urged to promptly volunteer reports to controllers of wind shear conditions they encounter. An advance warning of this information will assist other pilots in avoiding or coping with a wind shear on approach or departure.

b. When describing conditions, use of the terms "negative" or "positive" wind shear should be avoided. PIREPs of "negative wind shear on final," intended to describe loss of airspeed and lift, have been interpreted to mean that no wind shear was encountered. The recommended method for wind shear reporting is to state the loss or gain of airspeed and the altitudes at which it was encountered.

EXAMPLE−

1. *Denver Tower, Cessna 1234 encountered wind shear, loss of 20 knots at 400.*

2. *Tulsa Tower, American 721 encountered wind shear on final, gained 25 knots between 600 and 400 feet followed by loss of 40 knots between 400 feet and surface.*

1. Pilots who are not able to report wind shear in these specific terms are encouraged to make reports in terms of the effect upon their aircraft.

EXAMPLE−

Miami Tower, Gulfstream 403 Charlie encountered an abrupt wind shear at 800 feet on final, max thrust required.

2. Pilots using Inertial Navigation Systems (INSs) should report the wind and altitude both above and below the shear level.

7−1−24. Clear Air Turbulence (CAT) PIREPs

CAT has become a very serious operational factor to flight operations at all levels and especially to jet traffic flying in excess of 15,000 feet. The best available information on this phenomenon must come from pilots via the PIREP reporting procedures. All pilots encountering CAT conditions are urgently requested to report time, location, and intensity (light, moderate, severe, or extreme) of the element to the FAA facility with which they are maintaining radio contact. If time and conditions permit, elements should be reported according to the standards for other PIREPs and position reports.

REFERENCE−

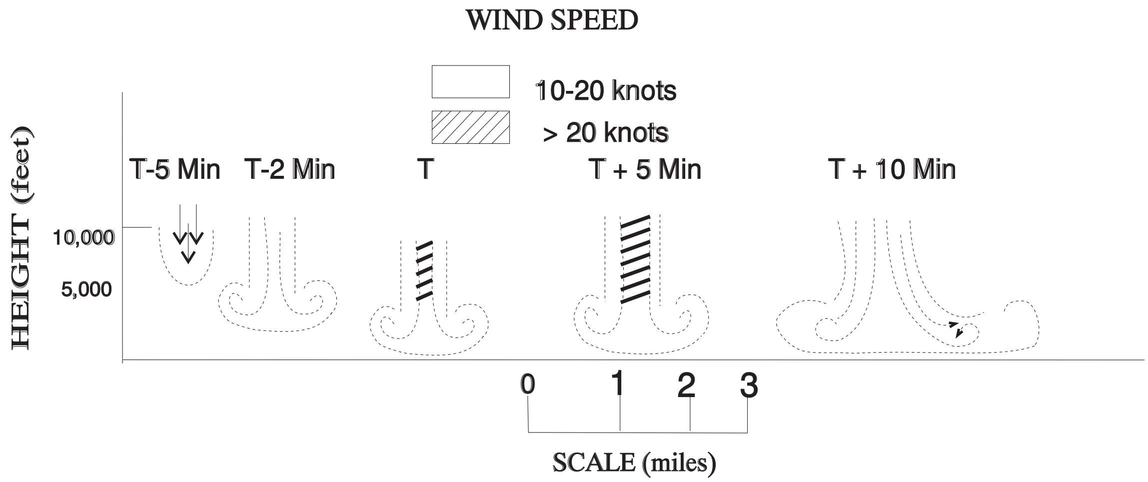
AIM, Paragraph 7−1−22 , PIREPs Relating to Turbulence

7−1−25. Microbursts

a. Relatively recent meteorological studies have confirmed the existence of microburst phenomenon. Microbursts are small scale intense downdrafts which, on reaching the surface, spread outward in all directions from the downdraft center. This causes the presence of both vertical and horizontal wind shears that can be extremely hazardous to all types and categories of aircraft, especially at low altitudes. Due to their small size, short life span, and the fact that they can occur over areas without surface precipitation, microbursts are not easily detectable using conventional weather radar or wind shear alert systems.

b. Parent clouds producing microburst activity can be any of the low or middle layer convective cloud types. Note, however, that microbursts commonly occur within the heavy rain portion of thunderstorms, and in much weaker, benign appearing convective cells that have little or no precipitation reaching the ground.

FIG 7-1-10
Evolution of a Microburst



Vertical cross section of the evolution of a microburst wind field. T is the time of initial divergence at the surface. The shading refers to the vector wind speeds. Figure adapted from Wilson et al., 1984, Microburst Wind Structure and Evaluation of Doppler Radar for Wind Shear Detection, DOT/FAA Report No. DOT/FAA/PM-84/29, National Technical Information Service, Springfield, VA 37 pp.

c. The life cycle of a microburst as it descends in a convective rain shaft is seen in FIG 7-1-10. An important consideration for pilots is the fact that the microburst intensifies for about 5 minutes after it strikes the ground.

d. Characteristics of microbursts include:

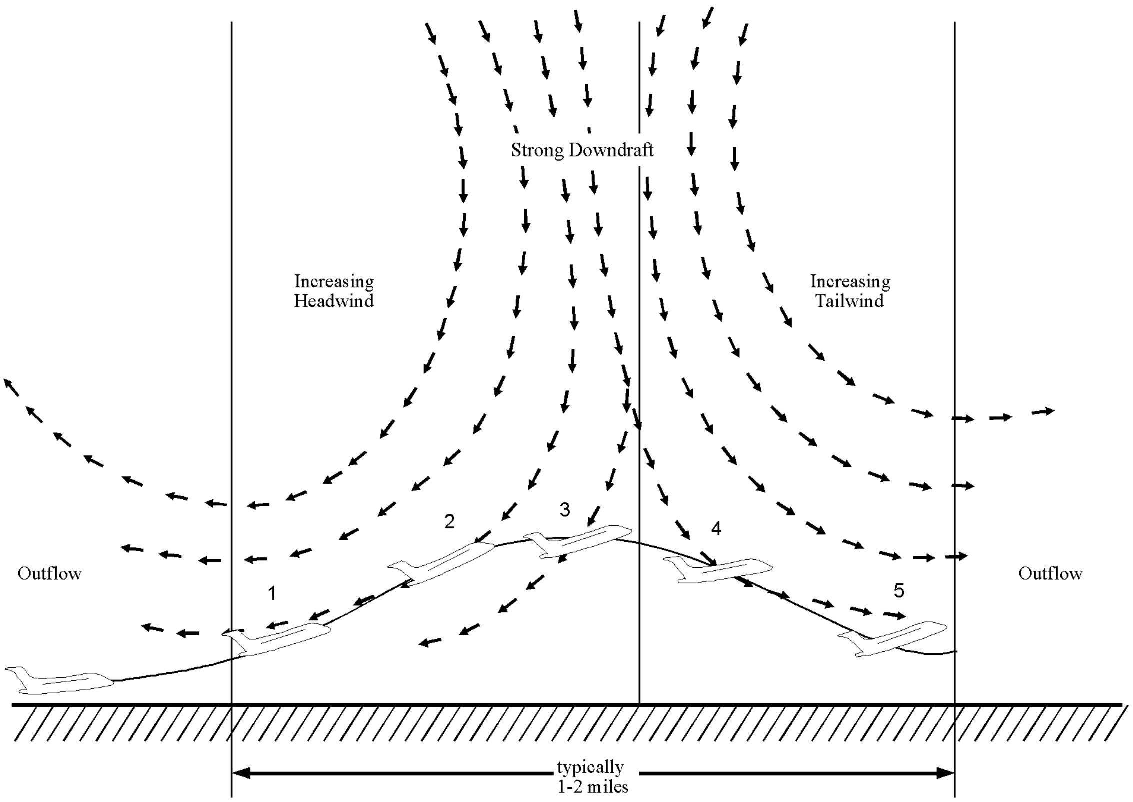
1. Size. The microburst downdraft is typically less than 1 mile in diameter as it descends from the cloud base to about 1,000-3,000 feet above the ground. In the transition zone near the ground, the downdraft changes to a horizontal outflow that can extend to approximately 2 $^{1}/_{2}$ miles in diameter.

2. Intensity. The downdrafts can be as strong as 6,000 feet per minute. Horizontal winds near the surface can be as strong as 45 knots resulting in a 90 knot shear (headwind to tailwind change for a traversing aircraft) across the microburst. These strong horizontal winds occur within a few hundred feet of the ground.

3. Visual Signs. Microbursts can be found almost anywhere that there is convective activity. They may be embedded in heavy rain associated with a thunderstorm or in light rain in benign appearing virga. When there is little or no precipitation at the surface accompanying the microburst, a ring of blowing dust may be the only visual clue of its existence.

4. Duration. An individual microburst will seldom last longer than 15 minutes from the time it strikes the ground until dissipation. The horizontal winds continue to increase during the first 5 minutes with the maximum intensity winds lasting approximately 2-4 minutes. Sometimes microbursts are concentrated into a line structure, and under these conditions, activity may continue for as long as an hour. Once microburst activity starts, multiple microbursts in the same general area are not uncommon and should be expected.

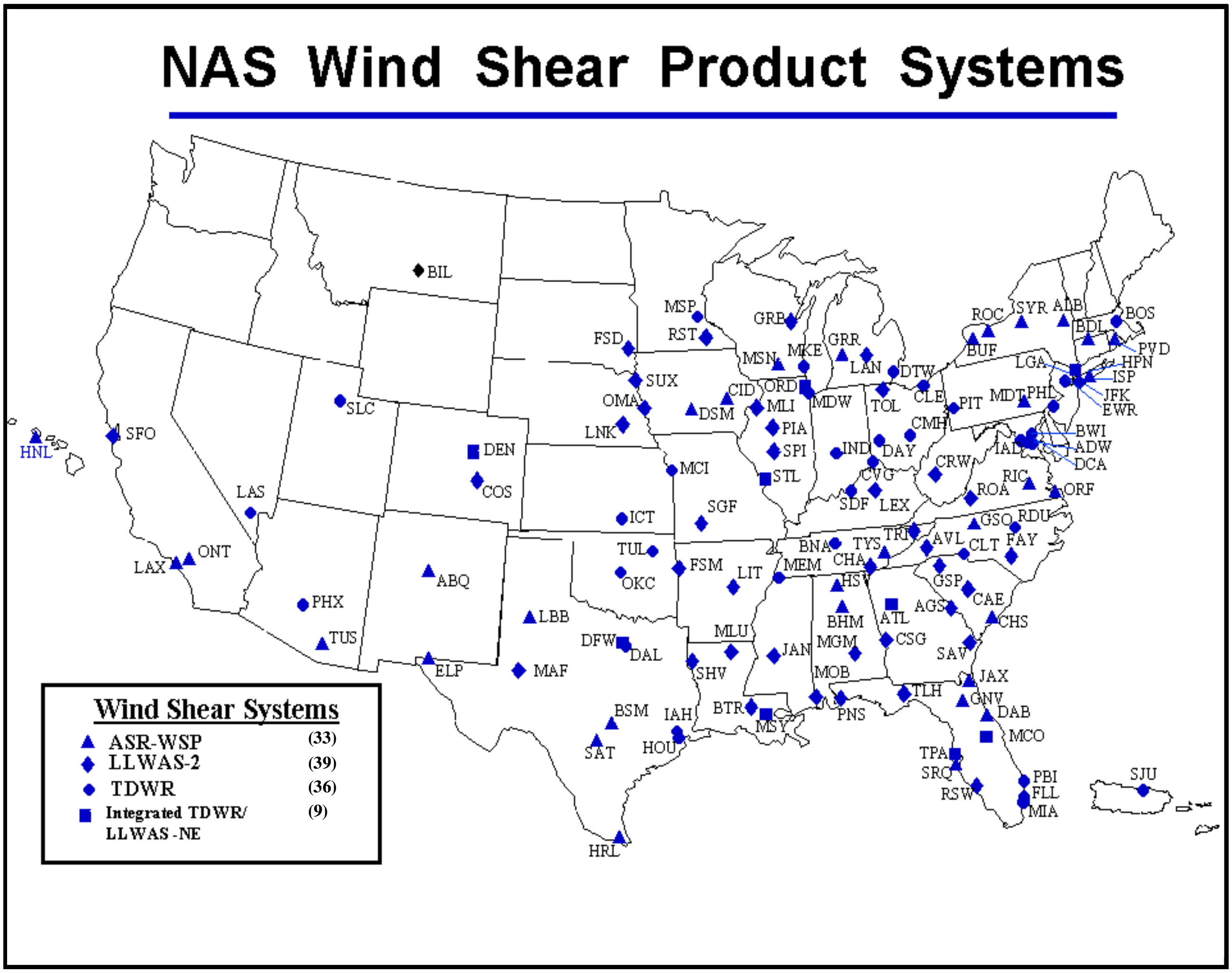
FIG 7−1−11
Microburst Encounter During Takeoff



A microburst encounter during takeoff. The airplane first encounters a headwind and experiences increasing performance (1), this is followed in short succession by a decreasing headwind component (2), a downdraft (3), and finally a strong tailwind (4), where 2 through 5 all result in decreasing performance of the airplane. Position (5) represents an extreme situation just prior to impact. Figure courtesy of Walter Frost, FWG Associates, Inc., Tullahoma, Tennessee.

e. Microburst wind shear may create a severe hazard for aircraft within 1,000 feet of the ground, particularly during the approach to landing and landing and take-off phases. The impact of a microburst on aircraft which have the unfortunate experience of penetrating one is characterized in FIG 7−1−11. The aircraft may encounter a headwind (performance increasing) followed by a downdraft and tailwind (both performance decreasing), possibly resulting in terrain impact.

FIG 7−1−12
NAS Wind Shear Product Systems



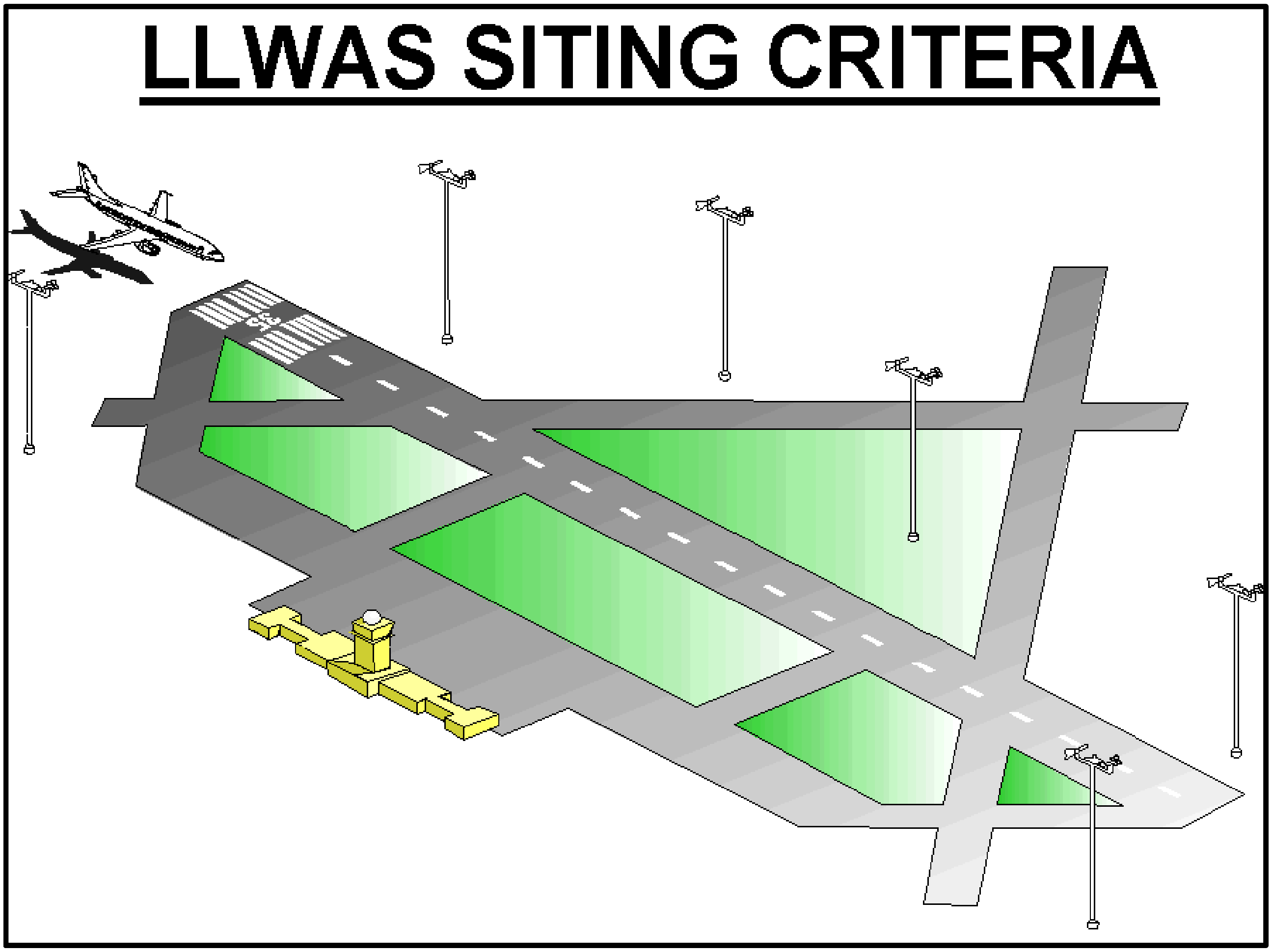
f. Detection of Microbursts, Wind Shear and Gust Fronts.

1. FAA's Integrated Wind Shear Detection Plan.

(a) The FAA currently employs an integrated plan for wind shear detection that will significantly improve both the safety and capacity of the majority of the airports currently served by the air carriers. This plan integrates several programs, such as the Integrated Terminal Weather System (ITWS), Terminal Doppler Weather Radar (TDWR), Weather System Processor (WSP), and Low Level Wind Shear Alert Systems (LLWAS) into a single strategic concept that significantly improves the aviation weather information in the terminal area. (See FIG 7−1−12.)

(b) The wind shear/microburst information and warnings are displayed on the ribbon display terminals (RBDT) located in the tower cabs. They are identical (and standardized) in the LLWAS, TDWR and WSP systems, and so designed that the controller does not need to interpret the data, but simply read the displayed information to the pilot. The RBDTs are constantly monitored by the controller to ensure the rapid and timely dissemination of any hazardous event(s) to the pilot.

FIG 7−1−13
LLWAS Siting Criteria

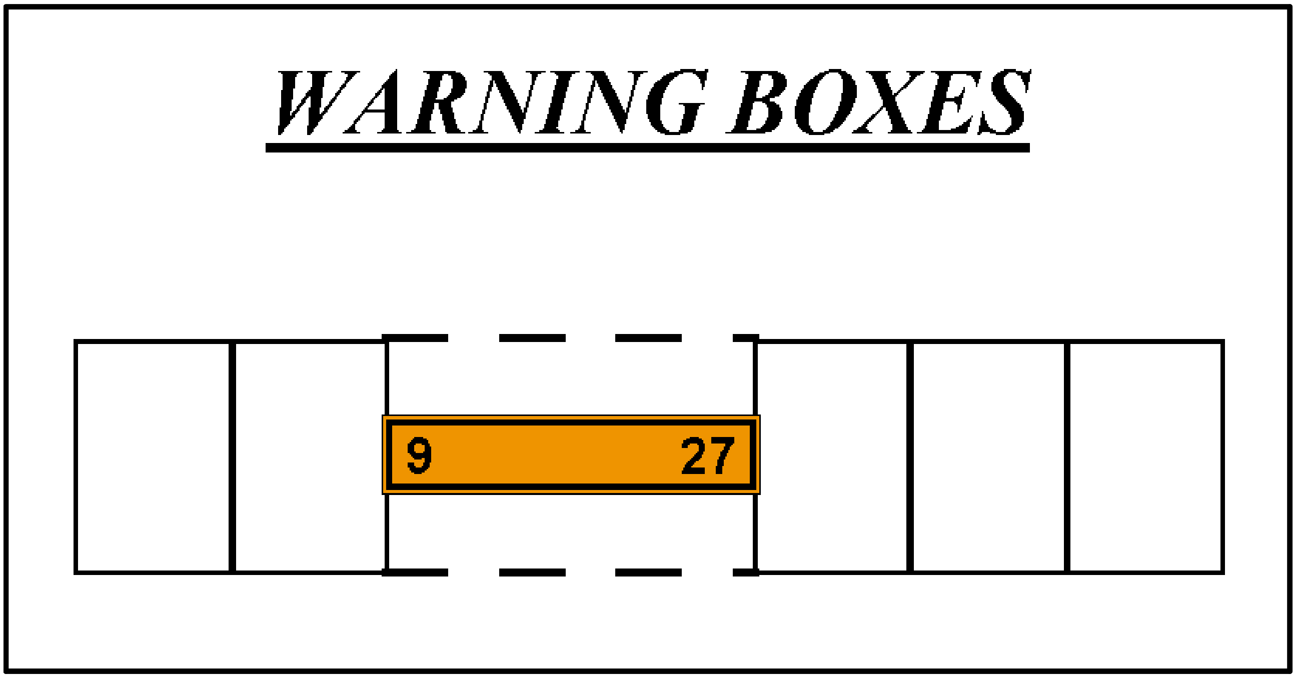


(c) The early detection of a wind shear/ micro−burst event, and the subsequent warning(s) issued to an aircraft on approach or departure, will alert the pilot/crew to the potential of, and to be prepared for, a situation that could become very dangerous! Without these warnings, the aircraft may NOT be able to climb out of, or safely transition, the event, resulting in a catastrophe. The air carriers, working with the FAA, have developed specialized training programs using their simulators to train and prepare their pilots on the demanding aircraft procedures required to escape these very dangerous wind shear and/or microburst encounters.

2. Low Level Wind Shear Alert System (LLWAS).

(a) The LLWAS provides wind data and software processes to detect the presence of hazardous wind shear and microbursts in the vicinity of an airport. Wind sensors, mounted on poles sometimes as high as 150 feet, are (ideally) located 2,000 − 3,500 feet, but not more than 5,000 feet, from the centerline of the runway. (See FIG 7−1−13.)

FIG 7-1-14
Warning Boxes



(b) LLWAS was fielded in 1988 at 110 airports across the nation. Many of these systems have been replaced by new TDWR and WSP technology. Eventually all LLWAS systems will be phased out; however, 39 airports will be upgraded to the LLWAS-NE (Network Expansion) system, which employs the very latest software and sensor technology. The new LLWAS-NE systems will not only provide the controller with wind shear warnings and alerts, including wind shear/microburst detection at the airport wind sensor location, but will also provide the location of the hazards relative to the airport runway(s). It will also have the flexibility and capability to grow with the airport as new runways are built. As many as 32 sensors, strategically located around the airport and in relationship to its runway configuration, can be accommodated by the LLWAS-NE network.

3. Terminal Doppler Weather Radar (TDWR).

(a) TDWRs are being deployed at 45 locations across the U.S. Optimum locations for TDWRs are 8 to 12 miles off of the airport proper, and designed to look at the airspace around and over the airport to detect microbursts, gust fronts, wind shifts and precipitation intensities. TDWR products advise the controller of wind shear and microburst events impacting all runways and the areas $^{1}/_{2}$ mile on either side of the extended centerline of the runways out to 3 miles on final approach and 2 miles out on departure.
(FIG 7-1-14 is a theoretical view of the warning boxes, including the runway, that the software uses in determining the location(s) of wind shear or microbursts). These warnings are displayed (as depicted in the examples in subparagraph 5) on the RBDT.

(b) It is very important to understand what TDWR does NOT DO:

(1) It **DOES NOT** warn of wind shear outside of the alert boxes (on the arrival and departure ends of the runways);

(2) It **DOES NOT** detect wind shear that is NOT a microburst or a gust front;

(3) It **DOES NOT** detect gusty or cross wind conditions; and

(4) It **DOES NOT** detect turbulence.

However, research and development is continuing on these systems. Future improvements may include such areas as storm motion (movement), improved gust front detection, storm growth and decay, microburst prediction, and turbulence detection.

(c) TDWR also provides a geographical situation display (GSD) for supervisors and traffic management specialists for planning purposes. The GSD displays (in color) 6 levels of weather (precipitation), gust fronts and predicted storm movement(s). This data is used by the tower supervisor(s), traffic management specialists and controllers to plan for runway changes and arrival/departure route changes in order to both reduce aircraft delays and increase airport capacity.

4. Weather System Processor (WSP).

(a) The WSP provides the controller, supervisor, traffic management specialist, and ultimately the pilot, with the same products as the terminal doppler weather radar (TDWR) at a fraction of the cost of a TDWR. This is accomplished by utilizing new technologies to access the weather channel capabilities of the existing ASR−9 radar located on or near the airport, thus eliminating the requirements for a separate radar location, land acquisition, support facilities and the associated communication landlines and expenses.

(b) The WSP utilizes the same RBDT display as the TDWR and LLWAS, and, just like TDWR, also has a GSD for planning purposes by supervisors, traffic management specialists and controllers. The WSP GSD emulates the TDWR display, i.e., it also depicts 6 levels of precipitation, gust fronts and predicted storm movement, and like the TDWR GSD, is used to plan for runway changes and arrival/departure route changes in order to reduce aircraft delays and to increase airport capacity.

(c) This system is currently under development and is operating in a developmental test status at the Albuquerque, New Mexico, airport. When fielded, the WSP is expected to be installed at 34 airports across the nation, substantially increasing the safety of the American flying public.

5. Operational aspects of LLWAS, TDWR and WSP.

To demonstrate how this data is used by both the controller and the pilot, 3 ribbon display examples and their explanations are presented:

(a) MICROBURST ALERTS

EXAMPLE−
This is what the controller sees on his/her ribbon display in the tower cab.

27A MBA 35K− 2MF 250 20

NOTE−
(See FIG 7−1−15 to see how the TDWR/WSP determines the microburst location).

This is what the controller will say when issuing the alert.

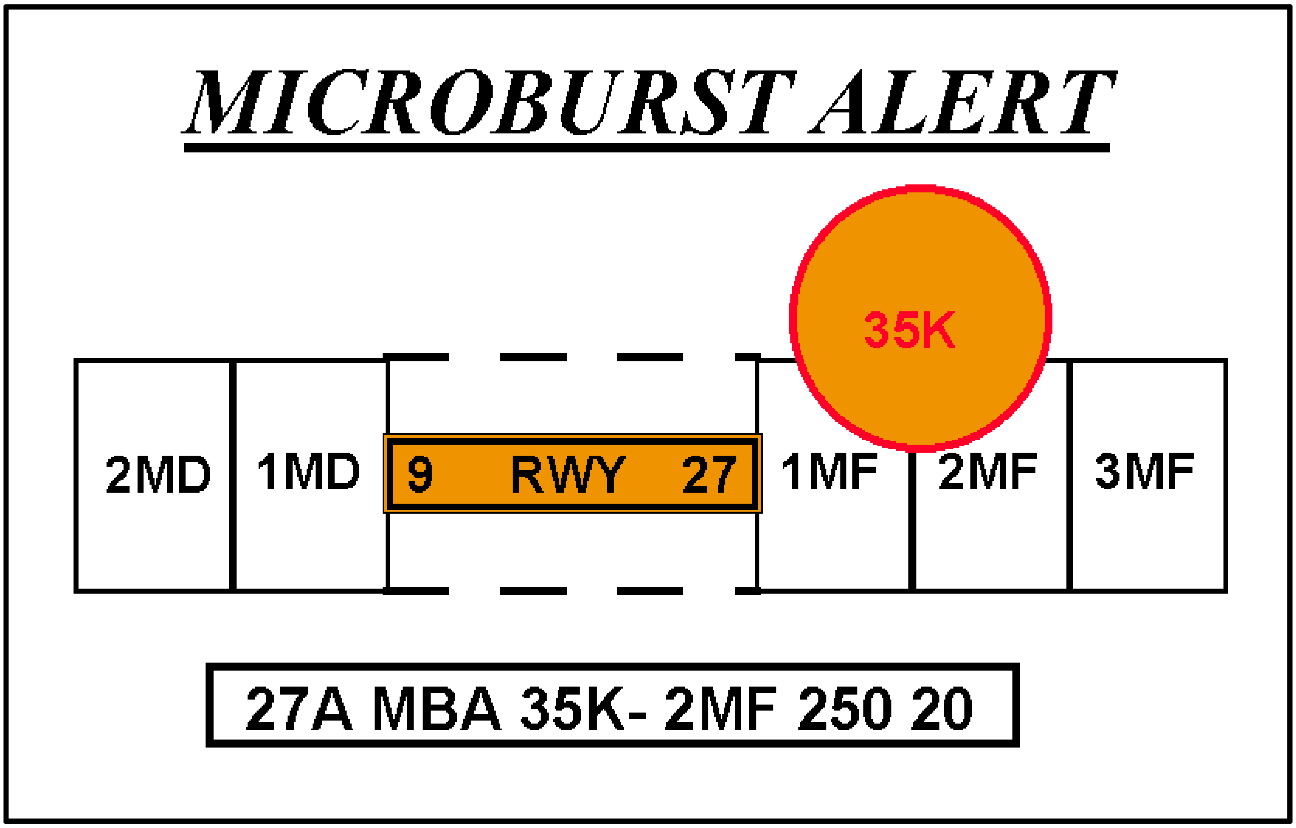
PHRASEOLOGY−
RUNWAY 27 ARRIVAL, MICROBURST ALERT, 35 KT LOSS 2 MILE FINAL, THRESHOLD WIND 250 AT 20.

In plain language, the controller is telling the pilot that on approach to runway 27, there is a microburst alert on the approach lane to the runway, and to anticipate or expect a 35 knot loss of airspeed at approximately 2 miles out on final approach (where it will first encounter the phenomena). With that information, the aircrew is forewarned, and should be prepared to apply wind shear/microburst escape procedures should they decide to continue the approach. Additionally, the surface winds at the airport for landing runway 27 are reported as 250 degrees at 20 knots.

NOTE−
Threshold wind is at pilot's request or as deemed appropriate by the controller.

REFERENCE−
FAA Order 7110.65, Paragraph 3−1−8b2(a), Air Traffic Control, Low Level Wind Shear/Microburst Advisories

FIG 7-1-15
Microburst Alert



(b) **WIND SHEAR ALERTS**

EXAMPLE-
This is what the controller sees on his/her ribbon display in the tower cab.

27A WSA 20K- 3MF 200 15

NOTE-
(See FIG 7-1-16 to see how the TDWR/WSP determines the wind shear location).

This is what the controller will say when issuing the alert.

PHRASEOLOGY-
RUNWAY 27 ARRIVAL, WIND SHEAR ALERT, 20 KT LOSS 3 MILE FINAL, THRESHOLD WIND 200 AT 15.

In plain language, the controller is advising the aircraft arriving on runway 27 that at about 3 miles out they can expect to encounter a wind shear condition that will decrease their airspeed by 20 knots and possibly encounter turbulence. Additionally, the airport surface winds for landing runway 27 are reported as 200 degrees at 15 knots.

NOTE-
Threshold wind is at pilot's request or as deemed appropriate by the controller.

REFERENCE-
FAA Order 7110.65, Air Traffic Control, Low Level Wind Shear/Microburst Advisories, Paragraph 3-1-8b2(a).

FIG 7-1-16
Weak Microburst Alert

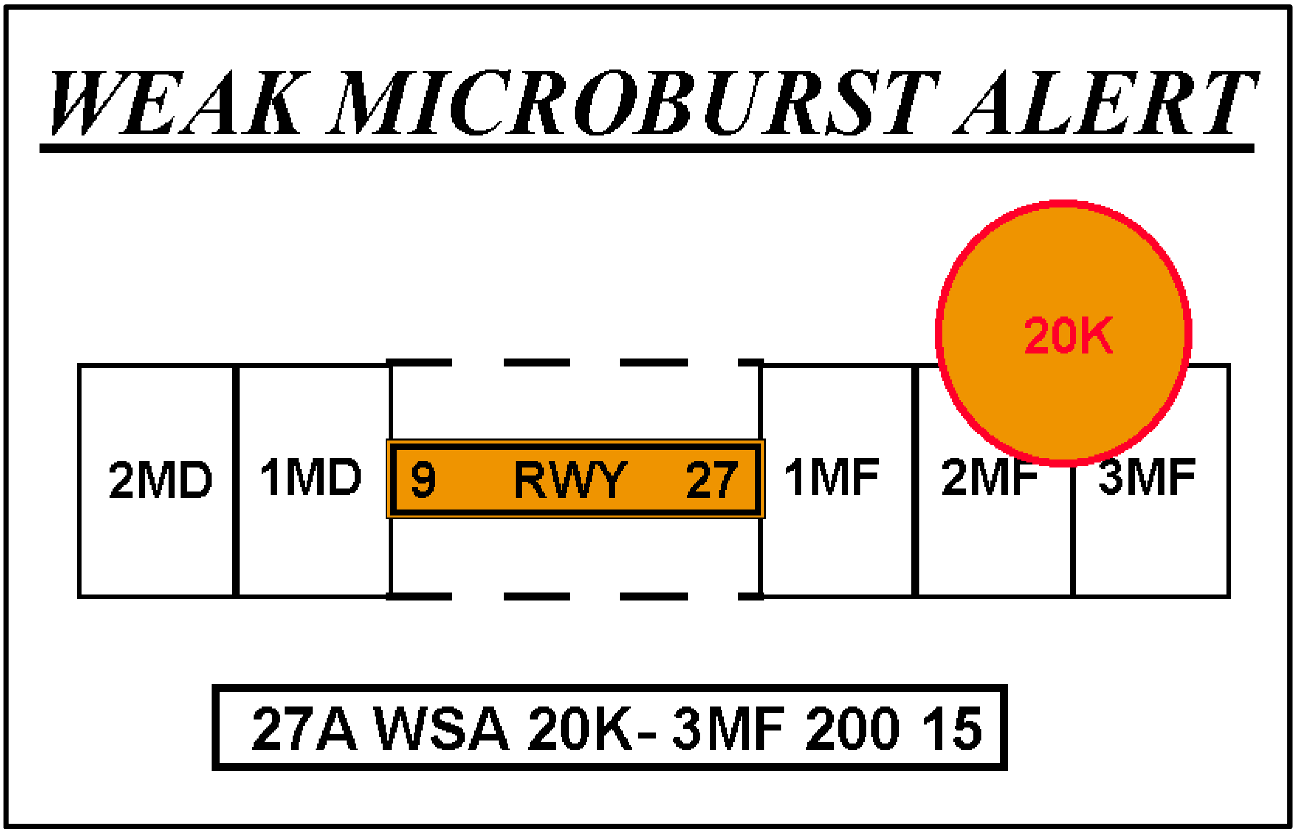
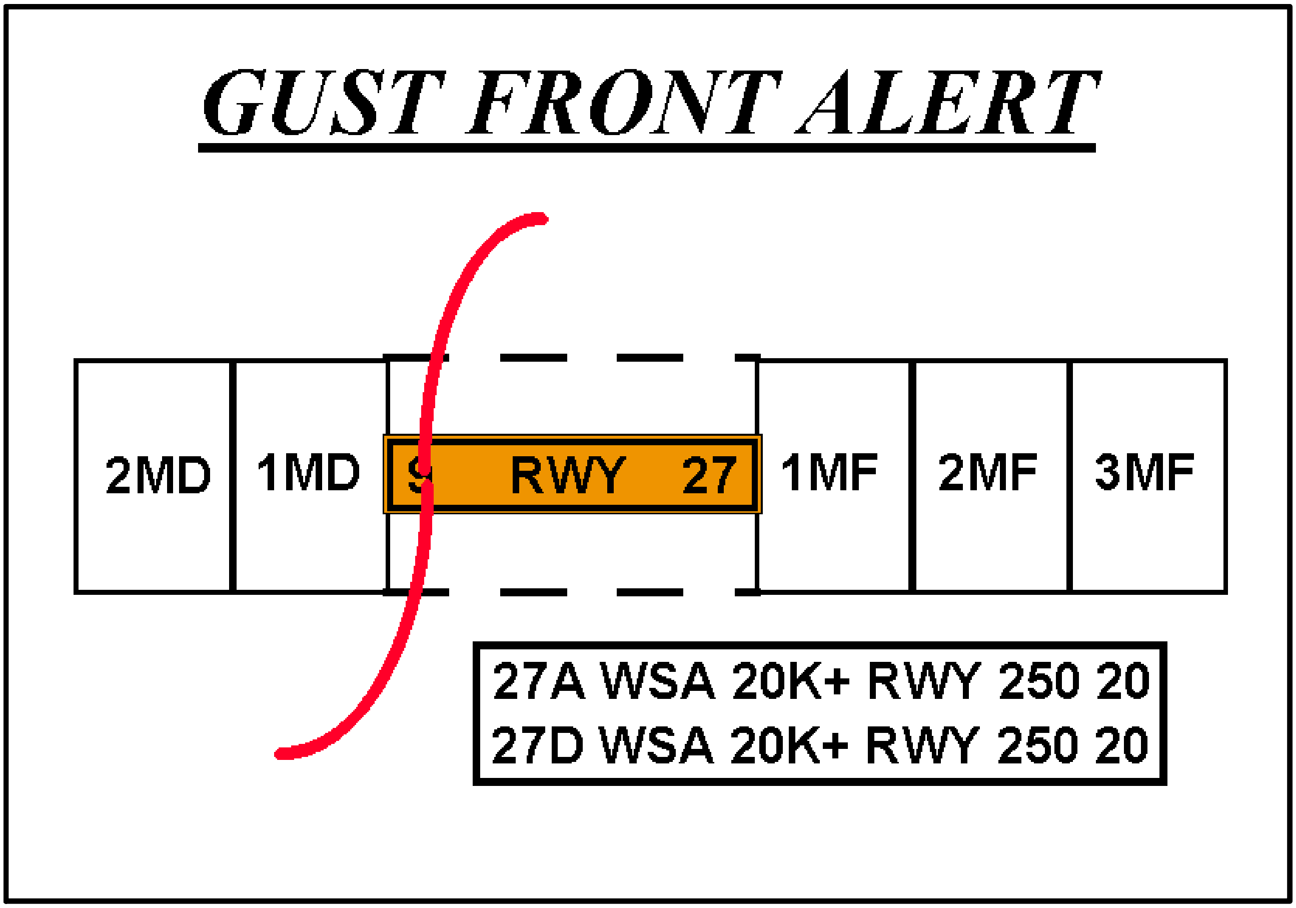


FIG 7-1-17
Gust Front Alert



(c) MULTIPLE WIND SHEAR ALERTS

EXAMPLE–
This is what the controller sees on his/her ribbon display in the tower cab.

27A WSA 20K+ RWY	250 20
27D WSA 20K+ RWY	250 20

NOTE–
(See FIG 7-1-17 to see how the TDWR/WSP determines the gust front/wind shear location.)

This is what the controller will say when issuing the alert.

PHRASEOLOGY–
MULTIPLE WIND SHEAR ALERTS. RUNWAY 27 ARRIVAL, WIND SHEAR ALERT, 20 KT GAIN ON RUNWAY; RUNWAY 27 DEPARTURE, WIND SHEAR ALERT, 20 KT GAIN ON RUNWAY, WIND 250 AT 20.

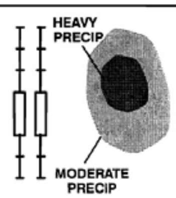
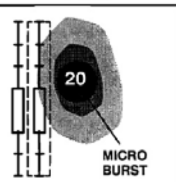
EXAMPLE–
In this example, the controller is advising arriving and departing aircraft that they could encounter a wind shear condition right on the runway due to a gust front (significant change of wind direction) with the possibility of a 20 knot gain in airspeed associated with the gust front. Additionally, the airport surface winds (for the runway in use) are reported as 250 degrees at 20 knots.

REFERENCE–
FAA Order 7110.65, Air Traffic Control, Low Level Wind Shear/Microburst Advisories, Paragraph 3-1-8b2(d).

6. The Terminal Weather Information for Pilots System (TWIP).

(a) With the increase in the quantity and quality of terminal weather information available through TDWR, the next step is to provide this information directly to pilots rather than relying on voice communications from ATC. The National Airspace System has long been in need of a means of delivering terminal weather information to the cockpit more efficiently in terms of both speed and accuracy to enhance pilot awareness of weather hazards and reduce air traffic controller workload. With the TWIP capability, terminal weather information, both alphanumerically and graphically, is now available directly to the cockpit at 43 airports in the U.S. NAS. (See FIG 7-1-18.)

FIG 7-1-18
TWIP Image of Convective Weather at MCO International

WEATHER SITUATION	TWIP TEXT MESSAGE
	MCO 1800 TERMINAL WEATHER -STORM(S) 3NM N-E MOD PRECIP 4NM NE HVY PRECIP MOVG W AT 15KT .EXPECTED MOD PRECIP BEGIN 1805
	MCO 1810 TERMINAL WEATHER *MODERATE PRECIP BEGAN 1805 -STORM(S) ARPT ALQDS MOD PRECIP 1NM N-E HVY PRECIP MOVG W AT 15KT .EXPECTED HVY PRECIP BEGIN 1815

(b) TWIP products are generated using weather data from the TDWR or the Integrated Terminal Weather System (ITWS) testbed. TWIP products are generated and stored in the form of text and character graphic messages. Software has been developed to allow TDWR or ITWS to format the data and send the TWIP products to a database resident at Aeronautical Radio, Inc. (ARINC). These products can then be accessed by pilots using the ARINC Aircraft Communications Addressing and Reporting System (ACARS) data link services. Airline dispatchers can also access this database and send messages to specific aircraft whenever wind shear activity begins or ends at an airport.

(c) TWIP products include descriptions and character graphics of microburst alerts, wind shear alerts, significant precipitation, convective activity within 30 NM surrounding the terminal area, and expected weather that will impact airport operations. During inclement weather, i.e., whenever a predetermined level of precipitation or wind shear is detected within 15 miles of the terminal area, TWIP products are updated once each minute for text messages and once every five minutes for character graphic messages. During good weather (below the predetermined precipitation or wind shear parameters) each message is updated every 10 minutes. These products are intended to improve the situational awareness of the pilot/flight crew, and to aid in flight planning prior to arriving or departing the terminal area. It is important to understand that, in the context of TWIP, the predetermined levels for inclement versus good weather has nothing to do with the criteria for VFR/MVFR/IFR/LIFR; it only deals with precipitation, wind shears and microbursts.

TBL 7-1-11
TWIP-Equipped Airports

Airport	Identifier
Andrews AFB, MD	KADW
Hartsfield-Jackson Atlanta Intl Airport	KATL
Nashville Intl Airport	KBNA
Logan Intl Airport	KBOS
Baltimore/Washington Intl Airport	KBWI
Hopkins Intl Airport	KCLE
Charlotte/Douglas Intl Airport	KCLT
Port Columbus Intl Airport	KCMH
Cincinnati/Northern Kentucky Intl Airport	KCVG
Dallas Love Field Airport	KDAL
James M. Cox Intl Airport	KDAY
Ronald Reagan Washington National Airport	KDCA
Denver Intl Airport	KDEN
Dallas-Fort Worth Intl Airport	KDFW
Detroit Metro Wayne County Airport	KDTW
Newark Liberty Intl Airport	KEWR
Fort Lauderdale-Hollywood Intl Airport	KFLL
William P. Hobby Airport	KHOU
Washington Dulles Intl Airport	KIAD
George Bush Intercontinental Airport	KIAH
Wichita Mid-Continent Airport	KICT
Indianapolis Intl Airport	KIND

Airport	Identifier
John F. Kennedy Intl Airport	KJFK
LaGuardia Airport	KLGA
Kansas City Intl Airport	KMCI
Orlando Intl Airport	KMCO
Midway Intl Airport	KMDW
Memphis Intl Airport	KMEM
Miami Intl Airport	KMIA
General Mitchell Intl Airport	KMKE
Minneapolis St. Paul Intl Airport	KMSP
Louis Armstrong New Orleans Intl Airport	KMSY
Will Rogers World Airport	KOKC
O'Hare Intl Airport	KORD
Palm Beach Intl Airport	KPBI
Philadelphia Intl Airport	KPHL
Pittsburgh Intl Airport	KPIT
Raleigh-Durham Intl Airport	KRDU
Louisville Intl Airport	KSDF
Salt Lake City Intl Airport	KSLC
Lambert-St. Louis Intl Airport	KSTL
Tampa Intl Airport	KTPA
Tulsa Intl Airport	KTUL

7-1-26. PIREPs Relating to Volcanic Ash Activity

a. Volcanic eruptions which send ash into the upper atmosphere occur somewhere around the world several times each year. Flying into a volcanic ash cloud can be extremely dangerous. At least two B747s have lost all power in all four engines after such an encounter. Regardless of the type aircraft, some damage is almost certain to ensue after an encounter with a volcanic ash cloud. Additionally, studies have shown that volcanic eruptions are the only significant source of large quantities of sulphur dioxide (SO_2) gas at jet-cruising altitudes. Therefore, the detection and subsequent reporting of SO_2 is of significant importance. Although SO_2 is colorless, its presence in the atmosphere should be suspected when a sulphur-like or rotten egg odor is present throughout the cabin.

b. While some volcanoes in the U.S. are monitored, many in remote areas are not. These unmonitored volcanoes may erupt without prior warning to the aviation community. A pilot observing a volcanic eruption who has not had previous notification of it may be the only witness to the eruption. Pilots are strongly encouraged to transmit a PIREP regarding volcanic eruptions and any observed volcanic ash clouds or detection of sulphur dioxide (SO_2) gas associated with volcanic activity.

c. Pilots should submit PIREPs regarding volcanic activity using the Volcanic Activity Reporting (VAR) form as illustrated in Appendix 2. If a VAR form is not immediately available, relay enough information to identify the position and type of volcanic activity.

d. Pilots should verbally transmit the data required in items 1 through 8 of the VAR as soon as possible. The data required in items 9 through 16 of the VAR should be relayed after landing if possible.

7-1-27. Thunderstorms

a. Turbulence, hail, rain, snow, lightning, sustained updrafts and downdrafts, icing conditions-all are present in thunderstorms. While there is some evidence that maximum turbulence exists at the middle level of a thunderstorm, recent studies show little variation of turbulence intensity with altitude.

b. There is no useful correlation between the external visual appearance of thunderstorms and the severity or amount of turbulence or hail within them. The visible thunderstorm cloud is only a portion of a turbulent system whose updrafts and downdrafts often extend far beyond the visible storm cloud. Severe turbulence can be expected up to 20 miles from severe thunderstorms. This distance decreases to about 10 miles in less severe storms.

c. Weather radar, airborne or ground based, will normally reflect the areas of moderate to heavy precipitation (radar does not detect turbulence). The frequency and severity of turbulence generally increases with the radar reflectivity which is closely associated with the areas of highest liquid water content of the storm. NO FLIGHT PATH THROUGH AN AREA OF STRONG OR VERY STRONG RADAR ECHOES SEPARATED BY 20-30 MILES OR LESS MAY BE CONSIDERED FREE OF SEVERE TURBULENCE.

d. Turbulence beneath a thunderstorm should not be minimized. This is especially true when the relative humidity is low in any layer between the surface and 15,000 feet. Then the lower altitudes may be characterized by strong out flowing winds and severe turbulence.

e. The probability of lightning strikes occurring to aircraft is greatest when operating at altitudes where temperatures are between minus 5 degrees Celsius and plus 5 degrees Celsius. Lightning can strike aircraft flying in the clear in the vicinity of a thunderstorm.

f. METAR reports do not include a descriptor for severe thunderstorms. However, by understanding severe thunderstorm criteria, i.e., 50 knot winds or $^{3}/_{4}$ inch hail, the information is available in the report to know that one is occurring.

g. Current weather radar systems are able to objectively determine precipitation intensity. These precipitation intensity areas are described as "light," "moderate," "heavy," and "extreme."

REFERENCE−
Pilot/Controller Glossary− Precipitation Radar Weather Descriptions

EXAMPLE−
1. *Alert provided by an ATC facility to an aircraft:*
(aircraft identification) EXTREME precipitation between ten o'clock and two o'clock, one five miles. Precipitation area is two five miles in diameter.

2. *Alert provided by an FSS:*
(aircraft identification) EXTREME precipitation two zero miles west of Atlanta V−O−R, two five miles wide, moving east at two zero knots, tops flight level three niner zero.

7−1−28. Thunderstorm Flying

a. Thunderstorm Avoidance. Never regard any thunderstorm lightly, even when radar echoes are of light intensity. Avoiding thunderstorms is the best policy. Following are some Do's and Don'ts of thunderstorm avoidance:

1. Don't land or takeoff in the face of an approaching thunderstorm. A sudden gust front of low level turbulence could cause loss of control.

2. Don't attempt to fly under a thunderstorm even if you can see through to the other side. Turbulence and wind shear under the storm could be hazardous.

3. Don't attempt to fly under the anvil of a thunderstorm. There is a potential for severe and extreme clear air turbulence.

4. Don't fly without airborne radar into a cloud mass containing scattered embedded thunderstorms. Scattered thunderstorms not embedded usually can be visually circumnavigated.

5. Don't trust the visual appearance to be a reliable indicator of the turbulence inside a thunderstorm.

6. Don't assume that ATC will offer radar navigation guidance or deviations around thunderstorms.

7. Don't use data-linked weather next generation weather radar (NEXRAD) mosaic imagery as the sole means for negotiating a path through a thunderstorm area (tactical maneuvering).

8. Do remember that the data-linked NEXRAD mosaic imagery shows where the weather was, not where the weather is. The weather conditions may be 15 to 20 minutes older than the age indicated on the display.

9. Do listen to chatter on the ATC frequency for Pilot Weather Reports (PIREP) and other aircraft requesting to deviate or divert.

10. Do ask ATC for radar navigation guidance or to approve deviations around thunderstorms, if needed.

11. Do use data-linked weather NEXRAD mosaic imagery (for example, Flight Information Service-Broadcast (FIS-B)) for route selection to avoid thunderstorms entirely (strategic maneuvering).

12. Do advise ATC, when switched to another controller, that you are deviating for thunderstorms before accepting to rejoin the original route.

13. Do ensure that after an authorized weather deviation, before accepting to rejoin the original route, that the route of flight is clear of thunderstorms.

14. Do avoid by at least 20 miles any thunderstorm identified as severe or giving an intense radar echo. This is especially true under the anvil of a large cumulonimbus.

15. Do circumnavigate the entire area if the area has 6/10 thunderstorm coverage.

16. Do remember that vivid and frequent lightning indicates the probability of a severe thunderstorm.

17. Do regard as extremely hazardous any thunderstorm with tops 35,000 feet or higher whether the top is visually sighted or determined by radar.

18. Do give a PIREP for the flight conditions.

19. Do divert and wait out the thunderstorms on the ground if unable to navigate around an area of thunderstorms.

20. Do contact Flight Service for assistance in avoiding thunderstorms. Flight Service specialists have NEXRAD mosaic radar imagery and NEXRAD single site radar with unique features such as base and composite reflectivity, echo tops, and VAD wind profiles.

b. If you cannot avoid penetrating a thunderstorm, following are some Do's before entering the storm:

1. Tighten your safety belt, put on your shoulder harness (if installed), if and secure all loose objects.

2. Plan and hold the course to take the aircraft through the storm in a minimum time.

3. To avoid the most critical icing, establish a penetration altitude below the freezing level or above the level of -15ºC.

4. Verify that pitot heat is on and turn on carburetor heat or jet engine anti-ice. Icing can be rapid at any altitude and cause almost instantaneous power failure and/or loss of airspeed indication.

5. Establish power settings for turbulence penetration airspeed recommended in the aircraft manual.

6. Turn up cockpit lights to highest intensity to lessen temporary blindness from lightning.

7. If using automatic pilot, disengage Altitude Hold Mode and Speed Hold Mode. The automatic altitude and speed controls will increase maneuvers of the aircraft thus increasing structural stress.

8. If using airborne radar, tilt the antenna up and down occasionally. This will permit the detection of other thunderstorm activity at altitudes other than the one being flown.

c. Following are some Do's and Don'ts during the thunderstorm penetration:

1. Do keep your eyes on your instruments. Looking outside the cockpit can increase danger of temporary blindness from lightning.

2. Don't change power settings; maintain settings for the recommended turbulence penetration airspeed.

3. Do maintain constant attitude. Allow the altitude and airspeed to fluctuate.

4. Don't turn back once you are in the thunderstorm. A straight course through the storm most likely will get the aircraft out of the hazards most quickly. In addition, turning maneuvers increase stress on the aircraft.

7−1−29. Key to Aerodrome Forecast (TAF) and Aviation Routine Weather Report (METAR)

FIG 7−1−19

Key to Aerodrome Forecast (TAF) and Aviation Routine Weather Report (METAR) (Front)

Key to Aerodrome Forecast (TAF) and Aviation Routine Weather Report (METAR) (Front)

TAF KPIT 091730Z 0918/1024 15005KT 5SM HZ FEW020 WS010/31022KT
FM091930 30015G25KT 3SM SHRA OVC015
TEMPO 0920/0922 1/2SM +TSRA OVC008CB
FM100100 27008KT 5SM SHRA BKN020 OVC040
PROB30 1004/1007 1SM -RA BR
FM101015 18005KT 6SM -SHRA OVC020
BECMG 1013/1015 P6SM NSW SKC

NOTE: Users are cautioned to confirm ***DATE*** and ***TIME*** of the TAF. For example FM**10**0000 is 0000Z on the **10th**. Do not confuse with ***1000Z!***

METAR KPIT 091955Z COR 22015G25KT 3/4SM R28L/2600FT TSRA OVC010CB 18/16 A2992 RMK SLP045 T01820159

Forecast	Explanation	Report
TAF	Message type: TAF-routine or TAF AMD-amended forecast, METAR-hourly, SPECI-special or TESTM-non-commissioned ASOS report	**METAR**
KPIT	ICAO location indicator	**KPIT**
091730Z	Issuance time: ALL times in UTC "Z", 2-digit date, 4-digit time	**091955Z**
0918/1024	Valid period, either 24 hours or 30 hours. The first two digits of EACH four digit number indicate the date of the valid period, the final two digits indicate the time (valid from 18Z on the 9th to 24Z on the 10th).	
	In U.S. METAR: CORrected ob; or AUTOmated ob for automated report with no human intervention; omitted when observer logs on.	**COR**
15005KT	Wind: 3 digit true-north direction, nearest 10 degrees (or VaRiaBle); next 2-3 digits for speed and unit, KT (KMH or MPS); as needed, Gust and maximum speed; 00000KT for calm; for METAR, if direction varies 60 degrees or more, Variability appended, e.g., 180V260	**22015G25KT**
5SM	Prevailing visibility; in U.S., Statute Miles & fractions; above 6 miles in TAF Plus6SM. (Or, 4-digit minimum visibility in meters and as required, lowest value with direction)	**¾SM**
	Runway Visual Range: R; 2-digit runway designator Left, Center, or Right as needed; "/", Minus or Plus in U.S., 4-digit value, FeeT in U.S., (usually meters elsewhere); 4-digit value Variability 4-digit value (and tendency Down, Up or No change)	**R28L/2600FT**
HZ	Significant present, forecast and recent weather: see table (on back)	**TSRA**
FEW020	Cloud amount, height and type: Sky Clear 0/8, FEW >0/8-2/8, ScaTtered 3/8-4/8, BroKeN 5/8-7/8, OverCast 8/8; 3-digit height in hundreds of ft; Towering Cumulus or CumulonimBus in **METAR**; in **TAF**, only CB. Vertical Visibility for obscured sky and height "VV004". More than 1 layer may be reported or forecast. In automated **METAR** reports only, CleaR for "clear below 12,000 feet"	**OVC 010CB**
	Temperature: degrees Celsius; first 2 digits, temperature "/" last 2 digits, dew-point temperature; Minus for below zero, e.g., M06	**18/16**
	Altimeter setting: indicator and 4 digits; in U.S., A-inches and hundredths; (Q-hectoPascals, e.g., Q1013)	**A2992**
WS010/31022KT	In U.S. **TAF**, non-convective low-level (≤¿2,000 ft) Wind Shear; 3-digit height (hundreds of ft); "/"; 3-digit wind direction and 2-3 digit wind speed above the indicated height, and unit, KT	

FIG 7−1−20

Key to Aerodrome Forecast (TAF) and Aviation Routine Weather Report (METAR) (Back)

Key to Aerodrome Forecast (TAF) and Aviation Routine Weather Report (METAR) (Back)

	In **METAR**, ReMarK indicator & remarks. For example: Sea- Level Pressure in hectoPascals & tenths, as shown: 1004.5 hPa; Temp/dew-point in tenths °C, as shown: temp. 18.2°C, dew-point 15.9°C	**RMK SLP045 T01820159**
FM091930	FroM: changes are expected at: 2-digit date, 2-digit hour, and 2-digit minute beginning time: indicates significant change. Each FM starts on a new line, indented 5 spaces	
TEMPO 0920/0922	TEMPOrary: changes expected for <1 hour and in total, < half of the period between the 2-digit date and 2-digit hour beginning, and 2-digit date and 2-digit hour ending time	
PROB30 1004/1007	PROBability and 2-digit percent (30 or 40): probable condition in the period between the 2-digit date & 2-digit hour beginning time, and the 2-digit date and 2-digit hour ending time	
BECMG 1013/1015	BECoMinG: change expected in the period between the 2-digit date and 2-digit hour beginning time, and the 2-digit date and 2-digit hour ending time	

Table of Significant Present, Forecast and Recent Weather - Grouped in categories and used in the order listed below; or as needed in TAF, No Significant Weather.

Qualifiers
Intensity or Proximity

"-" = Light	**No sign** = Moderate	**"+"** = Heavy

"VC" = Vicinity, but not at aerodrome. In the US METAR, 5 to 10 SM from the point of observation. In the US TAF, 5 to 10 SM from the center of the runway complex. Elsewhere, within 8000m.

Descriptor

BC – Patches	**BL** – Blowing	**DR** – Drifting	**FZ** – Freezing
MI – Shallow	**PR** – Partial	**SH** – Showers	**TS** – Thunderstorm

Weather Phenomena
Precipitation

DZ – Drizzle	**GR** – Hail	**GS** – Small Hail/Snow Pellets	
IC – Ice Crystals	**PL** – Ice Pellets	**RA** – Rain	**SG** – Snow Grains
SN – Snow	**UP** – Unknown Precipitation in automated observations		

Obscuration

BR – Mist (≥5/8SM)	**DU** – Widespread Dust	**FG** – Fog (<5/8SM)	**FU** – Smoke
HZ – Haze	**PY** – Spray	**SA** – Sand	**VA** – Volcanic Ash

Other

DS – Dust Storm	**FC** – Funnel Cloud	**+FC** – Tornado or Waterspout	
PO – Well developed dust or sand whirls		**SQ** – Squall	**SS** – Sandstorm

- Explanations in parentheses "()" indicate different worldwide practices.
- Ceiling is not specified; defined as the lowest broken or overcast layer, or the vertical visibility.
- NWS TAFs exclude BECMG groups and temperature forecasts, NWS TAFS do not use PROB in the first 9 hours of a TAF; NWS METARs exclude trend forecasts. US Military TAFs include Turbulence and Icing groups.

7−1−30. International Civil Aviation Organization (ICAO) Weather Formats

The U.S. uses the ICAO world standard for aviation weather reporting and forecasting. The World Meteorological Organization's (WMO) publication No. 782 "Aerodrome Reports and Forecasts" contains the base METAR and TAF code as adopted by the WMO member countries.

a. Although the METAR code is adopted worldwide, each country is allowed to make modifications or exceptions to the code for use in their particular country, e.g., the U.S. will continue to use statute miles for visibility, feet for RVR values, knots for wind speed, and inches of mercury for altimetry. However, temperature and dew point will be reported in degrees Celsius. The U.S reports prevailing visibility rather than lowest sector visibility. The elements in the body of a METAR report are separated with a space. The only exceptions are RVR, temperature, and dew point which are separated with a solidus (/). When an element does not occur, or cannot be observed, the preceding space and that element are omitted from that particular report. A METAR report contains the following sequence of elements in the following order:

1. Type of report.

2. ICAO Station Identifier.

3. Date and time of report.

4. Modifier (as required).

5. Wind.

6. Visibility.

7. Runway Visual Range (RVR).

8. Weather phenomena.

9. Sky conditions.

10. Temperature/dew point group.

11. Altimeter.

12. Remarks (RMK).

b. The following paragraphs describe the elements in a METAR report.

1. Type of report. There are two types of report:

(a) Aviation Routine Weather Report (METAR); and

(b) Nonroutine (Special) Aviation Weather Report (SPECI).

The type of report (METAR or SPECI) will always appear as the lead element of the report.

2. ICAO Station Identifier. The METAR code uses ICAO 4−letter station identifiers. In the contiguous 48 States, the 3−letter domestic station identifier is prefixed with a "K;" i.e., the domestic identifier for Seattle is SEA while the ICAO identifier is KSEA. Elsewhere, the first two letters of the ICAO identifier indicate what region of the world and country (or state) the station is in. For Alaska, all station identifiers start with "PA;" for Hawaii, all station identifiers start with "PH." Canadian station identifiers start with "CU," "CW," "CY," and "CZ." Mexican station identifiers start with "MM." The identifier for the western Caribbean is "M" followed by the individual country's letter; i.e., Cuba is "MU;" Dominican Republic "MD;" the Bahamas "MY." The identifier for the eastern Caribbean is "T" followed by the individual country's letter; i.e., Puerto Rico is "TJ." For a complete worldwide listing see ICAO Document 7910, Location Indicators.

3. Date and Time of Report. The date and time the observation is taken are transmitted as a six−digit date/time group appended with Z to denote Coordinated Universal Time (UTC). The first two digits are the date followed with two digits for hour and two digits for minutes.

EXAMPLE−
172345Z (the 17th day of the month at 2345Z)

4. Modifier (As Required). "AUTO" identifies a METAR/SPECI report as an automated weather report with no human intervention. If "AUTO" is shown in the body of the report, the type of sensor equipment used at the station will be encoded in the remarks section of the report. The absence of "AUTO" indicates that a report was made manually by an observer or that an automated report had human augmentation/backup. The modifier "COR" indicates a corrected report that is sent out to replace an earlier report with an error.

NOTE−
There are two types of automated stations, AO1 for automated weather reporting stations without a precipitation discriminator, and AO2 for automated stations with a precipitation discriminator. (A precipitation discriminator can determine the difference between liquid and frozen/freezing precipitation). This information appears in the remarks section of an automated report.

5. Wind. The wind is reported as a five digit group (six digits if speed is over 99 knots). The first three digits are the direction the wind is blowing from, in tens of degrees referenced to true north, or "VRB" if the direction is variable. The next two digits is the wind speed in knots, or if over 99 knots, the next three digits. If the wind is gusty, it is reported as a "G" after the speed followed by the highest gust reported. The abbreviation "KT" is appended to denote the use of knots for wind speed.

EXAMPLE−
13008KT − wind from 130 degrees at 8 knots
08032G45KT − wind from 080 degrees at 32 knots with gusts to 45 knots
VRB04KT − wind variable in direction at 4 knots
00000KT − wind calm
210103G130KT − wind from 210 degrees at 103 knots with gusts to 130 knots
If the wind direction is variable by 60 degrees or more and the speed is greater than 6 knots, a variable group consisting of the extremes of the wind direction separated by a "v" will follow the prevailing wind group.
32012G22KT 280V350

(a) Peak Wind. Whenever the peak wind exceeds 25 knots "PK WND" will be included in Remarks, e.g., PK WND 28045/1955 "Peak wind two eight zero at four five occurred at one niner five five." If the hour can be inferred from the report time, only the minutes will be appended, e.g., PK WND 34050/38 "Peak wind three four zero at five zero occurred at three eight past the hour."

(b) Wind shift. Whenever a wind shift occurs, "WSHFT" will be included in remarks followed by the time the wind shift began, e.g., WSHFT 30 FROPA "Wind shift at three zero due to frontal passage."

6. Visibility. Prevailing visibility is reported in statute miles with "SM" appended to it.

EXAMPLE−
7SM − seven statute miles
15SM − fifteen statute miles
$^1/_2$SM − one−half statute mile

(a) Tower/surface visibility. If either visibility (tower or surface) is below four statute miles, the lesser of the two will be reported in the body of the report; the greater will be reported in remarks.

(b) Automated visibility. ASOS/AWSS visibility stations will show visibility 10 or greater than 10 miles as "10SM." AWOS visibility stations will show visibility less than $^1/_4$ statute mile as "M$^1/_4$SM" and visibility 10 or greater than 10 miles as "10SM."

NOTE−
Automated sites that are augmented by human observer to meet service level requirements can report 0, 1/16 SM, and 1/8 SM visibility increments.

(c) Variable visibility. Variable visibility is shown in remarks (when rapid increase or decrease by $^1/_2$ statute mile or more and the average prevailing visibility is less than three miles) e.g., VIS 1V2 "visibility variable between one and two."

(d) Sector visibility. Sector visibility is shown in remarks when it differs from the prevailing visibility, and either the prevailing or sector visibility is less than three miles.

EXAMPLE−
VIS N2 − visibility north two

7. Runway Visual Range (When Reported). "R" identifies the group followed by the runway heading (and parallel runway designator, if needed) "/" and the visual range in feet (meters in other countries) followed with "FT" (feet is not spoken).

(a) Variability Values. When RVR varies (by more than on reportable value), the lowest and highest values are shown with "V" between them.

(b) Maximum/Minimum Range. "P" indicates an observed RVR is above the maximum value for this system (spoken as "more than"). "M" indicates an observed RVR is below the minimum value which can be determined by the system (spoken as "less than").

EXAMPLE−
R32L/1200FT − runway three two left R−V−R one thousand two hundred.
R27R/M1000V4000FT − runway two seven right R−V−R variable from less than one thousand to four thousand.

8. Weather Phenomena. The weather as reported in the METAR code represents a significant change in the way weather is currently reported. In METAR, weather is reported in the format:

Intensity/Proximity/Descriptor/Precipitation/ Obstruction to visibility/Other

NOTE–
The "/" above and in the following descriptions (except as the separator between the temperature and dew point) are for separation purposes in this publication and do not appear in the actual METARs.

(a) Intensity applies only to the first type of precipitation reported. A "–" denotes light, no symbol denotes moderate, and a "+" denotes heavy.

(b) Proximity applies to and reported only for weather occurring in the vicinity of the airport (between 5 and 10 miles of the point(s) of observation). It is denoted by the letters "VC." (Intensity and "VC" will not appear together in the weather group).

(c) Descriptor. These eight descriptors apply to the precipitation or obstructions to visibility:

TS .... thunderstorm
DR .... low drifting
SH .... showers
MI .... shallow
FZ .... freezing
BC .... patches
BL .... blowing
PR .... partial

NOTE–
*Although "TS" and "SH" are used with precipitation and may be preceded with an intensity symbol, the intensity still applies to the precipitation, **not** the descriptor.*

(d) Precipitation. There are nine types of precipitation in the METAR code:

RA .... rain
DZ .... drizzle
SN .... snow
GR .... hail ($^1/_4$" or greater)
GS .... small hail/snow pellets
PL .... ice pellets
SG .... snow grains
IC .... ice crystals (diamond dust)
UP .... unknown precipitation (automated stations only)

(e) Obstructions to visibility. There are eight types of obscuration phenomena in the METAR code (obscurations are any phenomena in the atmosphere, other than precipitation, that reduce horizontal visibility):

FG .... fog (vsby less than $^5/_8$ mile)
HZ .... haze
FU .... smoke
PY .... spray
BR .... mist (vsby $^5/_8$ – 6 miles)
SA .... sand
DU .... dust
VA .... volcanic ash

NOTE–
Fog (FG) is observed or forecast only when the visibility is less than five–eighths of mile, otherwise mist (BR) is observed or forecast.

(f) Other. There are five categories of other weather phenomena which are reported when they occur:

SQ .... squall
SS .... sandstorm
DS .... duststorm
PO .... dust/sand whirls
FC .... funnel cloud
+FC .... tornado/waterspout

Examples:

TSRA .... thunderstorm with moderate rain
+SN .... heavy snow
–RA FG .... light rain and fog
BRHZ .... mist and haze (visibility $^5/_8$ mile or greater)
FZDZ .... freezing drizzle
VCSH .... rain shower in the vicinity
+SHRASNPL .. heavy rain showers, snow, ice pellets (intensity indicator refers to the predominant rain)

9. Sky Condition. The sky condition as reported in METAR represents a significant change from the way sky condition is currently reported. In METAR, sky condition is reported in the format:

Amount/Height/(Type) or Indefinite Ceiling/Height

(a) Amount. The amount of sky cover is reported in eighths of sky cover, using the contractions:

SKC . . . . clear (no clouds)
FEW . . . . >0 to $^2/_8$
SCT . . . . scattered ($^3/_8$s to $^4/_8$s of clouds)
BKN . . . . broken ($^5/_8$s to $^7/_8$s of clouds)
OVC . . . . overcast ($^8/_8$s clouds)
CB . . . . Cumulonimbus when present
TCU . . . . Towering cumulus when present

NOTE−
1. *"SKC" will be reported at manual stations. "CLR" will be used at automated stations when no clouds below 12,000 feet are reported.*

2. A *ceiling layer is not designated in the METAR code. For aviation purposes, the ceiling is the lowest broken or overcast layer, or vertical visibility into an obscuration. Also there is no provision for reporting thin layers in the METAR code. When clouds are thin, that layer must be reported as if it were opaque.*

(b) Height. Cloud bases are reported with three digits in hundreds of feet above ground level (AGL). (Clouds above 12,000 feet cannot be reported by an automated station).

(c) (Type). If Towering Cumulus Clouds (TCU) or Cumulonimbus Clouds (CB) are present, they are reported after the height which represents their base.

EXAMPLE−
(Reported as) SCT025TCU BKN080 BKN250 (spoken as) "TWO THOUSAND FIVE HUNDRED SCATTERED TOWERING CUMULUS, CEILING EIGHT THOUSAND BROKEN, TWO FIVE THOUSAND BROKEN."
(Reported as) SCT008 OVC012CB (spoken as) "EIGHT HUNDRED SCATTERED CEILING ONE THOUSAND TWO HUNDRED OVERCAST CUMULONIMBUS CLOUDS."

(d) Vertical Visibility (indefinite ceiling height). The height into an indefinite ceiling is preceded by "VV" and followed by three digits indicating the vertical visibility in hundreds of feet. This layer indicates total obscuration.

EXAMPLE−
$^1/_8$ SM FG VV006 − visibility one eighth, fog, indefinite ceiling six hundred.

(e) Obscurations are reported when the sky is partially obscured by a ground−based phenomena by indicating the amount of obscuration as FEW, SCT, BKN followed by three zeros (000). In remarks, the obscuring phenomenon precedes the amount of obscuration and three zeros.

EXAMPLE−
BKN000 (in body) . . . . "sky partially obscured"
FU BKN000 (in remarks) . . . "smoke obscuring five− to seven−eighths of the sky"

(f) When sky conditions include a layer aloft, other than clouds, such as smoke or haze the type of phenomena, sky cover and height are shown in remarks.

EXAMPLE−
BKN020 (in body) . . . . "ceiling two thousand broken"
RMK FU BKN020 . . . . "broken layer of smoke aloft, based at two thousand"

(g) Variable ceiling. When a ceiling is below three thousand and is variable, the remark "CIG" will be shown followed with the lowest and highest ceiling heights separated by a "V."

EXAMPLE−
CIG 005V010 . . . . "ceiling variable between five hundred and one thousand"

(h) Second site sensor. When an automated station uses meteorological discontinuity sensors, remarks will be shown to identify site specific sky conditions which differ and are lower than conditions reported in the body.

EXAMPLE−
CIG 020 RY11 . . . . "ceiling two thousand at runway one one"

(i) Variable cloud layer. When a layer is varying in sky cover, remarks will show the variability range. If there is more than one cloud layer, the variable layer will be identified by including the layer height.

EXAMPLE−
SCT V BKN . . . . "scattered layer variable to broken"
BKN025 V OVC . . . . "broken layer at two thousand five hundred variable to overcast"

(j) Significant clouds. When significant clouds are observed, they are shown in remarks, along with the specified information as shown below:

(1) Cumulonimbus (CB), or Cumulonimbus Mammatus (CBMAM), distance (if known), direction from the station, and direction of movement, if known. If the clouds are beyond 10 miles from the airport, DSNT will indicate distance.

EXAMPLE–
CB W MOV E . . . . "cumulonimbus west moving east"
CBMAM DSNT S . . . . "cumulonimbus mammatus distant south"

(2) Towering Cumulus (TCU), location, (if known), or direction from the station.

EXAMPLE–
TCU OHD . . . . "towering cumulus overhead"
TCU W . . . . "towering cumulus west"

(3) Altocumulus Castellanus (ACC), Stratocumulus Standing Lenticular (SCSL), Altocumulus Standing Lenticular (ACSL), Cirrocumulus Standing Lenticular (CCSL) or rotor clouds, describing the clouds (if needed) and the direction from the station.

EXAMPLE–
ACC W . . . . "altocumulus castellanus west"
ACSL SW–S . . . . "standing lenticular altocumulus southwest through south"
APRNT ROTOR CLD S "apparent rotor cloud south"
CCSL OVR MT E . . . . . "standing lenticular cirrocumulus over the mountains east"

10. Temperature/Dew Point. Temperature and dew point are reported in two, two-digit groups in degrees Celsius, separated by a solidus ("/"). Temperatures below zero are prefixed with an "M." If the temperature is available but the dew point is missing, the temperature is shown followed by a solidus. If the temperature is missing, the group is omitted from the report.

EXAMPLE–
15/08 . . . . "temperature one five, dew point 8"
00/M02 . . . . "temperature zero, dew point minus 2"
M05/ . . . . "temperature minus five, dew point missing"

11. Altimeter. Altimeter settings are reported in a four-digit format in inches of mercury prefixed with an "A" to denote the units of pressure.

EXAMPLE–
A2995 – "Altimeter two niner niner five"

12. Remarks. Remarks will be included in all observations, when appropriate. The contraction "RMK" denotes the start of the remarks section of a METAR report.

Except for precipitation, phenomena located within 5 statute miles of the point of observation will be reported as at the station. Phenomena between 5 and 10 statute miles will be reported in the vicinity, "VC." Precipitation not occurring at the point of observation but within 10 statute miles is also reported as in the vicinity, "VC." Phenomena beyond 10 statute miles will be shown as distant, "DSNT." Distances are in statute miles except for automated lightning remarks which are in nautical miles. Movement of clouds or weather will be indicated by the direction toward which the phenomena is moving.

(a) There are two categories of remarks:

(1) Automated, manual, and plain language.

(2) Additive and automated maintenance data.

(b) Automated, Manual, and Plain Language. This group of remarks may be generated from either manual or automated weather reporting stations and generally elaborate on parameters reported in the body of the report. (Plain language remarks are only provided by manual stations).

(1) Volcanic eruptions.

(2) Tornado, Funnel Cloud, Waterspout.

(3) Station Type (AO1 or AO2).

(4) PK WND.

(5) WSHFT (FROPA).

(6) TWR VIS or SFC VIS.

(7) VRB VIS.

(8) Sector VIS.

(9) VIS @ 2^{nd} Site.

(10) (freq) LTG (type) (loc).

(11) Beginning/Ending of Precipitation/ TSTMS.

(12) TSTM Location MVMT.

(13) Hailstone Size (GR).

(14) Virga.

(15) VRB CIG (height).

(16) Obscuration.

(17) VRB Sky Condition.

(18) Significant Cloud Types.

(19) Ceiling Height 2nd Location.

(20) PRESFR PRESRR.

(21) Sea−Level Pressure.

(22) ACFT Mishap (not transmitted).

(23) NOSPECI.

(24) SNINCR.

(25) Other SIG Info.

(c) Additive and Automated Maintenance Data.

(1) Hourly Precipitation.

(2) 3− and 6−Hour Precipitation Amount.

(3) 24−Hour Precipitation.

(4) Snow Depth on Ground.

(5) Water Equivalent of Snow.

(6) Cloud Type.

(7) Duration of Sunshine.

(8) Hourly Temperature/Dew Point (Tenths).

(9) 6−Hour Maximum Temperature.

(10) 6−Hour Minimum Temperature.

(11) 24−Hour Maximum/Minimum Temperature.

(12) Pressure Tendency.

(13) Sensor Status.
PWINO
FZRANO
TSNO
RVRNO
PNO
VISNO

Examples of METAR reports and explanation:

METAR KBNA 281250Z 33018KT 290V360 1/2SM R31/2700FT SN BLSN FG VV008 00/M03 A2991 RMK RAE42SNB42

METAR . . . . . . aviation routine weather report
KBNA . . . . Nashville, TN
281250Z . . . . . . date 28th, time 1250 UTC
(no modifier) . . This is a manually generated report, due to the absence of "AUTO" and "AO1 or AO2" in remarks
33018KT . . . . . wind three three zero at one eight
290V360 . . . . . . wind variable between two nine zero and three six zero
1/2SM . . . . visibility one half
R31/2700FT . . . Runway three one RVR two thousand seven hundred
SN . . . . moderate snow
BLSN FG . . . . . visibility obscured by blowing snow and fog
VV008 . . . . indefinite ceiling eight hundred
00/M03 . . . . temperature zero, dew point minus three
A2991 . . . . altimeter two niner niner one
RMK . . . . remarks
RAE42 . . . . rain ended at four two
SNB42 . . . . snow began at four two

METAR KSFO 041453Z AUTO VRB02KT 3SM BR CLR 15/12 A3012 RMK AO2

METAR . . . . . . aviation routine weather report
KSFO . . . . San Francisco, CA
041453Z . . . . . . date 4th, time 1453 UTC
AUTO . . . . fully automated; no human intervention
VRB02KT . . . . wind variable at two
3SM . . . . visibility three
BR . . . . visibility obscured by mist
CLR . . . . no clouds below one two thousand
15/12 . . . . temperature one five, dew point one two

A3012 . . . . altimeter three zero one two
RMK . . . . remarks
AO2 . . . . this automated station has a weather discriminator (for precipitation)

SPECI KCVG 152224Z 28024G36KT 3/4SM +TSRA BKN008 OVC020CB 28/23 A3000 RMK TSRAB24 TS W MOV E

SPECI . . . . (nonroutine) aviation special weather report
KCVG . . . . Cincinnati, OH
152228Z . . . . . . date 15th, time 2228 UTC
(no modifier) . . This is a manually generated report due to the absence of "AUTO" and "AO1 or AO2" in remarks
28024G36KT . . wind two eight zero at two four gusts three six
3/4SM . . . . visibility three fourths
+TSRA . . . . thunderstorms, heavy rain
BKN008 ceiling eight hundred broken
OVC020CB . . . two thousand overcast cumulonimbus clouds
28/23 . . . . temperature two eight, dew point two three
A3000 . . . . altimeter three zero zero zero
RMK . . . . remarks
TSRAB24 . . . . . thunderstorm and rain began at two four
TS W MOV E thunderstorm west moving east

c. Aerodrome Forecast (TAF). A concise statement of the expected meteorological conditions at an airport during a specified period. At most locations, TAFs have a 24 hour forecast period. However, TAFs for some locations have a 30 hour forecast period. These forecast periods may be shorter in the case of an amended TAF. TAFs use the same codes as METAR weather reports. They are scheduled four times daily for 24−hour periods beginning at 0000Z, 0600Z, 1200Z, and 1800Z.

Forecast times in the TAF are depicted in two ways. The first is a 6−digit number to indicate a specific point in time, consisting of a two−digit date, two−digit hour, and two−digit minute (such as issuance time or FM). The second is a pair of four−digit numbers separated by a "/" to indicate a beginning and end for a period of time. In this case, each four−digit pair consists of a two−digit date and a two−digit hour.

TAFs are issued in the following format:

TYPE OF REPORT/ICAO STATION IDENTIFIER/ DATE AND TIME OF ORIGIN/VALID PERIOD DATE AND TIME/FORECAST METEOROLOGICAL CONDITIONS

NOTE−
The "/" above and in the following descriptions are for separation purposes in this publication and do not appear in the actual TAFs.

TAF KORD 051130Z 0512/0618 14008KT 5SM BR BKN030
TEMPO 0513/0516 1 1/2SM BR
FM051600 16010KT P6SM SKC
FM052300 20013G20KT 4SM SHRA OVC020
PROB40 0600/0606 2SM TSRA OVC008CB
BECMG 0606/0608 21015KT P6SM NSW SCT040

TAF format observed in the above example:

TAF = type of report

KORD = ICAO station identifier

051130Z = date and time of origin (issuance time)

0512/0618 = valid period date and times

14008KT 5SM BR BKN030 = forecast meteorological conditions

Explanation of TAF elements:

1. Type of Report. There are two types of TAF issuances, a routine forecast issuance (TAF) and an amended forecast (TAF AMD). An amended TAF is issued when the current TAF no longer adequately describes the on-going weather or the forecaster feels the TAF is not representative of the current or expected weather. Corrected (COR) or delayed (RTD) TAFs are identified only in the communications header which precedes the actual forecasts.

2. ICAO Station Identifier. The TAF code uses ICAO 4−letter location identifiers as described in the METAR section.

3. Date and Time of Origin. This element is the date and time the forecast is actually prepared. The format is a two−digit date and four−digit time followed, without a space, by the letter "Z."

4. Valid Period Date and Time. The UTC valid period of the forecast consists of two four−digit sets, separated by a "/". The first four−digit set is a two−digit date followed by the two−digit beginning hour, and the second four−digit set is a two−digit date followed by the two−digit ending hour. Although most airports have a 24−hour TAF, a select number of airports have a 30−hour TAF. In the case of an amended forecast, or a forecast which is corrected or delayed, the valid period may be for less than 24 hours. Where an airport or terminal operates on a part−time basis (less than 24 hours/day), the TAFs issued for those locations will have the abbreviated statement "AMD NOT SKED" added to the end of the forecasts. The time observations are scheduled to end and/or resume will be indicated by expanding the AMD NOT SKED statement. Expanded statements will include:

(a) Observation ending time (AFT DDHHmm; for example, AFT 120200)

(b) Scheduled observations resumption time (TIL DDHHmm; for example, TIL 171200Z) or

(c) Period of observation unavailability (DDHH/DDHH); for example, 2502/2512).

5. Forecast Meteorological Conditions. This is the body of the TAF. The basic format is:

WIND/VISIBILITY/WEATHER/SKY CONDITION/OPTIONAL DATA (WIND SHEAR)

The wind, visibility, and sky condition elements are always included in the initial time group of the forecast. Weather is included only if significant to aviation. If a significant, lasting change in any of the elements is expected during the valid period, a new time period with the changes is included. It should be noted that with the exception of a "FM" group the new time period will include only those elements which are expected to change, i.e., if a lowering of the visibility is expected but the wind is expected to remain the same, the new time period reflecting the lower visibility would not include a forecast wind. The forecast wind would remain the same as in the previous time period. Any temporary conditions expected during a specific time period are included with that time period. The following describes the elements in the above format.

(a) Wind. This five (or six) digit group includes the expected wind direction (first 3 digits) and speed (last 2 digits or 3 digits if 100 knots or greater). The contraction "KT" follows to denote the units of wind speed. Wind gusts are noted by the letter "G" appended to the wind speed followed by the highest expected gust. A variable wind direction is noted by "VRB" where the three digit direction usually appears. A calm wind (3 knots or less) is forecast as "00000KT."

EXAMPLE−
18010KT . . . . . wind one eight zero at one zero (wind is blowing from 180).
35012G20KT . . wind three five zero at one two gust two zero.

(b) Visibility. The expected prevailing visibility up to and including 6 miles is forecast in statute miles, including fractions of miles, followed by "SM" to note the units of measure. Expected visibilities greater than 6 miles are forecast as P6SM (plus six statute miles).

EXAMPLE−
1/2SM − visibility one−half
4SM − visibility four
P6SM − visibility more than six

(c) Weather Phenomena. The expected weather phenomena is coded in TAF reports using the same format, qualifiers, and phenomena contractions as METAR reports (except UP). Obscurations to vision will be forecast whenever the prevailing visibility is forecast to be 6 statute miles or less. If no significant weather is expected to occur during a specific time period in the forecast, the weather phenomena group is omitted for that time period. If, after a time period in which significant weather phenomena has been forecast, a change to a forecast of no significant weather phenomena occurs, the contraction NSW (No Significant Weather) will appear as the weather group in the new time period. (NSW is included only in TEMPO groups).

NOTE−
It is very important that pilots understand that NSW only refers to weather phenomena, i.e., rain, snow, drizzle, etc. Omitted conditions, such as sky conditions, visibility, winds, etc., are carried over from the previous time group.

(d) Sky Condition. TAF sky condition forecasts use the METAR format described in the METAR section. Cumulonimbus clouds (CB) are the only cloud type forecast in TAFs. When clear skies are forecast, the contraction "SKC" will always be used. The contraction "CLR" is never used in the TAF. When the sky is obscured due to a surface−based phenomenon, vertical visibility (VV) into the obscuration is forecast. The format for vertical visibility is "VV" followed by a three-digit height in hundreds of feet.

NOTE–
As in METAR, ceiling layers are not designated in the TAF code. For aviation purposes, the ceiling is the lowest broken or overcast layer or vertical visibility into a complete obscuration.

SKC . . . . "sky clear"
SCT005 BKN025CB . "five hundred scattered, ceiling two thousand five hundred broken cumulonimbus clouds"
VV008 . . . . "indefinite ceiling eight hundred"

(e) Optional Data (Wind Shear). Wind shear is the forecast of nonconvective low level winds (up to 2,000 feet). The forecast includes the letters "WS" followed by the height of the wind shear, the wind direction and wind speed at the indicated height and the ending letters "KT" (knots). Height is given in hundreds of feet (AGL) up to and including 2,000 feet. Wind shear is encoded with the contraction "WS," followed by a three-digit height, slant character "/," and winds at the height indicated in the same format as surface winds. The wind shear element is omitted if not expected to occur.

WS010/18040KT – "LOW LEVEL WIND SHEAR AT ONE THOUSAND, WIND ONE EIGHT ZERO AT FOUR ZERO"

d. Probability Forecast. The probability or chance of thunderstorms or other precipitation events occurring, along with associated weather conditions (wind, visibility, and sky conditions). The PROB30 group is used when the occurrence of thunderstorms or precipitation is 30–39% and the PROB40 group is used when the occurrence of thunderstorms or precipitation is 40–49%. This is followed by two four-digit groups separated by a "/", giving the beginning date and hour, and the ending date and hour of the time period during which the thunderstorms or precipitation are expected.

NOTE–
NWS does not use PROB 40 in the TAF. However U.S. Military generated TAFS may include PROB40. PROB30 will not be shown during the first nine hours of a NWS forecast.

EXAMPLE–
PROB40 2221/2302 $^{1}/_{2}$SM +TSRA "chance between 2100Z and 0200Z of visibility one-half statute mile in thunderstorms and heavy rain."
PROB30 3010/3014 1SM RASN . "chance between 1000Z and 1400Z of visibility one statute mile in mixed rain and snow."

e. Forecast Change Indicators. The following change indicators are used when either a rapid, gradual, or temporary change is expected in some or all of the forecast meteorological conditions. Each change indicator marks a time group within the TAF report.

1. From (FM) group. The FM group is used when a rapid change, usually occurring in less than one hour, in prevailing conditions is expected. Typically, a rapid change of prevailing conditions to more or less a completely new set of prevailing conditions is associated with a synoptic feature passing through the terminal area (cold or warm frontal passage). Appended to the "FM" indicator is the six-digit date, hour, and minute the change is expected to begin and continues until the next change group or until the end of the current forecast. A "FM" group will mark the beginning of a new line in a TAF report (indented 5 spaces). Each "FM" group contains all the required elements–wind, visibility, weather, and sky condition. Weather will be omitted in "FM" groups when it is not significant to aviation. FM groups will not include the contraction NSW.

EXAMPLE–
FM210100 14010KT P6SM SKC – "after 0100Z on the 21st, wind one four zero at one zero, visibility more than six, sky clear."

2. Becoming (BECMG) group. The BECMG group is used when a gradual change in conditions is expected over a longer time period, usually two hours. The time period when the change is expected is two four-digit groups separated by a "/", with the beginning date and hour, and ending date and hour of the change period which follows the BECMG indicator. The gradual change will occur at an unspecified time within this time period. Only the changing forecast meteorological conditions are included in BECMG groups. The omitted conditions are carried over from the previous time group.

NOTE−
The NWS does not use BECMG in the TAF.

EXAMPLE−
OVC012 BECMG 0114/0116 BKN020 − "ceiling one thousand two hundred overcast. Then a gradual change to ceiling two thousand broken between 1400Z on the 1st and 1600Z on the 1st."

3. Temporary (TEMPO) group. The TEMPO group is used for any conditions in wind, visibility, weather, or sky condition which are expected to last for generally less than an hour at a time (occasional), and are expected to occur during less than half the time period. The TEMPO indicator is followed by two four−digit groups separated by a "/". The first four digit group gives the beginning date and hour, and the second four digit group gives the ending date and hour of the time period during which the temporary conditions are expected. Only the changing forecast meteorological conditions are included in TEMPO groups. The omitted conditions are carried over from the previous time group.

EXAMPLE−
1. *SCT030 TEMPO 0519/0523 BKN030 − "three thousand scattered with occasional ceilings three thousand broken between 1900Z on the 5th and 2300Z on the 5th."*

2. *4SM HZ TEMPO 1900/1906 2SM BR HZ − "visibility four in haze with occasional visibility two in mist and haze between 0000Z on the 19th and 0600Z on the 19th."*

Section 4. Bird Hazards and Flight Over National Refuges, Parks, and Forests

7−4−1. Migratory Bird Activity

a. Bird strike risk increases because of bird migration during the months of March through April, and August through November.

b. The altitudes of migrating birds vary with winds aloft, weather fronts, terrain elevations, cloud conditions, and other environmental variables. While over 90 percent of the reported bird strikes occur at or below 3,000 feet AGL, strikes at higher altitudes are common during migration. Ducks and geese are frequently observed up to 7,000 feet AGL and pilots are cautioned to minimize en route flying at lower altitudes during migration.

c. Considered the greatest potential hazard to aircraft because of their size, abundance, or habit of flying in dense flocks are gulls, waterfowl, vultures, hawks, owls, egrets, blackbirds, and starlings. Four major migratory flyways exist in the U.S. The Atlantic flyway parallels the Atlantic Coast. The Mississippi Flyway stretches from Canada through the Great Lakes and follows the Mississippi River. The Central Flyway represents a broad area east of the Rockies, stretching from Canada through Central America. The Pacific Flyway follows the west coast and overflies major parts of Washington, Oregon, and California. There are also numerous smaller flyways which cross these major north-south migratory routes.

7−4−2. Reducing Bird Strike Risks

a. The most serious strikes are those involving ingestion into an engine (turboprops and turbine jet engines) or windshield strikes. These strikes can result in emergency situations requiring prompt action by the pilot.

b. Engine ingestions may result in sudden loss of power or engine failure. Review engine out procedures, especially when operating from airports with known bird hazards or when operating near high bird concentrations.

c. Windshield strikes have resulted in pilots experiencing confusion, disorientation, loss of communications, and aircraft control problems. Pilots are encouraged to review their emergency procedures before flying in these areas.

d. When encountering birds en route, climb to avoid collision, because birds in flocks generally distribute themselves downward, with lead birds being at the highest altitude.

e. Avoid overflight of known areas of bird concentration and flying at low altitudes during bird migration. Charted wildlife refuges and other natural areas contain unusually high local concentration of birds which may create a hazard to aircraft.

7−4−3. Reporting Bird Strikes

Pilots are urged to report any bird or other wildlife strike using FAA Form 5200−7, Bird/Other Wildlife Strike Report (Appendix 1). Additional forms are available at any FSS; at any FAA Regional Office or at **http://wildlife−mitigation.tc.faa.gov**. The data derived from these reports are used to develop standards to cope with this potential hazard to aircraft and for documentation of necessary habitat control on airports.

7−4−4. Reporting Bird and Other Wildlife Activities

If you observe birds or other animals on or near the runway, request airport management to disperse the wildlife before taking off. Also contact the nearest FAA ARTCC, FSS, or tower (including non−Federal towers) regarding large flocks of birds and report the:

a. Geographic location.

b. Bird type (geese, ducks, gulls, etc.).

c. Approximate numbers.

d. Altitude.

e. Direction of bird flight path.

7-4-5. Pilot Advisories on Bird and Other Wildlife Hazards

Many airports advise pilots of other wildlife hazards caused by large animals on the runway through the Chart Supplement U.S. and the NOTAM system. Collisions of landing and departing aircraft and animals on the runway are increasing and are not limited to rural airports. These accidents have also occurred at several major airports. Pilots should exercise extreme caution when warned of the presence of wildlife on and in the vicinity of airports. If you observe deer or other large animals in close proximity to movement areas, advise the FSS, tower, or airport management.

7-4-6. Flights Over Charted U.S. Wildlife Refuges, Parks, and Forest Service Areas

a. The landing of aircraft is prohibited on lands or waters administered by the National Park Service, U.S. Fish and Wildlife Service, or U.S. Forest Service without authorization from the respective agency. Exceptions include:

1. When forced to land due to an emergency beyond the control of the operator;

2. At officially designated landing sites; or

3. An approved official business of the Federal Government.

b. Pilots are requested to maintain a minimum altitude of 2,000 feet above the surface of the following: National Parks, Monuments, Seashores, Lakeshores, Recreation Areas and Scenic Riverways administered by the National Park Service, National Wildlife Refuges, Big Game Refuges, Game Ranges and Wildlife Ranges administered by the U.S. Fish and Wildlife Service, and Wilderness and Primitive areas administered by the U.S. Forest Service.

NOTE-
FAA Advisory Circular AC 91-36, Visual Flight Rules (VFR) Flight Near Noise-Sensitive Areas, defines the surface of a national park area (including parks, forests, primitive areas, wilderness areas, recreational areas, national seashores, national monuments, national lakeshores, and national wildlife refuge and range areas) as: the highest terrain within 2,000 feet laterally of the route of flight, or the upper-most rim of a canyon or valley.

c. Federal statutes prohibit certain types of flight activity and/or provide altitude restrictions over designated U.S. Wildlife Refuges, Parks, and Forest Service Areas. These designated areas, for example: Boundary Waters Canoe Wilderness Areas, Minnesota; Haleakala National Park, Hawaii; Yosemite National Park, California; and Grand Canyon National Park, Arizona, are charted on Sectional Charts.

d. Federal regulations also prohibit airdrops by parachute or other means of persons, cargo, or objects from aircraft on lands administered by the three agencies without authorization from the respective agency. Exceptions include:

1. Emergencies involving the safety of human life; or

2. Threat of serious property loss.

7−5−11. 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 which 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.

7−5−12. 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 7110.65, Paragraph 10−2−14, Unauthorized Laser Illumination of Aircraft
FAA Order 7210.3, Paragraph 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 Special Notices section of the Chart Supplement U.S. for information regarding these activities.

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. **http://www.ibac.org/is−bao/isbao.htm**

3. **http://www.natasafety1st.org/bus_deice.htm**

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

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

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

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

8. 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 web site by selecting the current year's information bulletins:
http://www.faa.gov/library/manuals/examiners_inspectors/8400/fsat

7−5−15. 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, and/or engine damage/failure. These hazards are most critical during low altitude flight in calm and cold air, especially in and around approach and departure corridors or airport traffic areas.

Whether plumes are visible or invisible, the total extent of their turbulent affect is difficult to predict. Some studies do predict that the significant turbulent effects of an exhaust plume can extend to heights of over 1,000 feet above the height of the top of the stack or cooling tower. Any effects will be more pronounced in calm stable air where the plume is very hot and the surrounding area is still and cold. Fortunately, studies also predict that any amount of crosswind will help to dissipate the effects. However, the size of the tower or stack is not a good indicator of the predicted effect the plume may produce. The major effects are related to the heat or size of the plume effluent, the ambient air temperature, and the wind speed affecting the plume. Smaller aircraft can expect to feel an effect at a higher altitude than heavier aircraft.

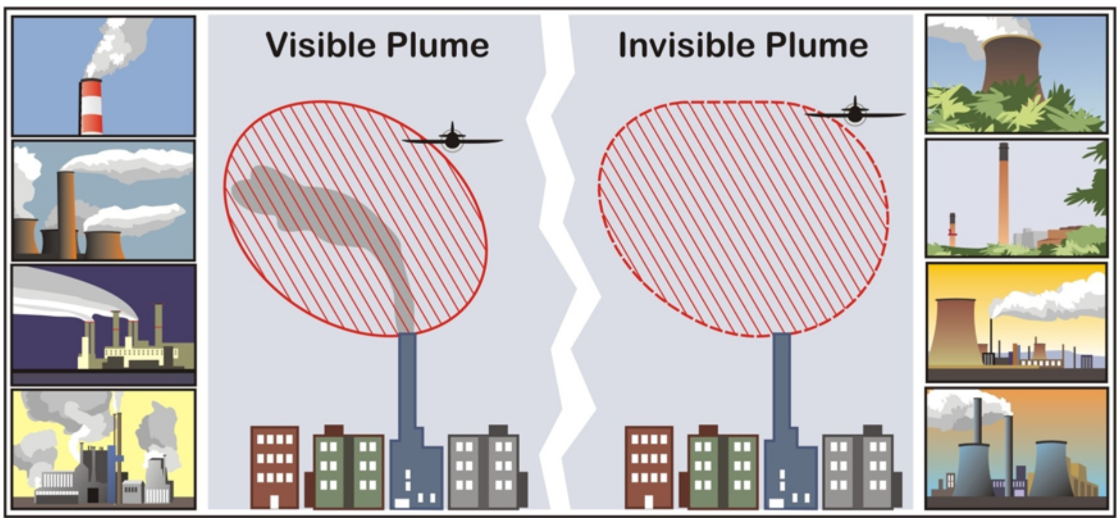
b. When able, a pilot should steer clear of exhaust plumes by flying on the upwind side of smokestacks or cooling towers. When a plume is visible via smoke or a condensation cloud, remain clear and realize a plume may have both visible and invisible characteristics. Exhaust stacks without visible plumes may still be in full operation, and airspace in the vicinity should be treated with caution.

As with mountain wave turbulence or clear air turbulence, an invisible plume may be encountered unexpectedly. Cooling towers, power plant stacks, exhaust fans, and other similar structures are depicted in FIG 7−5−2.

Pilots are encouraged to exercise caution when flying in the vicinity of exhaust plumes. Pilots are also encouraged to reference the Chart Supplement U.S. where amplifying notes may caution pilots and identify the location of structure(s) emitting exhaust plumes.

The best available information on this phenomenon must come from pilots via the PIREP reporting procedures. All pilots encountering hazardous plume conditions are urgently requested to report time, location, and intensity (light, moderate, severe, or extreme) of the element to the FAA facility with which they are maintaining radio contact. If time and conditions permit, elements should be reported according to the standards for other PIREPs and position reports (AIM Paragraph 7−1−22, PIREPS Relating to Turbulence).

FIG 7−5−2
Plumes



Chapter 9. Aeronautical Charts and Related Publications

Section 1. Types of Charts Available

9-1-1. General

Civil aeronautical charts for the U.S. and its territories, and possessions are produced by Aeronautical Navigation Products (AeroNav), **http://www.faa.gov/air_traffic/flight_info/aeronav** which is part of FAA's Air Traffic Organization, Mission Support Services.

9-1-2. Obtaining Aeronautical Charts

Public sales of charts and publications are available through a network of FAA chart agents primarily located at or near major civil airports. A listing of products, dates of latest editions and agents is available on the AeroNav website at: **http://www.faa.gov/air_traffic/flight_info/aeronav**.

9-1-3. Selected Charts and Products Available

VFR Navigation Charts
IFR Navigation Charts
Planning Charts
Supplementary Charts and Publications
Digital Products

9-1-4. General Description of Each Chart Series

a. VFR Navigation Charts.

1. Sectional Aeronautical Charts. Sectional Charts are designed for visual navigation of slow to medium speed aircraft. The topographic information consists of contour lines, shaded relief, drainage patterns, and an extensive selection of visual checkpoints and landmarks used for flight under VFR. Cultural features include cities and towns, roads, railroads, and other distinct landmarks. The aeronautical information includes visual and radio aids to navigation, airports, controlled airspace, special-use airspace, obstructions, and related data. Scale 1 inch = 6.86nm/1:500,000. 60 x 20 inches folded to 5 x 10 inches. Revised biannually, except most Alaskan charts are revised annually.
(See FIG 9-1-1 and FIG 9-1-2.)

2. VFR Terminal Area Charts (TAC). TACs depict the airspace designated as Class B airspace. While similar to sectional charts, TACs have more detail because the scale is larger. The TAC should be used by pilots intending to operate to or from airfields within or near Class B or Class C airspace. Areas with TAC coverage are indicated by a • on the Sectional Chart indexes. Scale 1 inch = 3.43nm/1:250,000. Charts are revised biannually, except Puerto Rico-Virgin Islands which is revised annually.
(See FIG 9-1-1 and FIG 9-1-2.)

3. U.S. Gulf Coast VFR Aeronautical Chart. The Gulf Coast Chart is designed primarily for helicopter operation in the Gulf of Mexico area. Information depicted includes offshore mineral leasing areas and blocks, oil drilling platforms, and high density helicopter activity areas. Scale 1 inch = 13.7nm/1:1,000,000. 55 x 27 inches folded to 5 x 10 inches. Revised annually.

4. Grand Canyon VFR Aeronautical Chart. Covers the Grand Canyon National Park area and is designed to promote aviation safety, flight free zones, and facilitate VFR navigation in this popular area. The chart contains aeronautical information for general aviation VFR pilots on one side and commercial VFR air tour operators on the other side.

FIG 9−1−1

Sectional and VFR Terminal Area Charts for the Conterminous U.S., Hawaii, Puerto Rico, and Virgin Islands

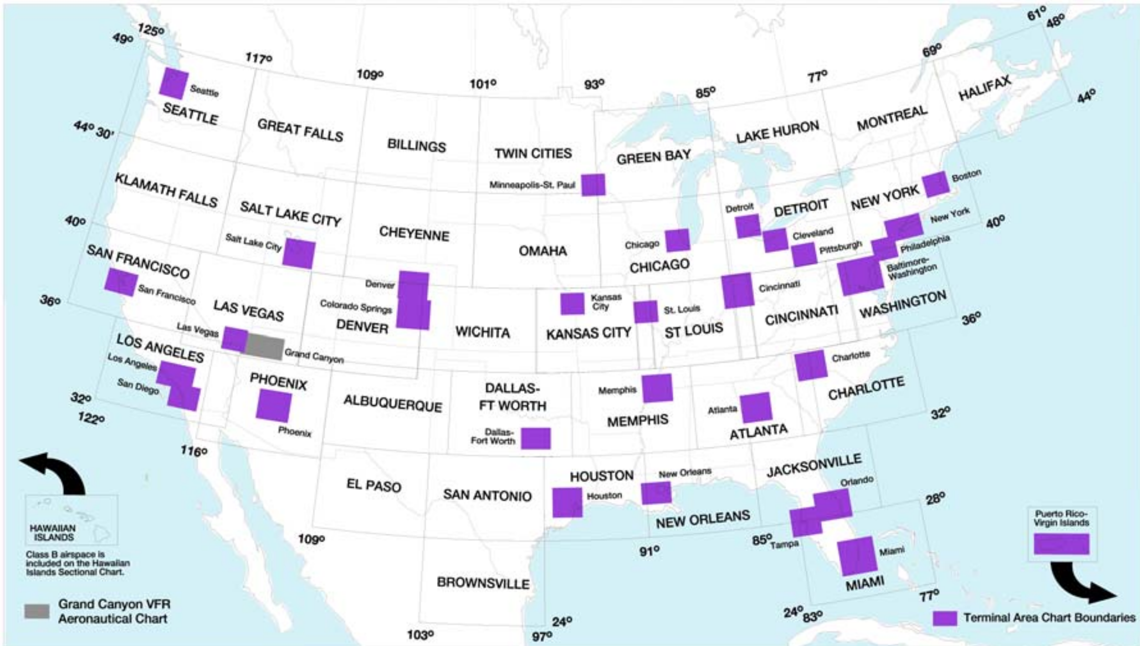
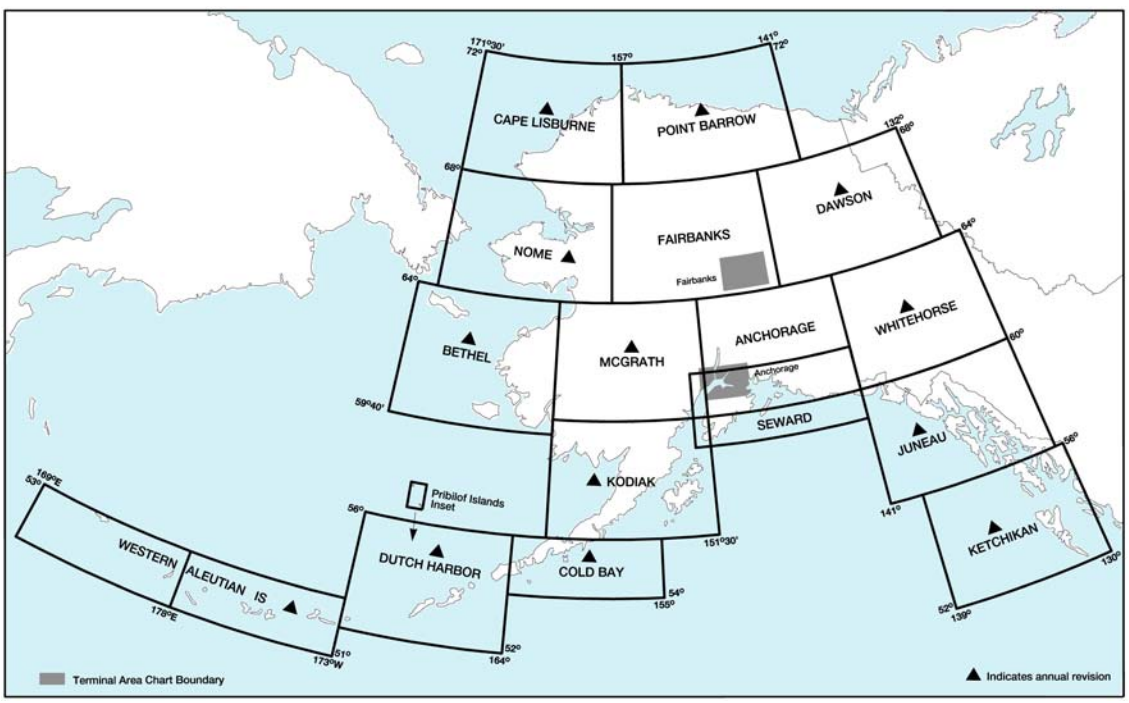


FIG 9−1−2

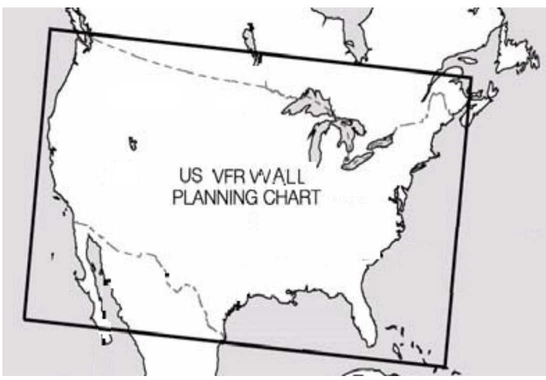
Sectional and VFR Terminal Area Charts for Alaska



3. U.S. VFR Wall Planning Chart. This chart is designed for VFR preflight planning and provides 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. Chart is revised biennially. (See FIG 9−1−9.)

FIG 9−1−9

U.S. VFR Wall Planning Chart



4. Charted 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. Chart scale 1 inch = 3.43nm/1:250,000.

d. Supplementary Charts and Publications.

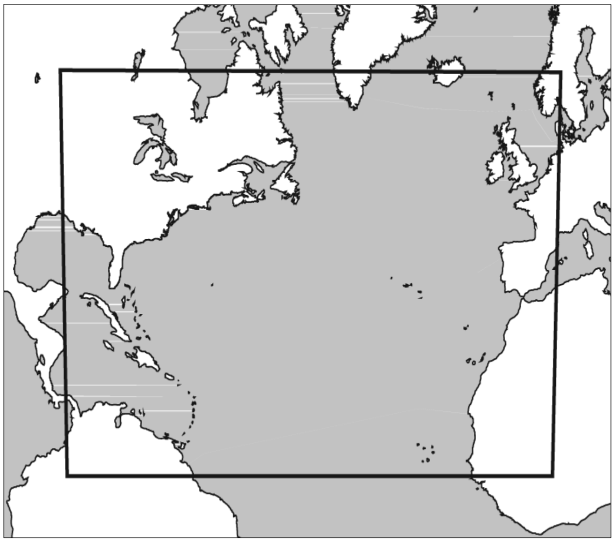
1. Chart Supplement U.S. This 7−volume booklet series contains data on airports, seaplane bases, heliports, NAVAIDs, communications data, weather data sources, airspace, special notices, and operational procedures. Coverage includes the conterminous U.S., Puerto Rico, and the Virgin Islands. The Chart Supplement U.S. shows data that cannot be readily depicted in graphic form; for example, airport hours of operations, types of fuel available, runway widths, lighting codes, etc. The Chart Supplement U.S. also provides a means for pilots to update visual charts between edition dates (The Chart Supplement U.S. is published every 56 days while Sectional Aeronautical and VFR Terminal Area Charts are generally revised every six months). The Aeronautical Chart Bulletins (VFR Chart Update Bulletins) are available for free download from the AeroNav web site. Volumes are side−bound 5−3/8 x 8−1/4 inches. (See FIG 9−1−12.)

2. Chart Supplement Alaska. This is a civil/military flight information publication issued by FAA every 56 days. It is a single volume booklet designed for use with appropriate IFR or VFR charts. The Chart Supplement Alaska contains airport sketches, communications data, weather data sources, airspace, listing of navigational facilities, and special notices and procedures. Volume is side−bound 5−3/8 x 8−1/4 inches.

3. Chart Supplement Pacific. This supplement is designed for use with appropriate VFR or IFR en route charts. Included in this one−volume booklet are the chart supplement, communications data, weather data sources, airspace, navigational facilities, special notices, and Pacific area procedures. IAP charts, DP charts, STAR charts, airport diagrams, radar minimums, and supporting data for the Hawaiian and Pacific Islands are included. The manual is published every 56 days. Volume is side−bound 5−3/8 x 8−1/4 inches.

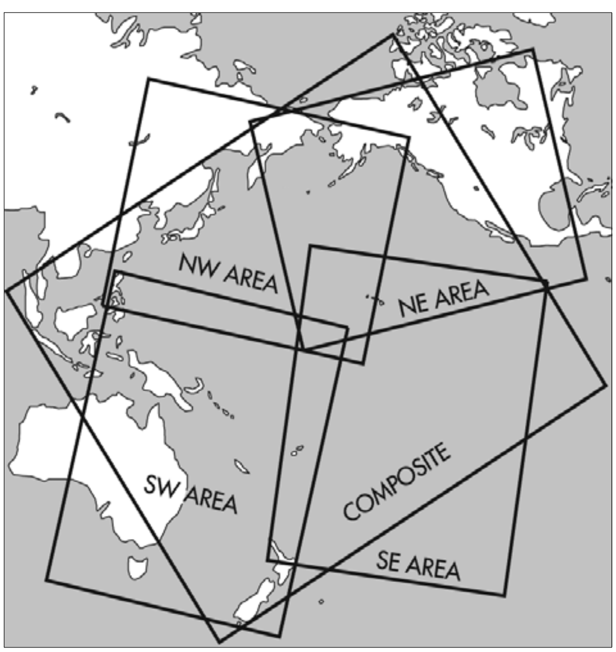
4. North Atlantic Route Chart. Designed for FAA controllers to monitor transatlantic flights, this 5−color chart shows oceanic control areas, coastal navigation aids, oceanic reporting points, and NAVAID geographic coordinates. Full Size Chart: Scale 1 inch = 113.1nm/1:8,250,000. Chart is shipped flat only. Half Size Chart: Scale 1 inch = 150.8nm/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 weeks. (See FIG 9−1−10.)

FIG 9-1-10
North Atlantic Route Charts



5. 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 = 164nm/1:12,000,000. 48 x 41-1/2 inches. Area Charts: Scale 1 inch = 95.9nm/1:7,000,000. 52 x 40-1/2 inches. All charts shipped unfolded. Charts revised every 56 days. (See FIG 9-1-11.)

FIG 9-1-11
North Pacific Oceanic Route Charts



6. 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.

7. 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 AeroNav web site.

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 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.

(c) The Digital Aeronautical Chart Supplement (DACS). The DACS is specifically designed to provide digital airspace data not otherwise readily available. The supplement includes a *Change Notice* for IAPFIX.dat at the mid-point between revisions. The *Change Notice* is available only by free download from the AeroNav website.

The DACS individual data files are:

ENHIGH.DAT: High altitude airways (conterminous U.S.)
ENLOW.DAT: Low altitude airways (conterminous U.S.)
IAPFIX.DAT: Selected instrument approach procedure NAVAID and fix data.
MTRFIX.DAT: Military training routes data.
ALHIGH.DAT: Alaska high altitude airways data.
ALLOW.DAT: Alaska low altitude airways data.
PR.DAT: Puerto Rico airways data.
HAWAII.DAT: Hawaii airways data.
BAHAMA.DAT: Bahamas routes data.
OCEANIC.DAT: Oceanic routes data.
STARS.DAT: Standard terminal arrivals data.
DP.DAT: Instrument departure procedures data.
LOPREF.DAT: Preferred low altitude IFR routes data.
HIPREF.DAT: Preferred high altitude IFR routes data.
ARF.DAT: Air route radar facilities data.
ASR.DAT: Airport surveillance radar facilities data.

2. The National Flight Database (NFD) (ARINC 424 [Ver 13 & 15]). The NFD 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 AeroNav Products website. The root mean square error of the transformation will not exceed two pixels. Digital−VC DVDs are updated every 28 days and are available by subscription only.

FIG 9−1−12
Chart Supplement U.S. Geographic Areas

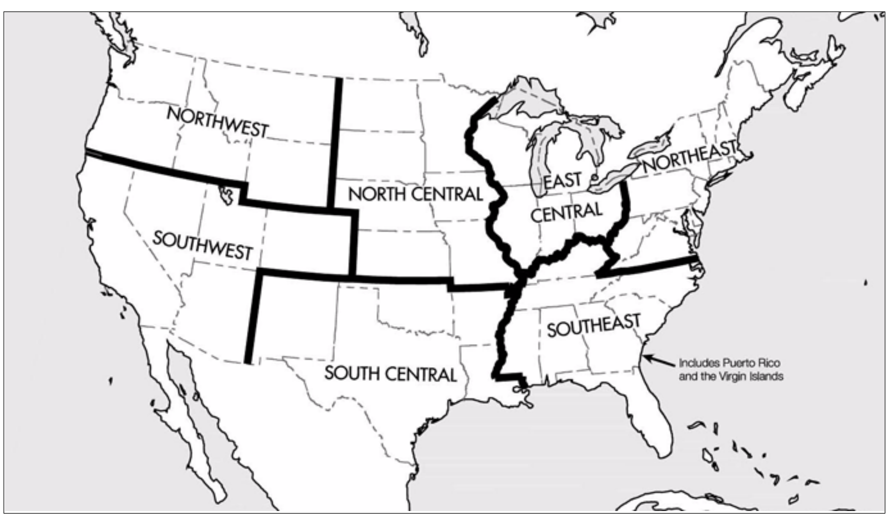
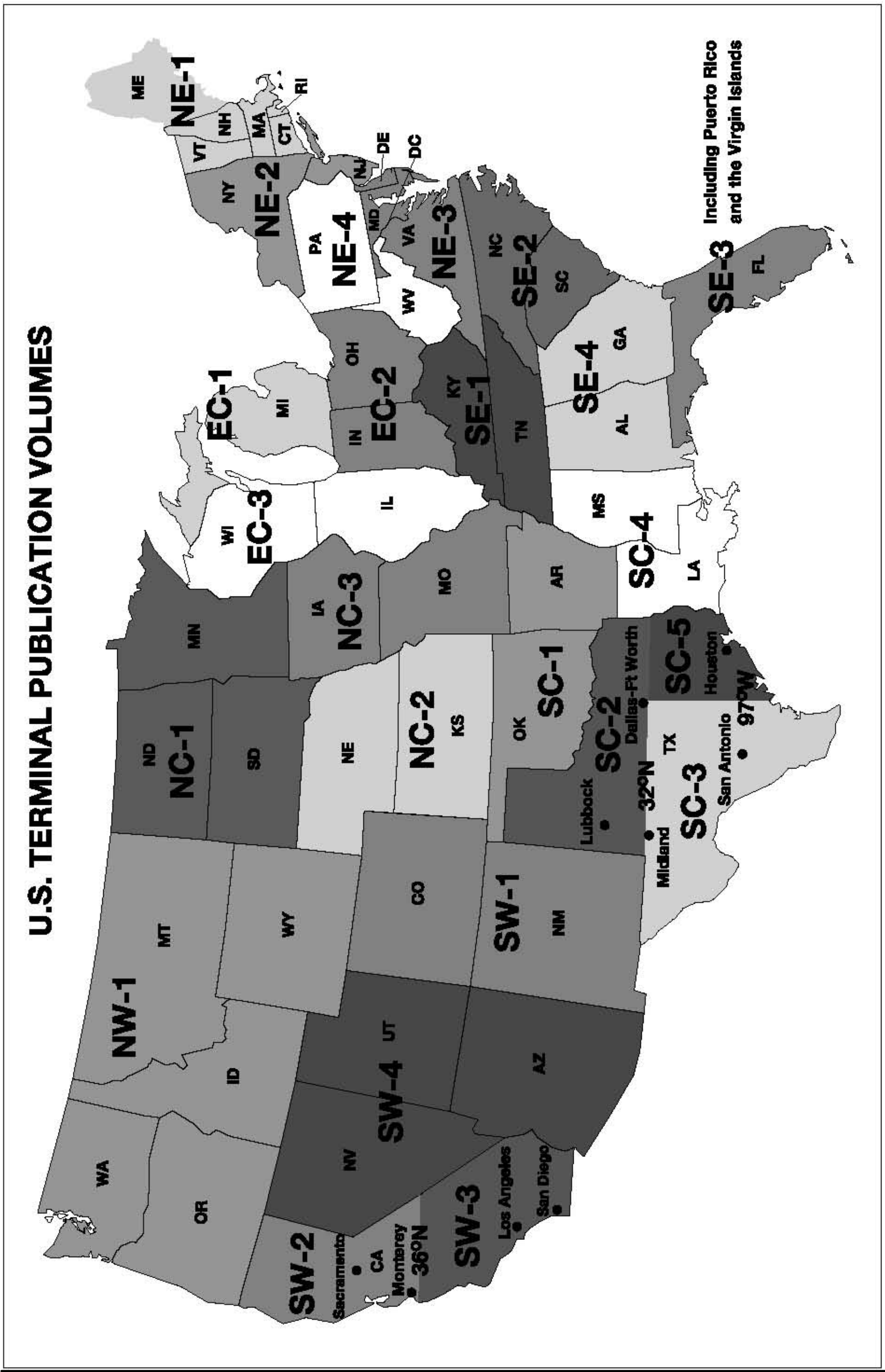


FIG 9−1−13
U.S. Terminal Publication Volumes



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
AC	Advisory Circular
ACAR	Aircraft Communications Addressing and Reporting System
ADCUS	Advise Customs
ADDS	Aviation Digital Data Service
ADF	Automatic Direction Finder
ADIZ	Air Defense Identification Zone
ADS−B	Automatic Dependent Surveillance−Broadcast
AeroNav	Aeronautical Navigation Products
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
ALD	Available Landing Distance
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
ARTS	Automated Radar Terminal System
ASDE−X . . .	Airport Surface Detection Equipment − Model X
ASOS	Automated Surface Observing System
ASR	Airport Surveillance Radar

Abbreviation/ Acronym	Meaning
ASRS	Aviation Safety Reporting System
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
ATT	Attitude Retention System
AWC	Aviation Weather Center
AWOS	Automated Weather Observing System
AWSS	Automated Weather Sensor 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
C/A	Coarse Acquisition
CARTS	Common Automated Radar Terminal System (ARTS) (to include ARTS IIIE and ARTS IIE)
CAT	Clear Air Turbulence
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
DCA	Ronald Reagan Washington National Airport
DCP	Data Collection Package
DER	Departure End of Runway

Abbreviation/ Acronym	Meaning
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
DUATS	Direct User Access Terminal System
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
FAROS	Final Approach Runway Occupancy Signal
FAWP	Final Approach Waypoint
FB	Fly−by
FCC	Federal Communications Commission
FD	Flight Director System
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
FMSP	Flight Management System Procedure
FO	Fly−over
FPA	Flight Path Angle
FPV	Flight Path Vector
FPNM	Feet Per Nautical Mile

Abbreviation/ Acronym	Meaning
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
HDTA	High Density Traffic Airports
HEMS	Helicopter Emergency Medical Services
HIRL	High Intensity Runway Lights
HIWAS	Hazardous Inflight Weather Advisory Service
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
ICAO	International Civil Aviation Organization
IF	Intermediate Fix
IFIM	International Flight Information Manual
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
LAAS	Local Area Augmentation System
LAHSO	Land and Hold Short Operations
LAWRS	Limited Aviation Weather Reporting Station
LDA	Localizer Type Directional Aid

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. This Glossary will be revised, as necessary, to maintain a common understanding of the system.

EXPLANATION OF CHANGES

d. Terms Added:
ATC SURVEILLANCE SOURCE
CHART SUPPLEMENT U.S.
COLD TEMPERATURE COMPENSATION
GROUND BASED AUGMENTATION SYSTEM (GBAS)
GROUND BASED AUGMENTATION SYSTEM (GBAS) LANDING SYSTEM (GLS)
TIME BASED FLOW MANAGEMENT (TBFM)
WIDE AREA MULTILATERATION (WAM)

e. Terms Deleted:
AIRPORT/FACILITY DIRECTORY (A/FD)
EN ROUTE FLIGHT ADVISORY SERVICE
FLIGHT WATCH
OCEANIC DISPLAY AND PLANNING SYSTEM (ODAPS)
REMOTE AIRPORT ADVISORY (RAA)
SUPER HIGH FREQUENCY
TRAFFIC MANAGEMENT ADVISOR (TMA)

f. Terms Modified:
ADVISORY SERVICE
AVIATION WEATHER SERVICE
BRAKING ACTION
DISTANCE MEASURING EQUIPMENT
DME FIX
FLIGHT SERVICE STATION (FSS)
ICING
LOCAL AIRPORT ADVISORY (LAA)
RADAR CONTACT
RADAR CONTACT LOST

SCHEDULED TIME OF ARRIVAL (STA)
UNFROZEN

g. Editorial/format changes were made where necessary. Revision bars were not used due to the insignificant nature of the changes.

PAGE CONTROL CHART

REMOVE PAGES	DATED	INSERT PAGES	DATED
PCG−1 and PCG−2	12/10/15	PCG−1 and PCG−2	05/26/16
PCG A−1	12/10/15	PCG A−1	12/10/15
PCG A−2 through PCG A−16	12/10/15	PCG A−2 through PCG A−16	05/26/16
PCG B−1	12/10/15	PCG B−1	05/26/16
PCG B−2	12/10/15	PCG B−2	12/10/15
PCG C−1	12/10/15	PCG C−1	12/10/15
PCG C−2 through PCG C−9	12/10/15	PCG C−2 through PCG C−9	05/26/16
PCG D−1	12/10/15	PCG D−1	12/10/15
PCG D−2 and PCG D−3	12/10/15	PCG D−2 and PCG D−3	05/26/16
PCG D−4	12/10/15	PCG D−4	12/10/15
PCG E−1 and PCG E−2	12/10/15	PCG E−1 and PCG E−2	05/26/16
PCG F−3	12/10/15	PCG F−3	12/10/15
PCG F−4 and PCG F−5	12/10/15	PCG F−4 and PCG F−5	05/26/16
PCG G−1	12/10/15	PCG G−1	12/10/15
PCG G−2 and PCG G−3	12/10/15	PCG G−2 and PCG G−3	05/26/16
PCG I−1 through PCG I−6	12/10/15	PCG I−1 through PCG I−6	05/26/16
PCG L−1	12/10/15	PCG L−1	12/10/15
PCG L−2	12/10/15	PCG L−2	05/26/16
PCG N−1 through PCG N−4	12/10/15	PCG N−1 through PCG N−4	05/26/16
PCG O−1	12/10/15	PCG O−1	12/10/15
PCG O−2	12/10/15	PCG O−2	05/26/16
PCG P−3	12/10/15	PCG P−3	12/10/15
PCG P−4	12/10/15	PCG P−4	05/26/16
PCG R−1 through PCG R−8	12/10/15	PCG R−1 through PCG R−8	05/26/16
PCG S−1	12/10/15	PCG S−1	12/10/15
PCG S−2	12/10/15	PCG S−2	05/26/16
PCG S−5	12/10/15	PCG S−5	05/26/16
PCG S−6 and PCG S−7	12/10/15	PCG S−6 and PCG S−7	12/10/15
PCG S−8	12/10/15	PCG S−8	05/26/16
PCG T−3 through PCG T−8	12/10/15	PCG T−3 through PCG T−8	05/26/16
PCG U−1	12/10/15	PCG U−1	05/26/16
PCG V−3	12/10/15	PCG V−3	12/10/15
PCG V−4	12/10/15	PCG V−4	05/26/16
PCG W−1	12/10/15	PCG W−1 and PCG W−2	05/26/16

A

AAI−
(See ARRIVAL AIRCRAFT INTERVAL.)

AAR−
(See AIRPORT ARRIVAL RATE.)

ABBREVIATED IFR FLIGHT PLANS− An authorization by ATC requiring pilots to submit only that information needed for the purpose of ATC. It includes only a small portion of the usual IFR flight plan information. In certain instances, this may be only aircraft identification, location, and pilot request. Other information may be requested if needed by ATC for separation/control purposes. It is frequently used by aircraft which are airborne and desire an instrument approach or by aircraft which are on the ground and desire a climb to VFR-on-top.
(See VFR-ON-TOP.)
(Refer to AIM.)

ABEAM− An aircraft is "abeam" a fix, point, or object when that fix, point, or object is approximately 90 degrees to the right or left of the aircraft track. Abeam indicates a general position rather than a precise point.

ABORT− To terminate a preplanned aircraft maneuver; e.g., an aborted takeoff.

ACC [ICAO]−
(See ICAO term AREA CONTROL CENTER.)

ACCELERATE-STOP DISTANCE AVAILABLE− The runway plus stopway length declared available and suitable for the acceleration and deceleration of an airplane aborting a takeoff.

ACCELERATE-STOP DISTANCE AVAILABLE [ICAO]− The length of the take-off run available plus the length of the stopway if provided.

ACDO−
(See AIR CARRIER DISTRICT OFFICE.)

ACKNOWLEDGE− Let me know that you have received and understood this message.

ACL−
(See AIRCRAFT LIST.)

ACLS−
(See AUTOMATIC CARRIER LANDING SYSTEM.)

ACLT−
(See ACTUAL CALCULATED LANDING TIME.)

ACROBATIC FLIGHT− An intentional maneuver involving an abrupt change in an aircraft's attitude, an abnormal attitude, or abnormal acceleration not necessary for normal flight.
(See ICAO term ACROBATIC FLIGHT.)
(Refer to 14 CFR Part 91.)

ACROBATIC FLIGHT [ICAO]− Maneuvers intentionally performed by an aircraft involving an abrupt change in its attitude, an abnormal attitude, or an abnormal variation in speed.

ACTIVE RUNWAY−
(See RUNWAY IN USE/ACTIVE RUNWAY/DUTY RUNWAY.)

ACTUAL CALCULATED LANDING TIME− ACLT is a flight's frozen calculated landing time. An actual time determined at freeze calculated landing time (FCLT) or meter list display interval (MLDI) for the adapted vertex for each arrival aircraft based upon runway configuration, airport acceptance rate, airport arrival delay period, and other metered arrival aircraft. This time is either the vertex time of arrival (VTA) of the aircraft or the tentative calculated landing time (TCLT)/ACLT of the previous aircraft plus the arrival aircraft interval (AAI), whichever is later. This time will not be updated in response to the aircraft's progress.

ACTUAL NAVIGATION PERFORMANCE (ANP)−
(See REQUIRED NAVIGATION PERFORMANCE.)

ADDITIONAL SERVICES− Advisory information provided by ATC which includes but is not limited to the following:

a. Traffic advisories.

b. Vectors, when requested by the pilot, to assist aircraft receiving traffic advisories to avoid observed traffic.

c. Altitude deviation information of 300 feet or more from an assigned altitude as observed on a verified (reading correctly) automatic altitude readout (Mode C).

d. Advisories that traffic is no longer a factor.

e. Weather and chaff information.

f. Weather assistance.

g. Bird activity information.

h. Holding pattern surveillance. Additional services are provided to the extent possible contingent only upon the controller's capability to fit them into the performance of higher priority duties and on the basis of limitations of the radar, volume of traffic, frequency congestion, and controller workload. The controller has complete discretion for determining if he/she is able to provide or continue to provide a service in a particular case. The controller's reason not to provide or continue to provide a service in a particular case is not subject to question by the pilot and need not be made known to him/her.

(See TRAFFIC ADVISORIES.)
(Refer to AIM.)

ADF−
(See AUTOMATIC DIRECTION FINDER.)

ADIZ−
(See AIR DEFENSE IDENTIFICATION ZONE.)

ADLY−
(See ARRIVAL DELAY.)

ADMINISTRATOR− The Federal Aviation Administrator or any person to whom he/she has delegated his/her authority in the matter concerned.

ADR−
(See AIRPORT DEPARTURE RATE.)

ADS [ICAO]−
(See ICAO term AUTOMATIC DEPENDENT SURVEILLANCE.)

ADS−B−
(See AUTOMATIC DEPENDENT SURVEILLANCE−BROADCAST.)

ADS−C−
(See AUTOMATIC DEPENDENT SURVEILLANCE−CONTRACT.)

ADVISE INTENTIONS− Tell me what you plan to do.

ADVISORY− Advice and information provided to assist pilots in the safe conduct of flight and aircraft movement.
(See ADVISORY SERVICE.)

ADVISORY FREQUENCY− The appropriate frequency to be used for Airport Advisory Service.
(See LOCAL AIRPORT ADVISORY.)
(See UNICOM.)
(Refer to ADVISORY CIRCULAR NO. 90-42.)
(Refer to AIM.)

ADVISORY SERVICE− Advice and information provided by a facility to assist pilots in the safe conduct of flight and aircraft movement.
(See ADDITIONAL SERVICES.)
(See LOCAL AIRPORT ADVISORY.)
(See RADAR ADVISORY.)
(See SAFETY ALERT.)
(See TRAFFIC ADVISORIES.)
(Refer to AIM.)

AERIAL REFUELING− A procedure used by the military to transfer fuel from one aircraft to another during flight.
(Refer to VFR/IFR Wall Planning Charts.)

AERODROME− A defined area on land or water (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure, and movement of aircraft.

AERODROME BEACON [ICAO]− Aeronautical beacon used to indicate the location of an aerodrome from the air.

AERODROME CONTROL SERVICE [ICAO]− Air traffic control service for aerodrome traffic.

AERODROME CONTROL TOWER [ICAO]− A unit established to provide air traffic control service to aerodrome traffic.

AERODROME ELEVATION [ICAO]− The elevation of the highest point of the landing area.

AERODROME TRAFFIC CIRCUIT [ICAO]− The specified path to be flown by aircraft operating in the vicinity of an aerodrome.

AERONAUTICAL BEACON− A visual NAVAID displaying flashes of white and/or colored light to indicate the location of an airport, a heliport, a landmark, a certain point of a Federal airway in mountainous terrain, or an obstruction.
(See AIRPORT ROTATING BEACON.)
(Refer to AIM.)

AERONAUTICAL CHART− A map used in air navigation containing all or part of the following: topographic features, hazards and obstructions, navigation aids, navigation routes, designated airspace, and airports. Commonly used aeronautical charts are:

a. Sectional Aeronautical Charts (1:500,000)− Designed for visual navigation of slow or medium speed aircraft. Topographic information on these charts features the portrayal of relief and a judicious selection of visual check points for VFR flight. Aeronautical information includes visual and radio aids to navigation, airports, controlled airspace, restricted areas, obstructions, and related data.

b. VFR Terminal Area Charts (1:250,000)− Depict Class B airspace which provides for the control or segregation of all the aircraft within Class B airspace. The chart depicts topographic information and aeronautical information which includes visual and radio aids to navigation, airports, controlled airspace, restricted areas, obstructions, and related data.

c. En Route Low Altitude Charts− Provide aeronautical information for en route instrument navigation (IFR) in the low altitude stratum. Information includes the portrayal of airways, limits of controlled airspace, position identification and frequencies of radio aids, selected airports, minimum en route and minimum obstruction clearance altitudes, airway distances, reporting points, restricted areas, and related data. Area charts, which are a part of this series, furnish terminal data at a larger scale in congested areas.

d. En Route High Altitude Charts− Provide aeronautical information for en route instrument navigation (IFR) in the high altitude stratum. Information includes the portrayal of jet routes, identification and frequencies of radio aids, selected airports, distances, time zones, special use airspace, and related information.

e. Instrument Approach Procedures (IAP) Charts− Portray the aeronautical data which is required to execute an instrument approach to an airport. These charts depict the procedures, including all related data, and the airport diagram. Each procedure is designated for use with a specific type of electronic navigation system including NDB, TACAN, VOR, ILS RNAV and GLS. These charts are identified by the type of navigational aid(s)/equipment required to provide final approach guidance.

f. Instrument Departure Procedure (DP) Charts− Designed to expedite clearance delivery and to facilitate transition between takeoff and en route operations. Each DP is presented as a separate chart and may serve a single airport or more than one airport in a given geographical location.

g. Standard Terminal Arrival (STAR) Charts− Designed to expedite air traffic control arrival procedures and to facilitate transition between en route and instrument approach operations. Each STAR procedure is presented as a separate chart and may serve a single airport or more than one airport in a given geographical location.

h. Airport Taxi Charts− Designed to expedite the efficient and safe flow of ground traffic at an airport. These charts are identified by the official airport name; e.g., Ronald Reagan Washington National Airport.

(See ICAO term AERONAUTICAL CHART.)

AERONAUTICAL CHART [ICAO]− A representation of a portion of the earth, its culture and relief, specifically designated to meet the requirements of air navigation.

AERONAUTICAL INFORMATION MANUAL (AIM)− A primary FAA publication whose purpose is to instruct airmen about operating in the National Airspace System of the U.S. It provides basic flight information, ATC Procedures and general instructional information concerning health, medical facts, factors affecting flight safety, accident and hazard reporting, and types of aeronautical charts and their use.

AERONAUTICAL INFORMATION PUBLICATION (AIP) [ICAO]− A publication issued by or with the authority of a State and containing aeronautical information of a lasting character essential to air navigation.

(See CHART SUPPLEMENT U.S.)

AFFIRMATIVE− Yes.

AFIS−

(See AUTOMATIC FLIGHT INFORMATION SERVICE − ALASKA FSSs ONLY.)

AFP−

(See AIRSPACE FLOW PROGRAM.)

AIM−

(See AERONAUTICAL INFORMATION MANUAL.)

AIP [ICAO]−
(See ICAO term AERONAUTICAL INFORMATION PUBLICATION.)

AIR CARRIER DISTRICT OFFICE− An FAA field office serving an assigned geographical area, staffed with Flight Standards personnel serving the aviation industry and the general public on matters related to the certification and operation of scheduled air carriers and other large aircraft operations.

AIR DEFENSE EMERGENCY− A military emergency condition declared by a designated authority. This condition exists when an attack upon the continental U.S., Alaska, Canada, or U.S. installations in Greenland by hostile aircraft or missiles is considered probable, is imminent, or is taking place.
(Refer to AIM.)

AIR DEFENSE IDENTIFICATION ZONE (ADIZ)− The area of airspace over land or water, extending upward from the surface, within which the ready identification, the location, and the control of aircraft are required in the interest of national security.

a. Domestic Air Defense Identification Zone. An ADIZ within the United States along an international boundary of the United States.

b. Coastal Air Defense Identification Zone. An ADIZ over the coastal waters of the United States.

c. Distant Early Warning Identification Zone (DEWIZ). An ADIZ over the coastal waters of the State of Alaska.

d. Land−Based Air Defense Identification Zone. An ADIZ over U.S. metropolitan areas, which is activated and deactivated as needed, with dimensions, activation dates and other relevant information disseminated via NOTAM.

Note: ADIZ locations and operating and flight plan requirements for civil aircraft operations are specified in 14 CFR Part 99.

(Refer to AIM.)

AIR NAVIGATION FACILITY− Any facility used in, available for use in, or designed for use in, aid of air navigation, including landing areas, lights, any apparatus or equipment for disseminating weather information, for signaling, for radio-directional finding, or for radio or other electrical communication, and any other structure or mechanism having a similar purpose for guiding or controlling flight in the air or the landing and takeoff of aircraft.
(See NAVIGATIONAL AID.)

AIR ROUTE SURVEILLANCE RADAR− Air route traffic control center (ARTCC) radar used primarily to detect and display an aircraft's position while en route between terminal areas. The ARSR enables controllers to provide radar air traffic control service when aircraft are within the ARSR coverage. In some instances, ARSR may enable an ARTCC to provide terminal radar services similar to but usually more limited than those provided by a radar approach control.

AIR ROUTE TRAFFIC CONTROL CENTER− A facility established to provide air traffic control service to aircraft operating on IFR flight plans within controlled airspace and principally during the en route phase of flight. When equipment capabilities and controller workload permit, certain advisory/assistance services may be provided to VFR aircraft.
(See EN ROUTE AIR TRAFFIC CONTROL SERVICES.)
(Refer to AIM.)

AIR TAXI− Used to describe a helicopter/VTOL aircraft movement conducted above the surface but normally not above 100 feet AGL. The aircraft may proceed either via hover taxi or flight at speeds more than 20 knots. The pilot is solely responsible for selecting a safe airspeed/altitude for the operation being conducted.
(See HOVER TAXI.)
(Refer to AIM.)

AIR TRAFFIC− Aircraft operating in the air or on an airport surface, exclusive of loading ramps and parking areas.
(See ICAO term AIR TRAFFIC.)

AIR TRAFFIC [ICAO]− All aircraft in flight or operating on the maneuvering area of an aerodrome.

AIR TRAFFIC CLEARANCE− An authorization by air traffic control for the purpose of preventing collision between known aircraft, for an aircraft to proceed under specified traffic conditions within controlled airspace. The pilot-in-command of an aircraft may not deviate from the provisions of a visual flight rules (VFR) or instrument flight rules (IFR) air traffic clearance except in an emergency or unless an amended clearance has been obtained. Additionally, the pilot may request a different clearance from that which has been issued by air traffic control (ATC) if information available to the pilot makes another course of action more practicable or if aircraft equipment limitations or company procedures forbid compliance with the clearance issued. Pilots may also request clarification or amendment, as appropriate, any time a clearance is not fully understood, or considered unacceptable because of safety of flight. Controllers should, in such instances and to the extent of operational practicality and safety, honor the pilot's request. 14 CFR Part 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." THE PILOT IS RESPONSIBLE TO REQUEST AN AMENDED CLEARANCE if ATC issues a clearance that would cause a pilot to deviate from a rule or regulation, or in the pilot's opinion, would place the aircraft in jeopardy.

(See ATC INSTRUCTIONS.)
(See ICAO term AIR TRAFFIC CONTROL CLEARANCE.)

AIR TRAFFIC CONTROL− A service operated by appropriate authority to promote the safe, orderly and expeditious flow of air traffic.

(See ICAO term AIR TRAFFIC CONTROL SERVICE.)

AIR TRAFFIC CONTROL CLEARANCE [ICAO]− Authorization for an aircraft to proceed under conditions specified by an air traffic control unit.

Note 1: For convenience, the term air traffic control clearance is frequently abbreviated to clearance when used in appropriate contexts.

Note 2: The abbreviated term clearance may be prefixed by the words taxi, takeoff, departure, en route, approach or landing to indicate the particular portion of flight to which the air traffic control clearance relates.

AIR TRAFFIC CONTROL SERVICE−

(See AIR TRAFFIC CONTROL.)

AIR TRAFFIC CONTROL SERVICE [ICAO]− A service provided for the purpose of:

a. Preventing collisions:

1. Between aircraft; and

2. On the maneuvering area between aircraft and obstructions.

b. Expediting and maintaining an orderly flow of air traffic.

AIR TRAFFIC CONTROL SPECIALIST− A person authorized to provide air traffic control service.

(See AIR TRAFFIC CONTROL.)
(See FLIGHT SERVICE STATION.)
(See ICAO term CONTROLLER.)

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). Responsible for approving IFR flights at designated high density traffic airports (John F. Kennedy, LaGuardia, and Ronald Reagan Washington National) during specified hours.

(Refer to 14 CFR Part 93.)
(See CHART SUPPLEMENT U.S.)

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.

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 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.

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.

(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) and the Antonov An-225 (A225) are classified as super.

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.

c. Large− Aircraft of more than 41,000 pounds, maximum certificated takeoff weight, up to but not including 300,000 pounds.

d. Small− Aircraft of 41,000 pounds or less maximum certificated takeoff weight.

(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 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 shall 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.

AIRMEN'S METEOROLOGICAL INFORMATION−
(See AIRMET.)

AIRMET− In-flight weather advisories issued only to amend the area forecast concerning weather phenomena which are of operational interest to all aircraft and potentially hazardous to aircraft having limited capability because of lack of equipment, instrumentation, or pilot qualifications. AIRMETs concern weather of less severity than that covered by SIGMETs or Convective SIGMETs. AIRMETs cover moderate icing, moderate turbulence, sustained winds of 30 knots or more at the surface, widespread areas of ceilings less than 1,000 feet and/or visibility less than 3 miles, and extensive mountain obscurement.
(See AWW.)
(See CONVECTIVE SIGMET.)
(See CWA.)
(See SIGMET.)
(Refer to AIM.)

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 FAAO 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 STREAM FILTER (ASF)− An on/off filter that allows the conflict notification function to be inhibited for arrival streams into single or multiple airports to prevent nuisance alerts.

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 a X−band Surface Movement Radar and multilateration. Data from these two sources are fused and presented on a digital display.

c. ASDE−3X− an ASDE−X system that uses the ASDE−3 Surface Movement Radar.

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."

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.)

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− 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 distance measured from a point-in-space by systems using area navigation reference capabilities that are 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.

(See AUTOMATED RADAR TERMINAL SYSTEMS.)

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.)

(See AUTOMATED RADAR TERMINAL SYSTEMS.)

(Refer to AIM.)

ALTITUDE RESERVATION− 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.

(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 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 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 30NM arc centered on the IF bounded by a straight line extending through the IF perpendicular to the intermediate course.

2. LEFT BASE AREA− A 30NM arc centered on the right corner IAF. The area shares a boundary with the straight-in area except that it extends out for 30NM 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 30NM arc centered on the left corner IAF. The area shares a boundary with the straight-in area except that it extends out for 30NM 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 an ILS 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.

ARINC− An acronym for Aeronautical Radio, Inc., a corporation largely owned by a group of airlines. ARINC is licensed by the FCC as an aeronautical station and contracted by the FAA to provide communications support for air traffic control and meteorological services in portions of international airspace.

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 AIRCRAFT INTERVAL− An internally generated program in hundredths of minutes based upon the AAR. AAI is the desired optimum interval between successive arrival aircraft over the vertex.

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 SECTOR− An operational control sector containing one or more meter fixes.

ARRIVAL SECTOR ADVISORY LIST− An ordered list of data on arrivals displayed at the PVD/MDM of the sector which controls the meter fix.

ARRIVAL SEQUENCING PROGRAM− The automated program designed to assist in sequencing aircraft destined for the same airport.

ARRIVAL TIME− The time an aircraft touches down on arrival.

ARSR−
(See AIR ROUTE SURVEILLANCE RADAR.)

ARTCC−
(See AIR ROUTE TRAFFIC CONTROL CENTER.)

ARTS−
(See AUTOMATED RADAR TERMINAL SYSTEMS.)

ASDA−
(See ACCELERATE-STOP DISTANCE AVAILABLE.)

ASDA [ICAO]−
(See ICAO Term ACCELERATE-STOP DISTANCE AVAILABLE.)

ASDE−
(See AIRPORT SURFACE DETECTION EQUIPMENT.)

ASF−
(See AIRPORT STREAM FILTER.)

ASLAR−
(See AIRCRAFT SURGE LAUNCH AND RECOVERY.)

ASP−
(See ARRIVAL SEQUENCING PROGRAM.)

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.DME FIX
(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.

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.)

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.)

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 INFORMATION TRANSFER− 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 FAAO 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 RADAR TERMINAL SYSTEMS (ARTS)− A generic term for several tracking systems included in the Terminal Automation Systems (TAS). ARTS plus a suffix roman numeral denotes a major modification to that system.

a. ARTS IIIA. The Radar Tracking and Beacon Tracking Level (RT&BTL) of the modular, programmable automated radar terminal system. ARTS IIIA detects, tracks, and predicts primary as well as secondary radar-derived aircraft targets. This more sophisticated computer-driven system upgrades the existing ARTS III system by providing improved tracking, continuous data recording, and fail-soft capabilities.

b. Common ARTS. Includes ARTS IIE, ARTS IIIE; and ARTS IIIE with ACD (see DTAS) which combines functionalities of the previous ARTS systems.

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), Automated Weather Sensor System (AWSS) 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 U.S. 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 GPS−derived position and other information such as velocity over the data link, which is received by a ground−based transmitter/receiver (transceiver) for processing and display at an air traffic control facility.
(See GLOBAL POSITIONING SYSTEM.)
(See GROUND−BASED TRANSCEIVER.)

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) is a datalink translation function of the ADS−B ground system required to accommodate the two separate operating frequencies (978 MHz and 1090 ES). 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, breaking action, airport NOTAMs, and other applicable information. The information is continuously broadcast over a discrete VHF radio frequency (usually the ASOS/AWSS/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 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.)

AWW−

(See SEVERE WEATHER FORECAST ALERTS.)

B

BACK-TAXI– A term used by air traffic controllers to taxi an aircraft on the runway opposite to the traffic flow. The aircraft may be instructed to back-taxi to the beginning of the runway or at some point before reaching the runway end for the purpose of departure or to exit the runway.

BASE LEG–
(See TRAFFIC PATTERN.)

BEACON–
(See AERONAUTICAL BEACON.)
(See AIRPORT ROTATING BEACON.)
(See AIRWAY BEACON.)
(See MARKER BEACON.)
(See NONDIRECTIONAL BEACON.)
(See RADAR.)

BEARING– The horizontal direction to or from any point, usually measured clockwise from true north, magnetic north, or some other reference point through 360 degrees.
(See NONDIRECTIONAL BEACON.)

BELOW MINIMUMS– Weather conditions below the minimums prescribed by regulation for the particular action involved; e.g., landing minimums, takeoff minimums.

BLAST FENCE– A barrier that is used to divert or dissipate jet or propeller blast.

BLAST PAD– A surface adjacent to the ends of a runway provided to reduce the erosive effect of jet blast and propeller wash.

BLIND SPEED– The rate of departure or closing of a target relative to the radar antenna at which cancellation of the primary radar target by moving target indicator (MTI) circuits in the radar equipment causes a reduction or complete loss of signal.
(See ICAO term BLIND VELOCITY.)

BLIND SPOT– An area from which radio transmissions and/or radar echoes cannot be received. The term is also used to describe portions of the airport not visible from the control tower.

BLIND TRANSMISSION–
(See TRANSMITTING IN THE BLIND.)

BLIND VELOCITY [ICAO]– The radial velocity of a moving target such that the target is not seen on primary radars fitted with certain forms of fixed echo suppression.

BLIND ZONE–
(See BLIND SPOT.)

BLOCKED– Phraseology used to indicate that a radio transmission has been distorted or interrupted due to multiple simultaneous radio transmissions.

BOTTOM ALTITUDE– In reference to published altitude restrictions on a STAR or STAR runway transition, the lowest altitude authorized.

BOUNDARY LIGHTS–
(See AIRPORT LIGHTING.)

BRAKING ACTION (GOOD, MEDIUM, POOR, OR NIL)– A report of conditions on the airport movement area providing a pilot with a degree/quality of braking that he/she might expect. Braking action is reported in terms of good, fair, poor, or nil. Effective October 1, 2016, Braking Action will be categorized in the following terms: Good, Good to Medium, Medium, Medium to Poor, Poor, and Nil.
(See RUNWAY CONDITION READING.)

BRAKING ACTION ADVISORIES– When tower controllers have received runway braking action reports which include the terms "fair," "poor," or "nil," or whenever weather conditions are conducive to deteriorating or rapidly changing runway braking conditions, the tower will include on the ATIS broadcast the statement, "Braking action advisories are in effect" on the ATIS broadcast. During the time braking action advisories are in effect, ATC will issue the latest braking action report for the runway in use to each arriving and departing aircraft. Pilots should be prepared for deteriorating braking conditions and should request current runway condition information if not volunteered by controllers. Pilots should also be prepared to provide a descriptive runway condition report to controllers after landing. Effective October 1, 2016, the term "fair" will be replaced with "medium".

BREAKOUT– A technique to direct aircraft out of the approach stream. In the context of simultaneous (independent) parallel operations, a breakout is used to direct threatened aircraft away from a deviating aircraft.

BROADCAST− Transmission of information for which an acknowledgement is not expected.

(See ICAO term BROADCAST.)

BROADCAST [ICAO]− A transmission of information relating to air navigation that is not addressed to a specific station or stations.

C

CALCULATED LANDING TIME− A term that may be used in place of tentative or actual calculated landing time, whichever applies.

CALL FOR RELEASE− Wherein the overlying ARTCC requires a terminal facility to initiate verbal coordination to secure ARTCC approval for release of a departure into the en route environment.

CALL UP− Initial voice contact between a facility and an aircraft, using the identification of the unit being called and the unit initiating the call.
(Refer to AIM.)

CANADIAN MINIMUM NAVIGATION PERFORMANCE SPECIFICATION AIRSPACE− That portion of Canadian domestic airspace within which MNPS separation may be applied.

CARDINAL ALTITUDES− "Odd" or "Even" thousand-foot altitudes or flight levels; e.g., 5,000, 6,000, 7,000, FL 250, FL 260, FL 270.
(See ALTITUDE.)
(See FLIGHT LEVEL.)

CARDINAL FLIGHT LEVELS−
(See CARDINAL ALTITUDES.)

CAT−
(See CLEAR-AIR TURBULENCE.)

CATCH POINT− A fix/waypoint that serves as a transition point from the high altitude waypoint navigation structure to an arrival procedure (STAR) or the low altitude ground−based navigation structure.

CEILING− The heights above the earth's surface of the lowest layer of clouds or obscuring phenomena that is reported as "broken," "overcast," or "obscuration," and not classified as "thin" or "partial."
(See ICAO term CEILING.)

CEILING [ICAO]− The height above the ground or water of the base of the lowest layer of cloud below 6,000 meters (20,000 feet) covering more than half the sky.

CENRAP−
(See CENTER RADAR ARTS PRESENTATION/PROCESSING.)

CENRAP-PLUS−
(See CENTER RADAR ARTS PRESENTATION/PROCESSING-PLUS.)

CENTER−
(See AIR ROUTE TRAFFIC CONTROL CENTER.)

CENTER'S AREA− The specified airspace within which an air route traffic control center (ARTCC) provides air traffic control and advisory service.
(See AIR ROUTE TRAFFIC CONTROL CENTER.)
(Refer to AIM.)

CENTER RADAR ARTS PRESENTATION/PROCESSING− A computer program developed to provide a back-up system for airport surveillance radar in the event of a failure or malfunction. The program uses air route traffic control center radar for the processing and presentation of data on the ARTS IIA or IIIA displays.

CENTER RADAR ARTS PRESENTATION/PROCESSING-PLUS− A computer program developed to provide a back-up system for airport surveillance radar in the event of a terminal secondary radar system failure. The program uses a combination of Air Route Traffic Control Center Radar and terminal airport surveillance radar primary targets displayed simultaneously for the processing and presentation of data on the ARTS IIA or IIIA displays.

CENTER TRACON AUTOMATION SYSTEM (CTAS)− A computerized set of programs designed to aid Air Route Traffic Control Centers and TRACONs in the management and control of air traffic.

CENTER WEATHER ADVISORY− An unscheduled weather advisory issued by Center Weather Service Unit meteorologists for ATC use to alert pilots of existing or anticipated adverse weather conditions within the next 2 hours. A CWA may modify or redefine a SIGMET.
(See AWW.)
(See AIRMET.)
(See CONVECTIVE SIGMET.)
(See SIGMET.)
(Refer to AIM.)

CENTRAL EAST PACIFIC− An organized route system between the U.S. West Coast and Hawaii.

CEP−
(See CENTRAL EAST PACIFIC.)

CERAP−
(See COMBINED CENTER-RAPCON.)

CERTIFIED TOWER RADAR DISPLAY (CTRD)− A FAA radar display certified for use in the NAS.

CFR−
(See CALL FOR RELEASE.)

CHAFF− Thin, narrow metallic reflectors of various lengths and frequency responses, used to reflect radar energy. These reflectors when dropped from aircraft and allowed to drift downward result in large targets on the radar display.

CHART SUPPLEMENT U.S.− A publication designed primarily as a pilot's operational manual containing all airports, seaplane bases, and heliports open to the public including communications data, navigational facilities, and certain special notices and procedures. This publication is issued in seven volumes according to geographical area.

CHARTED VFR FLYWAYS− Charted VFR Flyways are flight paths recommended for use to bypass areas heavily traversed by large turbine-powered aircraft. Pilot compliance with recommended flyways and associated altitudes is strictly voluntary. VFR Flyway Planning charts are published on the back of existing VFR Terminal Area charts.

CHARTED VISUAL FLIGHT PROCEDURE APPROACH− An approach conducted while operating on an instrument flight rules (IFR) flight plan which authorizes the pilot of an aircraft to proceed visually and clear of clouds to the airport via visual landmarks and other information depicted on a charted visual flight procedure. This approach must be authorized and under the control of the appropriate air traffic control facility. Weather minimums required are depicted on the chart.

CHASE− An aircraft flown in proximity to another aircraft normally to observe its performance during training or testing.

CHASE AIRCRAFT−
(See CHASE.)

CIRCLE-TO-LAND MANEUVER− A maneuver initiated by the pilot to align the aircraft with a runway for landing when a straight-in landing from an instrument approach is not possible or is not desirable. At tower controlled airports, this maneuver is made only after ATC authorization has been obtained and the pilot has established required visual reference to the airport.
(See CIRCLE TO RUNWAY.)
(See LANDING MINIMUMS.)
(Refer to AIM.)

CIRCLE TO RUNWAY (RUNWAY NUMBER)− Used by ATC to inform the pilot that he/she must circle to land because the runway in use is other than the runway aligned with the instrument approach procedure. When the direction of the circling maneuver in relation to the airport/runway is required, the controller will state the direction (eight cardinal compass points) and specify a left or right downwind or base leg as appropriate; e.g., "Cleared VOR Runway Three Six Approach circle to Runway Two Two," or "Circle northwest of the airport for a right downwind to Runway Two Two."
(See CIRCLE-TO-LAND MANEUVER.)
(See LANDING MINIMUMS.)
(Refer to AIM.)

CIRCLING APPROACH−
(See CIRCLE-TO-LAND MANEUVER.)

CIRCLING MANEUVER−
(See CIRCLE-TO-LAND MANEUVER.)

CIRCLING MINIMA−
(See LANDING MINIMUMS.)

CLASS A AIRSPACE−
(See CONTROLLED AIRSPACE.)

CLASS B AIRSPACE−
(See CONTROLLED AIRSPACE.)

CLASS C AIRSPACE−
(See CONTROLLED AIRSPACE.)

CLASS D AIRSPACE−
(See CONTROLLED AIRSPACE.)

CLASS E AIRSPACE−
(See CONTROLLED AIRSPACE.)

CLASS G AIRSPACE− That airspace not designated as Class A, B, C, D or E.

CLEAR AIR TURBULENCE (CAT)− Turbulence encountered in air where no clouds are present. This term is commonly applied to high-level turbulence associated with wind shear. CAT is often encountered in the vicinity of the jet stream.

(See WIND SHEAR.)
(See JET STREAM.)

CLEAR OF THE RUNWAY−

a. Taxiing aircraft, which is approaching a runway, is clear of the runway when all parts of the aircraft are held short of the applicable runway holding position marking.

b. A pilot or controller may consider an aircraft, which is exiting or crossing a runway, to be clear of the runway when all parts of the aircraft are beyond the runway edge and there are no restrictions to its continued movement beyond the applicable runway holding position marking.

c. Pilots and controllers shall exercise good judgement to ensure that adequate separation exists between all aircraft on runways and taxiways at airports with inadequate runway edge lines or holding position markings.

CLEARANCE−

(See AIR TRAFFIC CLEARANCE.)

CLEARANCE LIMIT− The fix, point, or location to which an aircraft is cleared when issued an air traffic clearance.

(See ICAO term CLEARANCE LIMIT.)

CLEARANCE LIMIT [ICAO]− The point to which an aircraft is granted an air traffic control clearance.

CLEARANCE VOID IF NOT OFF BY (TIME)− Used by ATC to advise an aircraft that the departure clearance is automatically canceled if takeoff is not made prior to a specified time. The pilot must obtain a new clearance or cancel his/her IFR flight plan if not off by the specified time.

(See ICAO term CLEARANCE VOID TIME.)

CLEARANCE VOID TIME [ICAO]− A time specified by an air traffic control unit at which a clearance ceases to be valid unless the aircraft concerned has already taken action to comply therewith.

CLEARED APPROACH− ATC authorization for an aircraft to execute any standard or special instrument approach procedure for that airport. Normally, an aircraft will be cleared for a specific instrument approach procedure.

(See CLEARED (Type of) APPROACH.)
(See INSTRUMENT APPROACH PROCEDURE.)
(Refer to 14 CFR Part 91.)
(Refer to AIM.)

CLEARED (Type of) APPROACH− ATC authorization for an aircraft to execute a specific instrument approach procedure to an airport; e.g., "Cleared ILS Runway Three Six Approach."

(See APPROACH CLEARANCE.)
(See INSTRUMENT APPROACH PROCEDURE.)
(Refer to 14 CFR Part 91.)
(Refer to AIM.)

CLEARED AS FILED− Means the aircraft is cleared to proceed in accordance with the route of flight filed in the flight plan. This clearance does not include the altitude, DP, or DP Transition.

(See REQUEST FULL ROUTE CLEARANCE.)
(Refer to AIM.)

CLEARED FOR TAKEOFF− ATC authorization for an aircraft to depart. It is predicated on known traffic and known physical airport conditions.

CLEARED FOR THE OPTION− ATC authorization for an aircraft to make a touch-and-go, low approach, missed approach, stop and go, or full stop landing at the discretion of the pilot. It is normally used in training so that an instructor can evaluate a student's performance under changing situations.

(See OPTION APPROACH.)
(Refer to AIM.)

CLEARED THROUGH− ATC authorization for an aircraft to make intermediate stops at specified airports without refiling a flight plan while en route to the clearance limit.

CLEARED TO LAND− ATC authorization for an aircraft to land. It is predicated on known traffic and known physical airport conditions.

CLEARWAY− An area beyond the takeoff runway under the control of airport authorities within which terrain or fixed obstacles may not extend above specified limits. These areas may be required for certain turbine-powered operations and the size and upward slope of the clearway will differ depending on when the aircraft was certificated.

(Refer to 14 CFR Part 1.)

CLIMB TO VFR− ATC authorization for an aircraft to climb to VFR conditions within Class B, C, D, and E surface areas when the only weather limitation is restricted visibility. The aircraft must remain clear of clouds while climbing to VFR.

(See SPECIAL VFR CONDITIONS.)
(Refer to AIM.)

CLIMBOUT− That portion of flight operation between takeoff and the initial cruising altitude.

CLIMB VIA− An abbreviated ATC clearance that requires compliance with the procedure lateral path, associated speed restrictions, and altitude restrictions along the cleared route or procedure.

CLOSE PARALLEL RUNWAYS− Two parallel runways whose extended centerlines are separated by less than 4,300 feet and at least 3000 feet (750 feet for SOIA operations) that are authorized to conduct simultaneous independent approach operations. PRM and simultaneous close parallel appear in approach title. Dual communications, special pilot training, an Attention All Users Page (AAUP), NTZ monitoring by displays that have aural and visual alerting algorithms are required. A high update rate surveillance sensor is required for certain runway or approach course spacing.

CLOSED RUNWAY− A runway that is unusable for aircraft operations. Only the airport management/military operations office can close a runway.

CLOSED TRAFFIC− Successive operations involving takeoffs and landings or low approaches where the aircraft does not exit the traffic pattern.

CLOUD− A cloud is a visible accumulation of minute water droplets and/or ice particles in the atmosphere above the Earth's surface. Cloud differs from ground fog, fog, or ice fog only in that the latter are, by definition, in contact with the Earth's surface.

CLT−
(See CALCULATED LANDING TIME.)

CLUTTER− In radar operations, clutter refers to the reception and visual display of radar returns caused by precipitation, chaff, terrain, numerous aircraft targets, or other phenomena. Such returns may limit or preclude ATC from providing services based on radar.

(See CHAFF.)
(See GROUND CLUTTER.)
(See PRECIPITATION.)
(See TARGET.)
(See ICAO term RADAR CLUTTER.)

CMNPS−
(See CANADIAN MINIMUM NAVIGATION PERFORMANCE SPECIFICATION AIRSPACE.)

COASTAL FIX− A navigation aid or intersection where an aircraft transitions between the domestic route structure and the oceanic route structure.

CODES− The number assigned to a particular multiple pulse reply signal transmitted by a transponder.

(See DISCRETE CODE.)

COLD TEMPERATURE COMPENSATION− An action on the part of the pilot to adjust an aircraft's indicated altitude due to the effect of cold temperatures on true altitude above terrain versus aircraft indicated altitude. The amount of compensation required increases at a greater rate with a decrease in temperature and increase in height above the reporting station.

COLLABORATIVE TRAJECTORY OPTIONS PROGRAM (CTOP)- CTOP is a traffic management program administered by the Air Traffic Control System Command Center (ATCSCC) that manages demand through constrained airspace, while considering operator preference with regard to both route and delay as defined in a Trajectory Options Set (TOS).

COMBINED CENTER-RAPCON− An air traffic facility which combines the functions of an ARTCC and a radar approach control facility.

(See AIR ROUTE TRAFFIC CONTROL CENTER.)
(See RADAR APPROACH CONTROL FACILITY.)

COMMON POINT− A significant point over which two or more aircraft will report passing or have reported passing before proceeding on the same or diverging tracks. To establish/maintain longitudinal separation, a controller may determine a common point not originally in the aircraft's flight plan and then clear the aircraft to fly over the point.

(See SIGNIFICANT POINT.)

COMMON PORTION−
(See COMMON ROUTE.)

COMMON ROUTE− That segment of a North American Route between the inland navigation facility and the coastal fix.

OR

COMMON ROUTE− Typically the portion of a RNAV STAR between the en route transition end point and the runway transition start point; however, the common route may only consist of a single point that joins the en route and runway transitions.

COMMON TRAFFIC ADVISORY FREQUENCY (CTAF)− A frequency designed for the purpose of carrying out airport advisory practices while operating to or from an airport without an operating control tower. The CTAF may be a UNICOM, Multicom, FSS, or tower frequency and is identified in appropriate aeronautical publications.
(See DESIGNATED COMMON TRAFFIC ADVISORY FREQUENCY (CTAF) AREA.)
(Refer to AC 90-42, Traffic Advisory Practices at Airports Without Operating Control Towers.)

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.)

COMPOSITE ROUTE SYSTEM− An organized oceanic route structure, incorporating reduced lateral spacing between routes, in which composite separation is authorized.

COMPOSITE SEPARATION− A method of separating aircraft in a composite route system where, by management of route and altitude assignments, a combination of half the lateral minimum specified for the area concerned and half the vertical minimum is applied.

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."

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 shall be issued when this procedure is applied.

Note: This procedure shall 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.

CONSOLAN− A low frequency, long-distance NAVAID used principally for transoceanic navigations.

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.

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 controller workload. Pilot-communications during operations within a sector are normally maintained on discrete frequencies assigned to the sector.

(See DISCRETE FREQUENCY.)

CONTROL SLASH− A radar beacon slash representing the actual position of the associated aircraft. Normally, the control slash is the one closest to the interrogating radar beacon site. When ARTCC radar is operating in narrowband (digitized) mode, the control slash is converted to a target symbol.

CONTROLLED AIRSPACE− An airspace of defined dimensions within which air traffic control service is provided to IFR flights and to VFR flights in accordance with the airspace classification.

a. Controlled airspace is a generic term that covers Class A, Class B, Class C, Class D, and Class E airspace.

b. Controlled airspace is also that airspace within which all aircraft operators are subject to certain pilot qualifications, operating rules, and equipment requirements in 14 CFR Part 91 (for specific operating requirements, please refer to 14 CFR Part 91). For IFR operations in any class of controlled airspace, a pilot must file an IFR flight plan and receive an appropriate ATC clearance. Each Class B, Class C, and Class D airspace area designated for an airport contains at least one primary airport around which the airspace is designated (for specific designations and descriptions of the airspace classes, please refer to 14 CFR Part 71).

c. Controlled airspace in the United States is designated as follows:

1. CLASS A− Generally, that airspace from 18,000 feet MSL up to and including FL 600, including the airspace overlying the waters within 12 nautical miles of the coast of the 48 contiguous States and Alaska. Unless otherwise authorized, all persons must operate their aircraft under IFR.

2. CLASS B− Generally, that airspace from the surface to 10,000 feet MSL surrounding the nation's busiest airports in terms of airport operations or passenger enplanements. The configuration of each Class B airspace area is individually tailored and consists of a surface area and two or more layers (some Class B airspaces areas resemble upside-down wedding cakes), and is designed to contain all published instrument procedures once an aircraft enters the airspace. An ATC clearance is required for all aircraft to operate in the area, and all aircraft that are so cleared receive separation services within the airspace. The cloud clearance requirement for VFR operations is "clear of clouds."

3. CLASS C− Generally, that airspace from the surface to 4,000 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower, are serviced by a radar approach control, and that have a certain number of IFR operations or passenger enplanements. Although the configuration of each Class C area is individually tailored, the airspace usually consists of a surface area with a 5 nautical mile (NM) radius, a circle with a 10NM radius that extends no lower than 1,200 feet up to 4,000 feet above the airport elevation and an outer area that is not charted. Each person must establish two-way radio communications with the ATC facility providing air traffic services prior to entering the airspace and thereafter maintain those communications while within the airspace. VFR aircraft are only separated from IFR aircraft within the airspace.

(See OUTER AREA.)

4. CLASS D− Generally, that airspace from the surface to 2,500 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower. The configuration of each Class D airspace area is individually tailored and when instrument procedures are published, the airspace will normally be designed to contain the procedures. Arrival extensions for instrument approach procedures may be Class D or Class E airspace. Unless otherwise authorized, each person must establish two-way radio communications with the ATC facility providing air traffic services prior to entering the airspace and thereafter maintain those communications while in the airspace. No separation services are provided to VFR aircraft.

5. CLASS E− Generally, if the airspace is not Class A, Class B, Class C, or Class D, and it is controlled airspace, it is Class E airspace. Class E airspace extends upward from either the surface or a designated altitude to the overlying or adjacent controlled airspace. When designated as a surface area, the airspace will be configured to contain all instrument procedures. Also in this class are Federal airways, airspace beginning at either 700 or 1,200 feet AGL used to transition to/from the terminal or en route environment, en route domestic, and offshore airspace areas designated below 18,000 feet MSL. Unless designated at a lower altitude, Class E airspace begins at 14,500 MSL over the United States, including that airspace overlying the waters within 12 nautical miles of the coast of the 48 contiguous States and Alaska, up to, but not including 18,000 feet MSL, and the airspace above FL 600.

CONTROLLED AIRSPACE [ICAO]− An airspace of defined dimensions within which air traffic control service is provided to IFR flights and to VFR flights in accordance with the airspace classification.

Note: Controlled airspace is a generic term which covers ATS airspace Classes A, B, C, D, and E.

CONTROLLED TIME OF ARRIVAL− Arrival time assigned during a Traffic Management Program. This time may be modified due to adjustments or user options.

CONTROLLER−
(See AIR TRAFFIC CONTROL SPECIALIST.)

CONTROLLER [ICAO]− A person authorized to provide air traffic control services.

CONTROLLER PILOT DATA LINK COMMUNICATIONS (CPDLC)− A two−way digital communications system that conveys textual air traffic control messages between controllers and pilots using ground or satellite-based radio relay stations.

CONVECTIVE SIGMET− A weather advisory concerning convective weather significant to the safety of all aircraft. Convective SIGMETs are issued for tornadoes, lines of thunderstorms, embedded thunderstorms of any intensity level, areas of thunderstorms greater than or equal to VIP level 4 with an area coverage of $^{4}/_{10}$ (40%) or more, and hail $^{3}/_{4}$ inch or greater.

(See AIRMET.)
(See AWW.)
(See CWA.)
(See SIGMET.)
(Refer to AIM.)

CONVECTIVE SIGNIFICANT METEOROLOGICAL INFORMATION−
(See CONVECTIVE SIGMET.)

COORDINATES− The intersection of lines of reference, usually expressed in degrees/minutes/seconds of latitude and longitude, used to determine position or location.

COORDINATION FIX− The fix in relation to which facilities will handoff, transfer control of an aircraft, or coordinate flight progress data. For terminal facilities, it may also serve as a clearance for arriving aircraft.

COPTER−
(See HELICOPTER.)

CORRECTION− An error has been made in the transmission and the correct version follows.

COUPLED APPROACH− An instrument approach performed by the aircraft autopilot, and/or visually depicted on the flight director, which is receiving position information and/or steering commands from onboard navigational equipment. In general, coupled non-precision approaches must be flown manually (autopilot disengaged) at altitudes lower than 50 feet AGL below the minimum descent altitude, and coupled precision approaches must be flown manually (autopilot disengaged) below 50 feet AGL unless authorized to conduct autoland operations. Coupled instrument approaches are commonly flown to the allowable IFR weather minima established by the operator or PIC, or flown VFR for training and safety.

COURSE−

a. The intended direction of flight in the horizontal plane measured in degrees from north.

b. The ILS localizer signal pattern usually specified as the front course or the back course.

(See BEARING.)
(See INSTRUMENT LANDING SYSTEM.)
(See RADIAL.)

CPDLC−
(See CONTROLLER PILOT DATA LINK COMMUNICATIONS.)

CPL [ICAO]−
(See ICAO term CURRENT FLIGHT PLAN.)

CRITICAL ENGINE− The engine which, upon failure, would most adversely affect the performance or handling qualities of an aircraft.

CROSS (FIX) AT (ALTITUDE)− Used by ATC when a specific altitude restriction at a specified fix is required.

CROSS (FIX) AT OR ABOVE (ALTITUDE)− Used by ATC when an altitude restriction at a specified fix is required. It does not prohibit the aircraft from crossing the fix at a higher altitude than specified; however, the higher altitude may not be one that will violate a succeeding altitude restriction or altitude assignment.

(See ALTITUDE RESTRICTION.)
(Refer to AIM.)

CROSS (FIX) AT OR BELOW (ALTITUDE)− Used by ATC when a maximum crossing altitude at a specific fix is required. It does not prohibit the aircraft from crossing the fix at a lower altitude; however, it must be at or above the minimum IFR altitude.

(See ALTITUDE RESTRICTION.)
(See MINIMUM IFR ALTITUDES.)
(Refer to 14 CFR Part 91.)

CROSSWIND−

a. When used concerning the traffic pattern, the word means "crosswind leg."

(See TRAFFIC PATTERN.)

b. When used concerning wind conditions, the word means a wind not parallel to the runway or the path of an aircraft.

(See CROSSWIND COMPONENT.)

CROSSWIND COMPONENT− The wind component measured in knots at 90 degrees to the longitudinal axis of the runway.

CRUISE− Used in an ATC clearance to authorize a pilot to conduct flight at any altitude from the minimum IFR altitude up to and including the altitude specified in the clearance. The pilot may level off at any intermediate altitude within this block of airspace. Climb/descent within the block is to be made at the discretion of the pilot. However, once the pilot starts descent and verbally reports leaving an altitude in the block, he/she may not return to that altitude without additional ATC clearance. Further, it is approval for the pilot to proceed to and make an approach at destination airport and can be used in conjunction with:

a. An airport clearance limit at locations with a standard/special instrument approach procedure. The CFRs require that if an instrument letdown to an airport is necessary, the pilot shall make the letdown in accordance with a standard/special instrument approach procedure for that airport, or

b. An airport clearance limit at locations that are within/below/outside controlled airspace and without a standard/special instrument approach procedure. Such a clearance is NOT AUTHORIZATION for the pilot to descend under IFR conditions below the applicable minimum IFR altitude nor does it imply that ATC is exercising control over aircraft in Class G airspace; however, it provides a means for the aircraft to proceed to destination airport, descend, and land in accordance with applicable CFRs governing VFR flight operations. Also, this provides search and rescue protection until such time as the IFR flight plan is closed.

(See INSTRUMENT APPROACH PROCEDURE.)

CRUISE CLIMB− A climb technique employed by aircraft, usually at a constant power setting, resulting in an increase of altitude as the aircraft weight decreases.

CRUISING ALTITUDE− An altitude or flight level maintained during en route level flight. This is a constant altitude and should not be confused with a cruise clearance.

(See ALTITUDE.)
(See ICAO term CRUISING LEVEL.)

CRUISING LEVEL−

(See CRUISING ALTITUDE.)

CRUISING LEVEL [ICAO]− A level maintained during a significant portion of a flight.

CT MESSAGE− An EDCT time generated by the ATCSCC to regulate traffic at arrival airports. Normally, a CT message is automatically transferred from the traffic management system computer to the NAS en route computer and appears as an EDCT. In the event of a communication failure between the traffic management system computer and the NAS, the CT message can be manually entered by the TMC at the en route facility.

CTA−

(See CONTROLLED TIME OF ARRIVAL.)
(See ICAO term CONTROL AREA.)

CTAF−

(See COMMON TRAFFIC ADVISORY FREQUENCY.)

CTAS−

(See CENTER TRACON AUTOMATION SYSTEM.)

CTOP−

(See COLLABORATIVE TRAJECTORY OPTIONS PROGRAM)

CTRD−

(See CERTIFIED TOWER RADAR DISPLAY.)

CURRENT FLIGHT PLAN [ICAO]− The flight plan, including changes, if any, brought about by subsequent clearances.

CURRENT PLAN− The ATC clearance the aircraft has received and is expected to fly.

CVFP APPROACH−

(See CHARTED VISUAL FLIGHT PROCEDURE APPROACH.)

CWA−

(See CENTER WEATHER ADVISORY and WEATHER ADVISORY.)

D

D-ATIS−
(See DIGITAL-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.)

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.

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− 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 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).)

DELAY TIME− The amount of time that the arrival must lose to cross the meter fix at the assigned meter fix time. This is the difference between ACLT and VTA.

DEPARTURE CENTER− The ARTCC having jurisdiction for the airspace that generates a flight to the impacted airport.

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.

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.

DEVIATIONS−

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.

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.

DOWNWIND LEG−
(See TRAFFIC PATTERN.)

DP−
(See INSTRUMENT DEPARTURE PROCEDURE.)

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.)

DT−

(See DELAY TIME.)

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 FAAO 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

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).)

ELT−
(See EMERGENCY LOCATOR TRANSMITTER.)

EMERGENCY− A distress or an urgency condition.

EMERGENCY LOCATOR TRANSMITTER− 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.)

E-MSAW−
(See EN ROUTE MINIMUM SAFE ALTITUDE WARNING.)

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− 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− 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 SPACING PROGRAM (ESP)− A program designed to assist the exit sector in achieving the required in-trail spacing.

EN ROUTE TRANSITION−

a. Conventional STARs/SIDs. The portion of a SID/STAR that connects to one or more en route airway/jet route.

b. RNAV STARs/SIDs. The portion of a STAR preceding the common route or point, or for a SID the portion following, that is coded for a specific en route fix, airway or jet route.

ESP−
(See EN ROUTE SPACING PROGRAM.)

ESTABLISHED−To be stable or fixed on a route, route segment, altitude, heading, etc.

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.

power or control. The standard overhead approach starts at a relatively high altitude over a runway ("high key") followed by a continuous 180 degree turn to a high, wide position ("low key") followed by a continuous 180 degree turn final. The standard straight-in pattern starts at a point that results in a straight-in approach with a high rate of descent to the runway. Flameout approaches terminate in the type approach requested by the pilot (normally fullstop).

FLIGHT CHECK− A call-sign prefix used by FAA aircraft engaged in flight inspection/certification of navigational aids and flight procedures. The word "recorded" may be added as a suffix; e.g., "Flight Check 320 recorded" to indicate that an automated flight inspection is in progress in terminal areas.

(See FLIGHT INSPECTION.)

(Refer to AIM.)

FLIGHT FOLLOWING−

(See TRAFFIC ADVISORIES.)

FLIGHT INFORMATION REGION− An airspace of defined dimensions within which Flight Information Service and Alerting Service are provided.

a. Flight Information Service. A service provided for the purpose of giving advice and information useful for the safe and efficient conduct of flights.

b. Alerting Service. A service provided to notify appropriate organizations regarding aircraft in need of search and rescue aid and to assist such organizations as required.

FLIGHT INFORMATION SERVICE− A service provided for the purpose of giving advice and information useful for the safe and efficient conduct of flights.

FLIGHT INFORMATION SERVICE−BROADCAST (FIS−B)− A ground broadcast service provided through the ADS−B Broadcast Services network over the UAT data link that operates on 978 MHz. The FIS−B system provides pilots and flight crews of properly equipped aircraft with a cockpit display of certain aviation weather and aeronautical information.

FLIGHT INSPECTION− Inflight investigation and evaluation of a navigational aid to determine whether it meets established tolerances.

(See FLIGHT CHECK.)

(See NAVIGATIONAL AID.)

FLIGHT LEVEL− A level of constant atmospheric pressure related to a reference datum of 29.92 inches of mercury. Each is stated in three digits that represent hundreds of feet. For example, flight level (FL) 250 represents a barometric altimeter indication of 25,000 feet; FL 255, an indication of 25,500 feet.

(See ICAO term FLIGHT LEVEL.)

FLIGHT LEVEL [ICAO]− A surface of constant atmospheric pressure which is related to a specific pressure datum, 1013.2 hPa (1013.2 mb), and is separated from other such surfaces by specific pressure intervals.

Note 1: A pressure type altimeter calibrated in accordance with the standard atmosphere:

a. When set to a QNH altimeter setting, will indicate altitude;

b. When set to a QFE altimeter setting, will indicate height above the QFE reference datum; and

c. When set to a pressure of 1013.2 hPa (1013.2 mb), may be used to indicate flight levels.

Note 2: The terms 'height' and 'altitude,' used in Note 1 above, indicate altimetric rather than geometric heights and altitudes.

FLIGHT LINE− A term used to describe the precise movement of a civil photogrammetric aircraft along a predetermined course(s) at a predetermined altitude during the actual photographic run.

FLIGHT MANAGEMENT SYSTEMS− A computer system that uses a large data base to allow routes to be preprogrammed and fed into the system by means of a data loader. The system is constantly updated with respect to position accuracy by reference to conventional navigation aids. The sophisticated program and its associated data base ensures that the most appropriate aids are automatically selected during the information update cycle.

FLIGHT MANAGEMENT SYSTEM PROCEDURE− An arrival, departure, or approach procedure developed for use by aircraft with a slant (/) E or slant (/) F equipment suffix.

FLIGHT PATH− A line, course, or track along which an aircraft is flying or intended to be flown.

(See COURSE.)
(See TRACK.)

FLIGHT PLAN− Specified information relating to the intended flight of an aircraft that is filed orally or in writing with an FSS or an ATC facility.

(See FAST FILE.)
(See FILED.)
(Refer to AIM.)

FLIGHT PLAN AREA (FPA)− The geographical area assigned to a flight service station (FSS) for the purpose of establishing primary responsibility for services that may include search and rescue for VFR aircraft, issuance of NOTAMs, pilot briefings, inflight services, broadcast services, emergency services, flight data processing, international operations, and aviation weather services. Large consolidated FSS facilities may combine FPAs into larger areas of responsibility (AOR).

(See FLIGHT SERVICE STATION.)
(See TIE-IN FACILITY.)

FLIGHT RECORDER− A general term applied to any instrument or device that records information about the performance of an aircraft in flight or about conditions encountered in flight. Flight recorders may make records of airspeed, outside air temperature, vertical acceleration, engine RPM, manifold pressure, and other pertinent variables for a given flight.

(See ICAO term FLIGHT RECORDER.)

FLIGHT RECORDER [ICAO]− Any type of recorder installed in the aircraft for the purpose of complementing accident/incident investigation.

Note: See Annex 6 Part I, for specifications relating to flight recorders.

FLIGHT SERVICE STATION (FSS)− An air traffic facility which provides pilot briefings, flight plan processing, en route flight advisories, search and rescue services, and assistance to lost aircraft and aircraft in emergency situations. FSS also relay ATC clearances, process Notices to Airmen, broadcast aviation weather and aeronautical information, and advise Customs and Immigration of transborder flights. In Alaska, FSS provide Airport Advisory Services.

(See FLIGHT PLAN AREA.)
(See TIE-IN FACILITY.)

FLIGHT STANDARDS DISTRICT OFFICE− An FAA field office serving an assigned geographical area and staffed with Flight Standards personnel who serve the aviation industry and the general public on matters relating to the certification and operation of air carrier and general aviation aircraft. Activities include general surveillance of operational safety, certification of airmen and aircraft, accident prevention, investigation, enforcement, etc.

FLIGHT TEST− A flight for the purpose of:

a. Investigating the operation/flight characteristics of an aircraft or aircraft component.

b. Evaluating an applicant for a pilot certificate or rating.

FLIGHT VISIBILITY−

(See VISIBILITY.)

FLIP−

(See DOD FLIP.)

FLY HEADING (DEGREES)− Informs the pilot of the heading he/she should fly. The pilot may have to turn to, or continue on, a specific compass direction in order to comply with the instructions. The pilot is expected to turn in the shorter direction to the heading unless otherwise instructed by ATC.

FLY-BY WAYPOINT− A fly-by waypoint requires the use of turn anticipation to avoid overshoot of the next flight segment.

FLY-OVER WAYPOINT− A fly-over waypoint precludes any turn until the waypoint is overflown and is followed by an intercept maneuver of the next flight segment.

FLY VISUAL TO AIRPORT−

(See PUBLISHED INSTRUMENT APPROACH PROCEDURE VISUAL SEGMENT.)

FMA−

(See FINAL MONITOR AID.)

FMS−

(See FLIGHT MANAGEMENT SYSTEM.)

FMSP−

(See FLIGHT MANAGEMENT SYSTEM PROCEDURE.)

FORMATION FLIGHT− More than one aircraft which, by prior arrangement between the pilots, operate as a single aircraft with regard to navigation and position reporting. Separation between aircraft within the formation is the responsibility of the flight leader and the pilots of the other aircraft in the flight. This includes transition periods when aircraft within the formation are maneuvering to attain separation from each other to effect individual control and during join-up and breakaway.

a. A standard formation is one in which a proximity of no more than 1 mile laterally or longitudinally and within 100 feet vertically from the flight leader is maintained by each wingman.

b. Nonstandard formations are those operating under any of the following conditions:

1. When the flight leader has requested and ATC has approved other than standard formation dimensions.

2. When operating within an authorized altitude reservation (ALTRV) or under the provisions of a letter of agreement.

3. When the operations are conducted in airspace specifically designed for a special activity.

(See ALTITUDE RESERVATION.)
(Refer to 14 CFR Part 91.)

FRC−
(See REQUEST FULL ROUTE CLEARANCE.)

FREEZE/FROZEN− Terms used in referring to arrivals which have been assigned ACLTs and to the lists in which they are displayed.

FREEZE CALCULATED LANDING TIME− A dynamic parameter number of minutes prior to the meter fix calculated time of arrival for each aircraft when the TCLT is frozen and becomes an ACLT (i.e., the VTA is updated and consequently the TCLT is modified as appropriate until FCLT minutes prior to meter fix calculated time of arrival, at which time updating is suspended and an ACLT and a frozen meter fix crossing time (MFT) is assigned).

FREEZE HORIZON− The time or point at which an aircraft's STA becomes fixed and no longer fluctuates with each radar update. This setting ensures a constant time for each aircraft, necessary for the metering controller to plan his/her delay technique. This setting can be either in distance from the meter fix or a prescribed flying time to the meter fix.

FREEZE SPEED PARAMETER− A speed adapted for each aircraft to determine fast and slow aircraft. Fast aircraft freeze on parameter FCLT and slow aircraft freeze on parameter MLDI.

FRICTION MEASUREMENT− A measurement of the friction characteristics of the runway pavement surface using continuous self-watering friction measurement equipment in accordance with the specifications, procedures and schedules contained in AC 150/5320−12, Measurement, Construction, and Maintenance of Skid Resistant Airport Pavement Surfaces.

FSDO−
(See FLIGHT STANDARDS DISTRICT OFFICE.)

FSPD−
(See FREEZE SPEED PARAMETER.)

FSS−
(See FLIGHT SERVICE STATION.)

FUEL DUMPING− Airborne release of usable fuel. This does not include the dropping of fuel tanks.
(See JETTISONING OF EXTERNAL STORES.)

FUEL REMAINING− A phrase used by either pilots or controllers when relating to the fuel remaining on board until actual fuel exhaustion. When transmitting such information in response to either a controller question or pilot initiated cautionary advisory to air traffic control, pilots will state the APPROXIMATE NUMBER OF MINUTES the flight can continue with the fuel remaining. All reserve fuel SHOULD BE INCLUDED in the time stated, as should an allowance for established fuel gauge system error.

FUEL SIPHONING− Unintentional release of fuel caused by overflow, puncture, loose cap, etc.

FUEL VENTING−
(See FUEL SIPHONING.)

FUSED TARGET-
(See DIGITAL TARGET)

FUSION [STARS/CARTS]- the combination of all available surveillance sources (airport surveillance radar [ASR], air route surveillance radar [ARSR], ADS-B, etc.) into the display of a single tracked target for air traffic control separation services. FUSION is the equivalent of the current single-sensor radar display. FUSION performance is characteristic of a single-sensor radar display system. Terminal areas use mono-pulse secondary surveillance radar (ASR 9, Mode S or ASR 11, MSSR).

G

GATE HOLD PROCEDURES− Procedures at selected airports to hold aircraft at the gate or other ground location whenever departure delays exceed or are anticipated to exceed 15 minutes. The sequence for departure will be maintained in accordance with initial call−up unless modified by flow control restrictions. Pilots should monitor the ground control/clearance delivery frequency for engine start/taxi advisories or new proposed start/taxi time if the delay changes.

GBT−
(See GROUND−BASED TRANSCEIVER.)

GCA−
(See GROUND CONTROLLED APPROACH.)

GDP−
(See GROUND DELAY PROGRAM.)

GENERAL AVIATION− That portion of civil aviation that does not include scheduled or unscheduled air carriers or commercial space operations.
(See ICAO term GENERAL AVIATION.)

GENERAL AVIATION [ICAO]− All civil aviation operations other than scheduled air services and nonscheduled air transport operations for remuneration or hire.

GEO MAP− The digitized map markings associated with the ASR-9 Radar System.

GLIDEPATH−
(See GLIDESLOPE.)

GLIDEPATH [ICAO]− A descent profile determined for vertical guidance during a final approach.

GLIDEPATH INTERCEPT ALTITUDE−
(See GLIDESLOPE INTERCEPT ALTITUDE.)

GLIDESLOPE− Provides vertical guidance for aircraft during approach and landing. The glideslope/glidepath is based on the following:

a. Electronic components emitting signals which provide vertical guidance by reference to airborne instruments during instrument approaches such as ILS or

b. Visual ground aids, such as VASI, which provide vertical guidance for a VFR approach or for the visual portion of an instrument approach and landing.

c. PAR. Used by ATC to inform an aircraft making a PAR approach of its vertical position (elevation) relative to the descent profile.
(See ICAO term GLIDEPATH.)

GLIDESLOPE INTERCEPT ALTITUDE− The published minimum altitude to intercept the glideslope in the intermediate segment of an instrument approach. Government charts use the lightning bolt symbol to identify this intercept point. This intersection is called the Precise Final Approach fix (PFAF). ATC directs a higher altitude, the resultant intercept becomes the PFAF.
(See FINAL APPROACH FIX.)
(See SEGMENTS OF AN INSTRUMENT APPROACH PROCEDURE.)

GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS) [ICAO]− GNSS refers collectively to the worldwide positioning, navigation, and timing determination capability available from one or more satellite constellation in conjunction with a network of ground stations.

GLOBAL NAVIGATION SATELLITE SYSTEM MINIMUM EN ROUTE IFR ALTITUDE (GNSS MEA)− The minimum en route IFR altitude on a published ATS route or route segment which assures acceptable Global Navigation Satellite System reception and meets obstacle clearance requirements.
(Refer to 14 CFR Part 91.)
(Refer to 14 CFR Part 95.)

GLOBAL POSITIONING SYSTEM (GPS)− GPS refers to the worldwide positioning, navigation and timing determination capability available from the U.S. satellite constellation. The service provided by GPS for civil use is defined in the GPS Standard Positioning System Performance Standard. GPS is composed of space, control, and user elements.

GNSS [ICAO]−
(See GLOBAL NAVIGATION SATELLITE SYSTEM.)

GNSS MEA−
(See GLOBAL NAVIGATION SATELLITE SYSTEM MINIMUM EN ROUTE IFR ALTITUDE.)

GO AHEAD− Proceed with your message. Not to be used for any other purpose.

GO AROUND− Instructions for a pilot to abandon his/her approach to landing. Additional instructions may follow. Unless otherwise advised by ATC, a VFR aircraft or an aircraft conducting visual approach should overfly the runway while climbing to traffic pattern altitude and enter the traffic pattern via the crosswind leg. A pilot on an IFR flight plan making an instrument approach should execute the published missed approach procedure or proceed as instructed by ATC; e.g., "Go around" (additional instructions if required).
(See LOW APPROACH.)
(See MISSED APPROACH.)

GPD−
(See GRAPHIC PLAN DISPLAY.)

GPS−
(See GLOBAL POSITIONING SYSTEM.)

GRAPHIC PLAN DISPLAY (GPD)− A view available with EDST that provides a graphic display of aircraft, traffic, and notification of predicted conflicts. Graphic routes for Current Plans and Trial Plans are displayed upon controller request.
(See EN ROUTE DECISION SUPPORT TOOL.)

GROSS NAVIGATION ERROR (GNE) − A lateral deviation from a cleared track, normally in excess of 25 Nautical Miles (NM). More stringent standards (for example, 10NM in some parts of the North Atlantic region) may be used in certain regions to support reductions in lateral separation.

GROUND BASED AUGMENTATION SYSTEM (GBAS)– A ground based GNSS station which provides local differential corrections, integrity parameters and approach data via VHF data broadcast to GNSS users to meet real-time performance requirements for CAT I precision approaches. The aircraft applies the broadcast data to improve the accuracy and integrity of its GNSS signals and computes the deviations to the selected approach. A single ground station can serve multiple runway ends up to an approximate radius of 23 NM.

GROUND BASED AUGMENTATION SYSTEM (GBAS) LANDING SYSTEM (GLS)- A type of precision IAP based on local augmentation of GNSS data using a single GBAS station to transmit locally corrected GNSS data, integrity parameters and approach information. This improves the accuracy of aircraft GNSS receivers' signal in space, enabling the pilot to fly a precision approach with much greater flexibility, reliability and complexity. The GLS procedure is published on standard IAP charts, features the title GLS with the designated runway and minima as low as 200 feet DA. Future plans are expected to support Cat II and CAT III operations.

GROUND−BASED TRANSCEIVER (GBT)− The ground−based transmitter/receiver (transceiver) receives automatic dependent surveillance−broadcast messages, which are forwarded to an air traffic control facility for processing and display with other radar targets on the plan position indicator (radar display).
(See AUTOMATIC DEPENDENT SURVEILLANCE-BROADCAST.)

GROUND CLUTTER− A pattern produced on the radar scope by ground returns which may degrade other radar returns in the affected area. The effect of ground clutter is minimized by the use of moving target indicator (MTI) circuits in the radar equipment resulting in a radar presentation which displays only targets which are in motion.
(See CLUTTER.)

GROUND COMMUNICATION OUTLET (GCO)− An unstaffed, remotely controlled, ground/ground communications facility. Pilots at uncontrolled airports may contact ATC and FSS via VHF to a telephone connection to obtain an instrument clearance or close a VFR or IFR flight plan. They may also get an updated weather briefing prior to takeoff. Pilots will use four "key clicks" on the VHF radio to contact the appropriate ATC facility or six "key clicks" to contact the FSS. The GCO system is intended to be used only on the ground.

GROUND CONTROLLED APPROACH− A radar approach system operated from the ground by air traffic control personnel transmitting instructions to the pilot by radio. The approach may be conducted with surveillance radar (ASR) only or with both surveillance and precision approach radar (PAR). Usage of the term "GCA" by pilots is discouraged except when referring to a GCA facility. Pilots should specifically request a "PAR" approach when a precision radar approach is desired or request an "ASR" or "surveillance" approach when a nonprecision radar approach is desired.

(See RADAR APPROACH.)

GROUND DELAY PROGRAM (GDP)− A traffic management process administered by the ATCSCC; when aircraft are held on the ground. The purpose of the program is to support the TM mission and limit airborne holding. It is a flexible program and may be implemented in various forms depending upon the needs of the AT system. Ground delay programs provide for equitable assignment of delays to all system users.

GROUND SPEED− The speed of an aircraft relative to the surface of the earth.

GROUND STOP (GS)− The GS is a process that requires aircraft that meet a specific criteria to remain on the ground. The criteria may be airport specific, airspace specific, or equipment specific; for example, all departures to San Francisco, or all departures entering Yorktown sector, or all Category I and II aircraft going to Charlotte. GSs normally occur with little or no warning.

GROUND VISIBILITY−

(See VISIBILITY.)

GS−

(See GROUND STOP.)

I

I SAY AGAIN− The message will be repeated.

IAF−
(See INITIAL APPROACH FIX.)

IAP−
(See INSTRUMENT APPROACH PROCEDURE.)

IAWP− Initial Approach Waypoint

ICAO−
(See ICAO Term INTERNATIONAL CIVIL AVIATION ORGANIZATION.)

ICING− The accumulation of airframe ice.

Types of icing are:

a. Rime Ice− Rough, milky, opaque ice formed by the instantaneous freezing of small supercooled water droplets.

b. Clear Ice− A glossy, clear, or translucent ice formed by the relatively slow freezing or large supercooled water droplets.

c. Mixed− A mixture of clear ice and rime ice.

Intensity of icing:

a. Trace− Ice becomes perceptible. Rate of accumulation is slightly greater than the rate of sublimation. Deicing/anti-icing equipment is not utilized unless encountered for an extended period of time (over 1 hour).

b. Light− The rate of accumulation may create a problem if flight is prolonged in this environment (over 1 hour). Occasional use of deicing/anti-icing equipment removes/prevents accumulation. It does not present a problem if the deicing/anti-icing equipment is used.

c. Moderate− The rate of accumulation is such that even short encounters become potentially hazardous and use of deicing/anti-icing equipment or flight diversion is necessary.

d. Severe− The rate of ice accumulation is such that ice protection systems fail to remove the accumulation of ice, or ice accumulates in locations not normally prone to icing, such as areas aft of protected surfaces and any other areas identified by the manufacturer. Immediate exit from the condition is necessary.

Note:
Severe icing is aircraft dependent, as are the other categories of icing intensity. Severe icing may occur at any ice accumulation rate.

IDENT− A request for a pilot to activate the aircraft transponder identification feature. This will help the controller to confirm an aircraft identity or to identify an aircraft.
(Refer to AIM.)

IDENT FEATURE− The special feature in the Air Traffic Control Radar Beacon System (ATCRBS) equipment. It is used to immediately distinguish one displayed beacon target from other beacon targets.
(See IDENT.)

IF−
(See INTERMEDIATE FIX.)

IFIM−
(See INTERNATIONAL FLIGHT INFORMATION MANUAL.)

IF NO TRANSMISSION RECEIVED FOR (TIME)− Used by ATC in radar approaches to prefix procedures which should be followed by the pilot in event of lost communications.
(See LOST COMMUNICATIONS.)

IFR−
(See INSTRUMENT FLIGHT RULES.)

IFR AIRCRAFT− An aircraft conducting flight in accordance with instrument flight rules.

IFR CONDITIONS− Weather conditions below the minimum for flight under visual flight rules.
(See INSTRUMENT METEOROLOGICAL CONDITIONS.)

IFR DEPARTURE PROCEDURE−
(See IFR TAKEOFF MINIMUMS AND DEPARTURE PROCEDURES.)
(Refer to AIM.)

IFR FLIGHT−
(See IFR AIRCRAFT.)

IFR LANDING MINIMUMS−
(See LANDING MINIMUMS.)

IFR MILITARY TRAINING ROUTES (IR)− Routes used by the Department of Defense and associated

Reserve and Air Guard units for the purpose of conducting low-altitude navigation and tactical training in both IFR and VFR weather conditions below 10,000 feet MSL at airspeeds in excess of 250 knots IAS.

IFR TAKEOFF MINIMUMS AND DEPARTURE PROCEDURES− Title 14 Code of Federal Regulations Part 91, prescribes standard takeoff rules for certain civil users. At some airports, obstructions or other factors require the establishment of nonstandard takeoff minimums, departure procedures, or both to assist pilots in avoiding obstacles during climb to the minimum en route altitude. Those airports are listed in FAA/DOD Instrument Approach Procedures (IAPs) Charts under a section entitled "IFR Takeoff Minimums and Departure Procedures." The FAA/DOD IAP chart legend illustrates the symbol used to alert the pilot to nonstandard takeoff minimums and departure procedures. When departing IFR from such airports or from any airports where there are no departure procedures, DPs, or ATC facilities available, pilots should advise ATC of any departure limitations. Controllers may query a pilot to determine acceptable departure directions, turns, or headings after takeoff. Pilots should be familiar with the departure procedures and must assure that their aircraft can meet or exceed any specified climb gradients.

IF/IAWP− Intermediate Fix/Initial Approach Waypoint. The waypoint where the final approach course of a T approach meets the crossbar of the T. When designated (in conjunction with a TAA) this waypoint will be used as an IAWP when approaching the airport from certain directions, and as an IFWP when beginning the approach from another IAWP.

IFWP− Intermediate Fix Waypoint

ILS−
(See INSTRUMENT LANDING SYSTEM.)

ILS CATEGORIES− 1. Category I. An ILS approach procedure which provides for approach to a height above touchdown of not less than 200 feet and with runway visual range of not less than 1,800 feet.− 2. Special Authorization Category I. An ILS approach procedure which provides for approach to a height above touchdown of not less than 150 feet and with runway visual range of not less than 1,400 feet, HUD to DH. 3. Category II. An ILS approach procedure which provides for approach to a height above touchdown of not less than 100 feet and with runway visual range of not less than 1,200 feet (with autoland or HUD to touchdown and noted on authorization, RVR 1,000 feet).− 4. Special Authorization Category II with Reduced Lighting. An ILS approach procedure which provides for approach to a height above touchdown of not less than 100 feet and with runway visual range of not less than 1,200 feet with autoland or HUD to touchdown and noted on authorization (no touchdown zone and centerline lighting are required).− 5. Category III:

a. IIIA.−An ILS approach procedure which provides for approach without a decision height minimum and with runway visual range of not less than 700 feet.

b. IIIB.−An ILS approach procedure which provides for approach without a decision height minimum and with runway visual range of not less than 150 feet.

c. IIIC.−An ILS approach procedure which provides for approach without a decision height minimum and without runway visual range minimum.

ILS PRM APPROACH− An instrument landing system (ILS) approach conducted to parallel runways whose extended centerlines are separated by less than 4,300 feet and at least 3,000 feet where independent closely spaced approaches are permitted. Also used in conjunction with an LDA PRM, RNAV PRM or GLS PRM approach to conduct Simultaneous Offset Instrument Approach (SOIA) operations. No Transgression Zone (NTZ) monitoring is required to conduct these approaches. ATC utilizes an enhanced display with alerting and, with certain runway spacing, a high update rate PRM surveillance sensor. Use of a secondary monitor frequency, pilot PRM training, and publication of an Attention All Users Page are also required for all PRM approaches.
(Refer to AIM)

IM−
(See INNER MARKER.)

IMC−
(See INSTRUMENT METEOROLOGICAL CONDITIONS.)

IMMEDIATELY− Used by ATC or pilots when such action compliance is required to avoid an imminent situation.

INCERFA (Uncertainty Phase) [ICAO]− A situation wherein uncertainty exists as to the safety of an aircraft and its occupants.

INCREASE SPEED TO (SPEED)−
(See SPEED ADJUSTMENT.)

INERTIAL NAVIGATION SYSTEM− An RNAV system which is a form of self-contained navigation.
(See Area Navigation/RNAV.)

INFLIGHT REFUELING−
(See AERIAL REFUELING.)

INFLIGHT WEATHER ADVISORY−
(See WEATHER ADVISORY.)

INFORMATION REQUEST− A request originated by an FSS for information concerning an overdue VFR aircraft.

INITIAL APPROACH FIX− The fixes depicted on instrument approach procedure charts that identify the beginning of the initial approach segment(s).
(See FIX.)
(See SEGMENTS OF AN INSTRUMENT APPROACH PROCEDURE.)

INITIAL APPROACH SEGMENT−
(See SEGMENTS OF AN INSTRUMENT APPROACH PROCEDURE.)

INITIAL APPROACH SEGMENT [ICAO]− That segment of an instrument approach procedure between the initial approach fix and the intermediate approach fix or, where applicable, the final approach fix or point.

INLAND NAVIGATION FACILITY− A navigation aid on a North American Route at which the common route and/or the noncommon route begins or ends.

INNER MARKER− A marker beacon used with an ILS (CAT II) precision approach located between the middle marker and the end of the ILS runway, transmitting a radiation pattern keyed at six dots per second and indicating to the pilot, both aurally and visually, that he/she is at the designated decision height (DH), normally 100 feet above the touchdown zone elevation, on the ILS CAT II approach. It also marks progress during a CAT III approach.
(See INSTRUMENT LANDING SYSTEM.)
(Refer to AIM.)

INNER MARKER BEACON−
(See INNER MARKER.)

INREQ−
(See INFORMATION REQUEST.)

INS−
(See INERTIAL NAVIGATION SYSTEM.)

INSTRUMENT APPROACH−
(See INSTRUMENT APPROACH PROCEDURE.)

INSTRUMENT APPROACH PROCEDURE− A series of predetermined maneuvers for the orderly transfer of an aircraft under instrument flight conditions from the beginning of the initial approach to a landing or to a point from which a landing may be made visually. It is prescribed and approved for a specific airport by competent authority.
(See SEGMENTS OF AN INSTRUMENT APPROACH PROCEDURE.)
(Refer to 14 CFR Part 91.)
(Refer to AIM.)

a. U.S. civil standard instrument approach procedures are approved by the FAA as prescribed under 14 CFR Part 97 and are available for public use.

b. U.S. military standard instrument approach procedures are approved and published by the Department of Defense.

c. Special instrument approach procedures are approved by the FAA for individual operators but are not published in 14 CFR Part 97 for public use.
(See ICAO term INSTRUMENT APPROACH PROCEDURE.)

INSTRUMENT APPROACH OPERATIONS [ICAO]* An approach and landing using instruments for navigation guidance based on an instrument approach procedure. There are two methods for executing instrument approach operations:

a. A two−dimensional (2D) instrument approach operation, using lateral navigation guidance only; and

b. A three−dimensional (3D) instrument approach operation, using both lateral and vertical navigation guidance.

Note: Lateral and vertical navigation guidance refers to the guidance provided either by:
a) a ground−based radio navigation aid; or
b) computer−generated navigation data from ground−based, space−based, self−contained navigation aids or a combination of these.

(See ICAO term INSTRUMENT APPROACH PROCEDURE.)

INSTRUMENT APPROACH PROCEDURE [ICAO]− A series of predetermined maneuvers by reference to flight instruments with specified protection from obstacles from the initial approach fix, or where applicable, from the beginning of a defined arrival route to a point from which a landing can be completed and thereafter, if a landing is not completed, to a position at which holding or en route obstacle clearance criteria apply.

(See ICAO term INSTRUMENT APPROACH OPERATIONS)

INSTRUMENT APPROACH PROCEDURES CHARTS−

(See AERONAUTICAL CHART.)

INSTRUMENT DEPARTURE PROCEDURE (DP)− A preplanned instrument flight rule (IFR) departure procedure published for pilot use, in graphic or textual format, that provides obstruction clearance from the terminal area to the appropriate en route structure. There are two types of DP, Obstacle Departure Procedure (ODP), printed either textually or graphically, and, Standard Instrument Departure (SID), which is always printed graphically.

(See IFR TAKEOFF MINIMUMS AND DEPARTURE PROCEDURES.)
(See OBSTACLE DEPARTURE PROCEDURES.)
(See STANDARD INSTRUMENT DEPARTURES.)
(Refer to AIM.)

INSTRUMENT DEPARTURE PROCEDURE (DP) CHARTS−

(See AERONAUTICAL CHART.)

INSTRUMENT FLIGHT RULES− Rules governing the procedures for conducting instrument flight. Also a term used by pilots and controllers to indicate type of flight plan.

(See INSTRUMENT METEOROLOGICAL CONDITIONS.)
(See VISUAL FLIGHT RULES.)
(See VISUAL METEOROLOGICAL CONDITIONS.)
(See ICAO term INSTRUMENT FLIGHT RULES.)
(Refer to AIM.)

INSTRUMENT FLIGHT RULES [ICAO]− A set of rules governing the conduct of flight under instrument meteorological conditions.

INSTRUMENT LANDING SYSTEM− A precision instrument approach system which normally consists of the following electronic components and visual aids:

a. Localizer.
(See LOCALIZER.)

b. Glideslope.
(See GLIDESLOPE.)

c. Outer Marker.
(See OUTER MARKER.)

d. Middle Marker.
(See MIDDLE MARKER.)

e. Approach Lights.
(See AIRPORT LIGHTING.)
(Refer to 14 CFR Part 91.)
(Refer to AIM.)

INSTRUMENT METEOROLOGICAL CONDITIONS− Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling less than the minima specified for visual meteorological conditions.

(See INSTRUMENT FLIGHT RULES.)
(See VISUAL FLIGHT RULES.)
(See VISUAL METEOROLOGICAL CONDITIONS.)

INSTRUMENT RUNWAY− A runway equipped with electronic and visual navigation aids for which a precision or nonprecision approach procedure having straight-in landing minimums has been approved.

(See ICAO term INSTRUMENT RUNWAY.)

INSTRUMENT RUNWAY [ICAO]− One of the following types of runways intended for the operation of aircraft using instrument approach procedures:

a. Nonprecision Approach Runway−An instrument runway served by visual aids and a nonvisual aid providing at least directional guidance adequate for a straight-in approach.

b. Precision Approach Runway, Category I−An instrument runway served by ILS and visual aids intended for operations down to 60 m (200 feet) decision height and down to an RVR of the order of 800 m.

c. Precision Approach Runway, Category II−An instrument runway served by ILS and visual aids intended for operations down to 30 m (100 feet) decision height and down to an RVR of the order of 400 m.

d. Precision Approach Runway, Category III−An instrument runway served by ILS to and along the surface of the runway and:

1. Intended for operations down to an RVR of the order of 200 m (no decision height being applicable) using visual aids during the final phase of landing;

2. Intended for operations down to an RVR of the order of 50 m (no decision height being applicable) using visual aids for taxiing;

3. Intended for operations without reliance on visual reference for landing or taxiing.

Note 1: See Annex 10 Volume I, Part I, Chapter 3, for related ILS specifications.

Note 2: Visual aids need not necessarily be matched to the scale of nonvisual aids provided. The criterion for the selection of visual aids is the conditions in which operations are intended to be conducted.

INTEGRITY− The ability of a system to provide timely warnings to users when the system should not be used for navigation.

INTERMEDIATE APPROACH SEGMENT−
(See SEGMENTS OF AN INSTRUMENT APPROACH PROCEDURE.)

INTERMEDIATE APPROACH SEGMENT [ICAO]− That segment of an instrument approach procedure between either the intermediate approach fix and the final approach fix or point, or between the end of a reversal, race track or dead reckoning track procedure and the final approach fix or point, as appropriate.

INTERMEDIATE FIX− The fix that identifies the beginning of the intermediate approach segment of an instrument approach procedure. The fix is not normally identified on the instrument approach chart as an intermediate fix (IF).
(See SEGMENTS OF AN INSTRUMENT APPROACH PROCEDURE.)

INTERMEDIATE LANDING− On the rare occasion that this option is requested, it should be approved. The departure center, however, must advise the ATCSCC so that the appropriate delay is carried over and assigned at the intermediate airport. An intermediate landing airport within the arrival center will not be accepted without coordination with and the approval of the ATCSCC.

INTERNATIONAL AIRPORT− Relating to international flight, it means:

a. An airport of entry which has been designated by the Secretary of Treasury or Commissioner of Customs as an international airport for customs service.

b. A landing rights airport at which specific permission to land must be obtained from customs authorities in advance of contemplated use.

c. Airports designated under the Convention on International Civil Aviation as an airport for use by international commercial air transport and/or international general aviation.
(See ICAO term INTERNATIONAL AIRPORT.)
(Refer to Chart Supplement U.S.)
(Refer to IFIM.)

INTERNATIONAL AIRPORT [ICAO]− Any airport designated by the Contracting State in whose territory it is situated as an airport of entry and departure for international air traffic, where the formalities incident to customs, immigration, public health, animal and plant quarantine and similar procedures are carried out.

INTERNATIONAL CIVIL AVIATION ORGANIZATION [ICAO]− A specialized agency of the United Nations whose objective is to develop the principles and techniques of international air navigation and to foster planning and development of international civil air transport.

a. Regions include:

1. African-Indian Ocean Region

2. Caribbean Region

3. European Region

4. Middle East/Asia Region

5. North American Region

6. North Atlantic Region

7. Pacific Region

8. South American Region

INTERNATIONAL FLIGHT INFORMATION MANUAL− A publication designed primarily as a pilot's preflight planning guide for flights into foreign airspace and for flights returning to the U.S. from foreign locations.

INTERROGATOR− The ground-based surveillance radar beacon transmitter-receiver, which normally scans in synchronism with a primary radar, transmitting discrete radio signals which repetitiously request all transponders on the mode being used to reply. The replies received are mixed with the primary radar returns and displayed on the same plan position indicator (radar scope). Also, applied to the airborne element of the TACAN/DME system.

(See TRANSPONDER.)
(Refer to AIM.)

INTERSECTING RUNWAYS− Two or more runways which cross or meet within their lengths.

(See INTERSECTION.)

INTERSECTION−

a. A point defined by any combination of courses, radials, or bearings of two or more navigational aids.

b. Used to describe the point where two runways, a runway and a taxiway, or two taxiways cross or meet.

INTERSECTION DEPARTURE− A departure from any runway intersection except the end of the runway.

(See INTERSECTION.)

INTERSECTION TAKEOFF−

(See INTERSECTION DEPARTURE.)

IR−

(See IFR MILITARY TRAINING ROUTES.)

ISR− Indicates the confidence level of the track requires 5NM separation. 3NM separation, 1 1/2NM separation, and target resolution cannot be used.

L

LAA−
(See LOCAL AIRPORT ADVISORY.)

LAAS−
(See LOW ALTITUDE ALERT SYSTEM.)

LAHSO− An acronym for "Land and Hold Short Operation." These operations include landing and holding short of an intersecting runway, a taxiway, a predetermined point, or an approach/departure flightpath.

LAHSO-DRY− Land and hold short operations on runways that are dry.

LAHSO-WET− Land and hold short operations on runways that are wet (but not contaminated).

LAND AND HOLD SHORT OPERATIONS− Operations which include simultaneous takeoffs and landings and/or simultaneous landings when a landing aircraft is able and is instructed by the controller to hold-short of the intersecting runway/ taxiway or designated hold-short point. Pilots are expected to promptly inform the controller if the hold short clearance cannot be accepted.
(See PARALLEL RUNWAYS.)
(Refer to AIM.)

LANDING AREA− Any locality either on land, water, or structures, including airports/heliports and intermediate landing fields, which is used, or intended to be used, for the landing and takeoff of aircraft whether or not facilities are provided for the shelter, servicing, or for receiving or discharging passengers or cargo.
(See ICAO term LANDING AREA.)

LANDING AREA [ICAO]− That part of a movement area intended for the landing or take-off of aircraft.

LANDING DIRECTION INDICATOR− A device which visually indicates the direction in which landings and takeoffs should be made.
(See TETRAHEDRON.)
(Refer to AIM.)

LANDING DISTANCE AVAILABLE (LDA)− The runway length declared available and suitable for a landing airplane.
(See ICAO term LANDING DISTANCE AVAILABLE.)

LANDING DISTANCE AVAILABLE [ICAO]− The length of runway which is declared available and suitable for the ground run of an aeroplane landing.

LANDING MINIMUMS− The minimum visibility prescribed for landing a civil aircraft while using an instrument approach procedure. The minimum applies with other limitations set forth in 14 CFR Part 91 with respect to the Minimum Descent Altitude (MDA) or Decision Height (DH) prescribed in the instrument approach procedures as follows:

a. Straight-in landing minimums. A statement of MDA and visibility, or DH and visibility, required for a straight-in landing on a specified runway, or

b. Circling minimums. A statement of MDA and visibility required for the circle-to-land maneuver.

Note: Descent below the MDA or DH must meet the conditions stated in 14 CFR Section 91.175.

(See CIRCLE-TO-LAND MANEUVER.)
(See DECISION HEIGHT.)
(See INSTRUMENT APPROACH PROCEDURE.)
(See MINIMUM DESCENT ALTITUDE.)
(See STRAIGHT-IN LANDING.)
(See VISIBILITY.)
(Refer to 14 CFR Part 91.)

LANDING ROLL− The distance from the point of touchdown to the point where the aircraft can be brought to a stop or exit the runway.

LANDING SEQUENCE− The order in which aircraft are positioned for landing.
(See APPROACH SEQUENCE.)

LAST ASSIGNED ALTITUDE− The last altitude/ flight level assigned by ATC and acknowledged by the pilot.
(See MAINTAIN.)
(Refer to 14 CFR Part 91.)

LATERAL NAVIGATION (LNAV)– A function of area navigation (RNAV) equipment which calculates, displays, and provides lateral guidance to a profile or path.

LATERAL SEPARATION− The lateral spacing of aircraft at the same altitude by requiring operation on different routes or in different geographical locations.
(See SEPARATION.)

LDA−
(See LOCALIZER TYPE DIRECTIONAL AID.)
(See LANDING DISTANCE AVAILABLE.)
(See ICAO Term LANDING DISTANCE AVAILABLE.)

LF−
(See LOW FREQUENCY.)

LIGHTED AIRPORT− An airport where runway and obstruction lighting is available.
(See AIRPORT LIGHTING.)
(Refer to AIM.)

LIGHT GUN− A handheld directional light signaling device which emits a brilliant narrow beam of white, green, or red light as selected by the tower controller. The color and type of light transmitted can be used to approve or disapprove anticipated pilot actions where radio communication is not available. The light gun is used for controlling traffic operating in the vicinity of the airport and on the airport movement area.
(Refer to AIM.)

LIGHT-SPORT AIRCRAFT (LSA)- An FAA-registered aircraft, other than a helicopter or powered-lift, that meets certain weight and performance. Principally it is a single engine aircraft with a maximum of two seats and weighing no more than 1,430 pounds if intended for operation on water, or 1,320 pounds if not. They must be of simple design (fixed landing gear (except if intended for operations on water or a glider) piston powered, non-pressurized, with a fixed or ground adjustable propeller), Performance is also limited to a maximum airspeed in level flight of not more than 120 knots CAS, have a maximum never-exceed speed of not more than 120 knots CAS for a glider, and have a maximum stalling speed, without the use of lift-enhancing devices (VS1) of not more than 45 knots CAS. They may be certificated as either Experimental LSA or as a Special LSA aircraft. A minimum of a sport pilot_certificate is required to operate light-sport aircraft." (Refer to 14 CFR Part 1, §1.1.)

LINE UP AND WAIT (LUAW)− Used by ATC to inform a pilot to taxi onto the departure runway to line up and wait. It is not authorization for takeoff. It is used when takeoff clearance cannot immediately be issued because of traffic or other reasons.
(See CLEARED FOR TAKEOFF.)

LOCAL AIRPORT ADVISORY (LAA)− A service available only in Alaska and provided by facilities, which are located on the landing airport, have a discrete ground−to−air communication frequency or the tower frequency when the tower is closed, automated weather reporting with voice broadcasting, and a continuous ASOS/AWSS/AWOS data display, other continuous direct reading instruments, or manual observations available to the specialist.
(See AIRPORT ADVISORY AREA.)

LOCAL TRAFFIC− Aircraft operating in the traffic pattern or within sight of the tower, or aircraft known to be departing or arriving from flight in local practice areas, or aircraft executing practice instrument approaches at the airport.
(See TRAFFIC PATTERN.)

LOCALIZER− The component of an ILS which provides course guidance to the runway.
(See INSTRUMENT LANDING SYSTEM.)
(See ICAO term LOCALIZER COURSE.)
(Refer to AIM.)

LOCALIZER COURSE [ICAO]− The locus of points, in any given horizontal plane, at which the DDM (difference in depth of modulation) is zero.

LOCALIZER OFFSET− An angular offset of the localizer aligned with 3° of the runway alignment.

LOCALIZER TYPE DIRECTIONAL AID− A localizer with an angular offset that exceeds 3°. of the runway alignment used for nonprecision instrument approaches with utility and accuracy comparable to a localizer but which are not part of a complete ILS.
(Refer to AIM.)

LOCALIZER TYPE DIRECTIONAL AID (LDA) PRECISION RUNWAY MONITOR (PRM) APPROACH− An approach, which includes a glidslope, used in conjunction with an ILS PRM, RNAV PRM or GLS PRM approach to an adjacent runway to conduct Simultaneous Offset Instrument Approaches (SOIA) to parallel runways whose centerlines are separated by less than 3,000 feet and

N

NAS−
(See NATIONAL AIRSPACE SYSTEM.)

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− 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 CENTER− A facility in Washington D.C., established by FAA to operate a central aeronautical information service for the collection, validation, and dissemination of aeronautical data in support of the activities of government, industry, and the aviation community. The information is published in the National Flight Data Digest.
(See NATIONAL FLIGHT DATA DIGEST.)

NATIONAL FLIGHT DATA DIGEST− 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.

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 Chart Supplement U.S.

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 developed for use within the United States for flight planning and navigation without reference to ground based navigational aids. The NRS waypoints are located in a grid pattern along defined latitude and longitude lines. The initial use of the NRS will be in the high altitude environment in conjunction with the High Altitude Redesign initiative. The NRS waypoints are intended for use 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.)

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.

NFDC−
(See NATIONAL FLIGHT DATA CENTER.)

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− Authorizes 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.

NONCOMPOSITE SEPARATION− Separation in accordance with minima other than the composite separation minimum specified for the area concerned.

NONDIRECTIONAL BEACON− An L/MF or UHF radio beacon transmitting nondirectional signals whereby the pilot of an aircraft equipped with direction finding equipment can determine his/her bearing to or from the radio beacon and "home" on or track to or from the station. When the radio beacon is installed in conjunction with the Instrument Landing System marker, it is normally called a Compass Locator.
(See AUTOMATIC DIRECTION FINDER.)
(See COMPASS LOCATOR.)

NONMOVEMENT AREAS− Taxiways and apron (ramp) areas not under the control of air traffic.

NONPRECISION APPROACH−
(See NONPRECISION APPROACH PROCEDURE.)

NONPRECISION APPROACH PROCEDURE− A standard instrument approach procedure in which no electronic glideslope is provided; e.g., VOR, TACAN, NDB, LOC, ASR, LDA, or SDF approaches.

NONRADAR− Precedes other terms and generally means without the use of radar, such as:

a. Nonradar Approach. Used to describe instrument approaches for which course guidance on final approach is not provided by ground-based precision or surveillance radar. Radar vectors to the final approach course may or may not be provided by ATC. Examples of nonradar approaches are VOR, NDB, TACAN, ILS, RNAV, and GLS approaches.

(See FINAL APPROACH COURSE.)
(See FINAL APPROACH-IFR.)
(See INSTRUMENT APPROACH PROCEDURE.)
(See RADAR APPROACH.)

b. Nonradar Approach Control. An ATC facility providing approach control service without the use of radar.

(See APPROACH CONTROL FACILITY.)
(See APPROACH CONTROL SERVICE.)

c. Nonradar Arrival. An aircraft arriving at an airport without radar service or at an airport served by a radar facility and radar contact has not been established or has been terminated due to a lack of radar service to the airport.

(See RADAR ARRIVAL.)
(See RADAR SERVICE.)

d. Nonradar Route. A flight path or route over which the pilot is performing his/her own navigation. The pilot may be receiving radar separation, radar monitoring, or other ATC services while on a nonradar route.

(See RADAR ROUTE.)

e. Nonradar Separation. The spacing of aircraft in accordance with established minima without the use of radar; e.g., vertical, lateral, or longitudinal separation.

(See RADAR SEPARATION.)
(See ICAO term NONRADAR SEPARATION.)

NONRADAR SEPARATION [ICAO]− The separation used when aircraft position information is derived from sources other than radar.

NON−RESTRICTIVE ROUTING (NRR)− Portions of a proposed route of flight where a user can flight plan the most advantageous flight path with no requirement to make reference to ground−based NAVAIDs.

NOPAC−

(See NORTH PACIFIC.)

NORDO (No Radio)− Aircraft that cannot or do not communicate by radio when radio communication is required are referred to as “NORDO.”

(See LOST COMMUNICATIONS.)

NORMAL OPERATING ZONE (NOZ)− The NOZ is the operating zone within which aircraft flight remains during normal independent simultaneous parallel ILS approaches.

NORTH AMERICAN ROUTE− A numerically coded route preplanned over existing airway and route systems to and from specific coastal fixes serving the North Atlantic. North American Routes consist of the following:

a. Common Route/Portion. That segment of a North American Route between the inland navigation facility and the coastal fix.

b. Noncommon Route/Portion. That segment of a North American Route between the inland navigation facility and a designated North American terminal.

c. Inland Navigation Facility. A navigation aid on a North American Route at which the common route and/or the noncommon route begins or ends.

d. Coastal Fix. A navigation aid or intersection where an aircraft transitions between the domestic route structure and the oceanic route structure.

NORTH AMERICAN ROUTE PROGRAM (NRP)− The NRP is a set of rules and procedures which are designed to increase the flexibility of user flight planning within published guidelines.

NORTH MARK− A beacon data block sent by the host computer to be displayed by the ARTS on a 360 degree bearing at a locally selected radar azimuth and distance. The North Mark is used to ensure correct range/azimuth orientation during periods of CENRAP.

NORTH PACIFIC− An organized route system between the Alaskan west coast and Japan.

NOTAM−

(See NOTICE TO AIRMEN.)

NOTAM [ICAO]− A notice containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations.

a. I Distribution− Distribution by means of telecommunication.

b. II Distribution− Distribution by means other than telecommunications.

NOTICE TO AIRMEN− A notice containing information (not known sufficiently in advance to publicize by other means) concerning the establishment, condition, or change in any component (facility, service, or procedure of, or hazard in the National Airspace System) the timely knowledge of which is essential to personnel concerned with flight operations.

a. NOTAM(D)− A NOTAM given (in addition to local dissemination) distant dissemination beyond the area of responsibility of the Flight Service Station. These NOTAMs will be stored and available until canceled.

b. FDC NOTAM− A NOTAM regulatory in nature, transmitted by USNOF and given system wide dissemination.

(See ICAO term NOTAM.)

NOTICES TO AIRMEN PUBLICATION− A publication issued every 28 days, designed primarily for the pilot, which contains current NOTAM information considered essential to the safety of flight as well as supplemental data to other aeronautical publications. The contraction NTAP is used in NOTAM text.

(See NOTICE TO AIRMEN.)

NRR−

(See NON−RESTRICTIVE ROUTING.)

NRS−

(See NAVIGATION REFERENCE SYSTEM.)

NTAP−

(See NOTICES TO AIRMEN PUBLICATION.)

NUMEROUS TARGETS VICINITY (LOCATION)− A traffic advisory issued by ATC to advise pilots that targets on the radar scope are too numerous to issue individually.

(See TRAFFIC ADVISORIES.)

O

OBSTACLE− An existing object, object of natural growth, or terrain at a fixed geographical location or which may be expected at a fixed location within a prescribed area with reference to which vertical clearance is or must be provided during flight operation.

OBSTACLE DEPARTURE PROCEDURE (ODP)− A preplanned instrument flight rule (IFR) departure procedure printed for pilot use in textual or graphic form to provide obstruction clearance via the least onerous route from the terminal area to the appropriate en route structure. ODPs are recommended for obstruction clearance and may be flown without ATC clearance unless an alternate departure procedure (SID or radar vector) has been specifically assigned by ATC.

(See IFR TAKEOFF MINIMUMS AND DEPARTURE PROCEDURES.)

(See STANDARD INSTRUMENT DEPARTURES.)

(Refer to AIM.)

OBSTACLE FREE ZONE− The OFZ is a three dimensional volume of airspace which protects for the transition of aircraft to and from the runway. The OFZ clearing standard precludes taxiing and parked airplanes and object penetrations, except for frangible NAVAID locations that are fixed by function. Additionally, vehicles, equipment, and personnel may be authorized by air traffic control to enter the area using the provisions of FAAO JO 7110.65, Para 3−1−5, VEHICLES/EQUIPMENT/ PERSONNEL ON RUNWAYS. The runway OFZ and when applicable, the inner-approach OFZ, and the inner-transitional OFZ, comprise the OFZ.

a. Runway OFZ. The runway OFZ is a defined volume of airspace centered above the runway. The runway OFZ is the airspace above a surface whose elevation at any point is the same as the elevation of the nearest point on the runway centerline. The runway OFZ extends 200 feet beyond each end of the runway. The width is as follows:

1. For runways serving large airplanes, the greater of:

(a) 400 feet, or

(b) 180 feet, plus the wingspan of the most demanding airplane, plus 20 feet per 1,000 feet of airport elevation.

2. For runways serving only small airplanes:

(a) 300 feet for precision instrument runways.

(b) 250 feet for other runways serving small airplanes with approach speeds of 50 knots, or more.

(c) 120 feet for other runways serving small airplanes with approach speeds of less than 50 knots.

b. Inner-approach OFZ. The inner-approach OFZ is a defined volume of airspace centered on the approach area. The inner-approach OFZ applies only to runways with an approach lighting system. The inner-approach OFZ begins 200 feet from the runway threshold at the same elevation as the runway threshold and extends 200 feet beyond the last light unit in the approach lighting system. The width of the inner-approach OFZ is the same as the runway OFZ and rises at a slope of 50 (horizontal) to 1 (vertical) from the beginning.

c. Inner-transitional OFZ. The inner transitional surface OFZ is a defined volume of airspace along the sides of the runway and inner-approach OFZ and applies only to precision instrument runways. The inner-transitional surface OFZ slopes 3 (horizontal) to 1 (vertical) out from the edges of the runway OFZ and inner-approach OFZ to a height of 150 feet above the established airport elevation.

(Refer to AC 150/5300-13, Chapter 3.)

(Refer to FAAO JO 7110.65, Para 3−1−5, VEHICLES/EQUIPMENT/PERSONNEL ON RUNWAYS.)

OBSTRUCTION− Any object/obstacle exceeding the obstruction standards specified by 14 CFR Part 77, Subpart C.

OBSTRUCTION LIGHT− A light or one of a group of lights, usually red or white, frequently mounted on a surface structure or natural terrain to warn pilots of the presence of an obstruction.

OCEANIC AIRSPACE− Airspace over the oceans of the world, considered international airspace, where oceanic separation and procedures per the International Civil Aviation Organization are applied. Responsibility for the provisions of air traffic control service in this airspace is delegated to various countries, based generally upon geographic proximity and the availability of the required resources.

OCEANIC ERROR REPORT− A report filed when ATC observes an Oceanic Error as defined by FAAO 7110.82, Reporting Oceanic Errors.

OCEANIC PUBLISHED ROUTE− A route established in international airspace and charted or described in flight information publications, such as Route Charts, DOD Enroute Charts, Chart Supplements, NOTAMs, and Track Messages.

OCEANIC TRANSITION ROUTE− An ATS route established for the purpose of transitioning aircraft to/from an organized track system.

ODP−
(See OBSTACLE DEPARTURE PROCEDURE.)

OFF COURSE− A term used to describe a situation where an aircraft has reported a position fix or is observed on radar at a point not on the ATC-approved route of flight.

OFF-ROUTE VECTOR− A vector by ATC which takes an aircraft off a previously assigned route. Altitudes assigned by ATC during such vectors provide required obstacle clearance.

OFFSET PARALLEL RUNWAYS− Staggered runways having centerlines which are parallel.

OFFSHORE/CONTROL AIRSPACE AREA− That portion of airspace between the U.S. 12 NM limit and the oceanic CTA/FIR boundary within which air traffic control is exercised. These areas are established to provide air traffic control services. Offshore/Control Airspace Areas may be classified as either Class A airspace or Class E airspace.

OFT−
(See OUTER FIX TIME.)

OM−
(See OUTER MARKER.)

ON COURSE−

a. Used to indicate that an aircraft is established on the route centerline.

b. Used by ATC to advise a pilot making a radar approach that his/her aircraft is lined up on the final approach course.
(See ON-COURSE INDICATION.)

ON-COURSE INDICATION− An indication on an instrument, which provides the pilot a visual means of determining that the aircraft is located on the centerline of a given navigational track, or an indication on a radar scope that an aircraft is on a given track.

ONE-MINUTE WEATHER− The most recent one minute updated weather broadcast received by a pilot from an uncontrolled airport ASOS/AWSS/AWOS.

ONER−
(See OCEANIC NAVIGATIONAL ERROR REPORT.)

OPERATIONAL−
(See DUE REGARD.)

OPERATIONS SPECIFICATIONS [ICAO]− The authorizations, conditions and limitations associated with the air operator certificate and subject to the conditions in the operations manual.

OPPOSITE DIRECTION AIRCRAFT− Aircraft are operating in opposite directions when:

a. They are following the same track in reciprocal directions; or

b. Their tracks are parallel and the aircraft are flying in reciprocal directions; or

c. Their tracks intersect at an angle of more than 135°.

OPTION APPROACH− An approach requested and conducted by a pilot which will result in either a touch-and-go, missed approach, low approach, stop-and-go, or full stop landing.
(See CLEARED FOR THE OPTION.)
(Refer to AIM.)

ORGANIZED TRACK SYSTEM− A series of ATS routes which are fixed and charted; i.e., CEP, NOPAC, or flexible and described by NOTAM; i.e., NAT TRACK MESSAGE.

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.

Note: The abbreviation "PAR" is also used to denote preferential arrival routes in ARTCC computers.

(See GLIDEPATH.)
(See PAR.)
(See PREFERENTIAL ROUTES.)
(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.

Note: Precision approach radars are designed to enable pilots of aircraft to be given guidance by radio communication during the final stages of the approach to land.

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 onboard 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.

PREFERENTIAL ROUTES− Preferential routes (PDRs, PARs, and PDARs) are adapted in ARTCC computers to accomplish inter/intrafacility controller coordination and to assure that flight data is posted at the proper control positions. Locations having a need for these specific inbound and outbound routes normally publish such routes in local facility bulletins, and their use by pilots minimizes flight plan route amendments. When the workload or traffic situation permits, controllers normally provide radar vectors or assign requested routes to minimize circuitous routing. Preferential routes are usually confined to one ARTCC's area and are referred to by the following names or acronyms:

a. Preferential Departure Route (PDR). A specific departure route from an airport or terminal area to an en route point where there is no further need for flow control. It may be included in an Instrument Departure Procedure (DP) or a Preferred IFR Route.

b. Preferential Arrival Route (PAR). A specific arrival route from an appropriate en route point to an airport or terminal area. It may be included in a Standard Terminal Arrival (STAR) or a Preferred IFR Route. The abbreviation "PAR" is used primarily within the ARTCC and should not be confused with the abbreviation for Precision Approach Radar.

c. Preferential Departure and Arrival Route (PDAR). A route between two terminals which are within or immediately adjacent to one ARTCC's area. PDARs are not synonymous with Preferred IFR Routes but may be listed as such as they do accomplish essentially the same purpose.

(See PREFERRED IFR ROUTES.)

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. 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 are correlated with DPs and STARs and may be defined by airways, jet routes, direct routes between NAVAIDs, Waypoints, NAVAID radials/ DME, or any combinations thereof.

(See CENTER'S AREA.)
(See INSTRUMENT DEPARTURE PROCEDURE.)
(See PREFERENTIAL ROUTES.)
(See STANDARD TERMINAL ARRIVAL.)
(Refer to CHART SUPPLEMENT U.S.)
(Refer to NOTICES TO AIRMEN PUBLICATION.)

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.

PRM−
(See ILS PRM APPROACH and PRECISION RUNWAY MONITOR SYSTEM.)

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

R

RADAR− A device which, by measuring the time interval between transmission and reception of radio pulses and correlating the angular orientation of the radiated antenna beam or beams in azimuth and/or elevation, provides information on range, azimuth, and/or elevation of objects in the path of the transmitted pulses.

a. Primary Radar− A radar system in which a minute portion of a radio pulse transmitted from a site is reflected by an object and then received back at that site for processing and display at an air traffic control facility.

b. Secondary Radar/Radar Beacon (ATCRBS)− A radar system in which the object to be detected is fitted with cooperative equipment in the form of a radio receiver/transmitter (transponder). Radar pulses transmitted from the searching transmitter/receiver (interrogator) site are received in the cooperative equipment and used to trigger a distinctive transmission from the transponder. This reply transmission, rather than a reflected signal, is then received back at the transmitter/receiver site for processing and display at an air traffic control facility.

(See INTERROGATOR.)
(See TRANSPONDER.)
(See ICAO term RADAR.)
(Refer to AIM.)

RADAR [ICAO]− A radio detection device which provides information on range, azimuth and/or elevation of objects.

a. Primary Radar− Radar system which uses reflected radio signals.

b. Secondary Radar− Radar system wherein a radio signal transmitted from a radar station initiates the transmission of a radio signal from another station.

RADAR ADVISORY− The provision of advice and information based on radar observations.

(See ADVISORY SERVICE.)

RADAR ALTIMETER−

(See RADIO ALTIMETER.)

RADAR APPROACH− An instrument approach procedure which utilizes Precision Approach Radar (PAR) or Airport Surveillance Radar (ASR).

(See AIRPORT SURVEILLANCE RADAR.)
(See INSTRUMENT APPROACH PROCEDURE.)
(See PRECISION APPROACH RADAR.)
(See SURVEILLANCE APPROACH.)
(See ICAO term RADAR APPROACH.)
(Refer to AIM.)

RADAR APPROACH [ICAO]− An approach, executed by an aircraft, under the direction of a radar controller.

RADAR APPROACH CONTROL FACILITY− A terminal ATC facility that uses radar and nonradar capabilities to provide approach control services to aircraft arriving, departing, or transiting airspace controlled by the facility.

(See APPROACH CONTROL SERVICE.)

a. Provides radar ATC services to aircraft operating in the vicinity of one or more civil and/or military airports in a terminal area. The facility may provide services of a ground controlled approach (GCA); i.e., ASR and PAR approaches. A radar approach control facility may be operated by FAA, USAF, US Army, USN, USMC, or jointly by FAA and a military service. Specific facility nomenclatures are used for administrative purposes only and are related to the physical location of the facility and the operating service generally as follows:

1. Army Radar Approach Control (ARAC) (Army).

2. Radar Air Traffic Control Facility (RATCF) (Navy/FAA).

3. Radar Approach Control (RAPCON) (Air Force/FAA).

4. Terminal Radar Approach Control (TRACON) (FAA).

5. Air Traffic Control Tower (ATCT) (FAA). (Only those towers delegated approach control authority.)

RADAR ARRIVAL− An aircraft arriving at an airport served by a radar facility and in radar contact with the facility.

(See NONRADAR.)

RADAR BEACON−
(See RADAR.)

RADAR CLUTTER [ICAO]− The visual indication on a radar display of unwanted signals.

RADAR CONTACT−

a. Used by ATC to inform an aircraft that it is identified using an approved ATC surveillance source on an air traffic controller's display and that radar flight following will be provided until radar service is terminated. Radar service may also be provided within the limits of necessity and capability. When a pilot is informed of "radar contact," he/she automatically discontinues reporting over compulsory reporting points.

(See ATC SURVEILLANCE SOURCE.)
(See RADAR CONTACT LOST.)
(See RADAR FLIGHT FOLLOWING.)
(See RADAR SERVICE.)
(See RADAR SERVICE TERMINATED.)
(Refer to AIM.)

b. The term used to inform the controller that the aircraft is identified and approval is granted for the aircraft to enter the receiving controllers airspace.

(See ICAO term RADAR CONTACT.)

RADAR CONTACT [ICAO]− The situation which exists when the radar blip or radar position symbol of a particular aircraft is seen and identified on a radar display.

RADAR CONTACT LOST− Used by ATC to inform a pilot that the surveillance data used to determine the aircraft's position is no longer being received, or is no longer reliable and radar service is no longer being provided. The loss may be attributed to several factors including the aircraft merging with weather or ground clutter, the aircraft operating below radar line of sight coverage, the aircraft entering an area of poor radar return, failure of the aircraft's equipment, or failure of the surveillance equipment.

(See CLUTTER.)
(See RADAR CONTACT.)

RADAR ENVIRONMENT− An area in which radar service may be provided.

(See ADDITIONAL SERVICES.)
(See RADAR CONTACT.)
(See RADAR SERVICE.)
(See TRAFFIC ADVISORIES.)

RADAR FLIGHT FOLLOWING− The observation of the progress of radar identified aircraft, whose primary navigation is being provided by the pilot, wherein the controller retains and correlates the aircraft identity with the appropriate target or target symbol displayed on the radar scope.

(See RADAR CONTACT.)
(See RADAR SERVICE.)
(Refer to AIM.)

RADAR IDENTIFICATION− The process of ascertaining that an observed radar target is the radar return from a particular aircraft.

(See RADAR CONTACT.)
(See RADAR SERVICE.)
(See ICAO term RADAR IDENTIFICATION.)

RADAR IDENTIFICATION [ICAO]− The process of correlating a particular radar blip or radar position symbol with a specific aircraft.

RADAR IDENTIFIED AIRCRAFT− An aircraft, the position of which has been correlated with an observed target or symbol on the radar display.

(See RADAR CONTACT.)
(See RADAR CONTACT LOST.)

RADAR MONITORING−
(See RADAR SERVICE.)

RADAR NAVIGATIONAL GUIDANCE−
(See RADAR SERVICE.)

RADAR POINT OUT− An action taken by a controller to transfer the radar identification of an aircraft to another controller if the aircraft will or may enter the airspace or protected airspace of another controller and radio communications will not be transferred.

RADAR REQUIRED− A term displayed on charts and approach plates and included in FDC NOTAMs to alert pilots that segments of either an instrument approach procedure or a route are not navigable because of either the absence or unusability of a NAVAID. The pilot can expect to be provided radar navigational guidance while transiting segments labeled with this term.

(See RADAR ROUTE.)
(See RADAR SERVICE.)

RADAR ROUTE− A flight path or route over which an aircraft is vectored. Navigational guidance and altitude assignments are provided by ATC.

(See FLIGHT PATH.)
(See ROUTE.)

RADAR SEPARATION−
(See RADAR SERVICE.)

RADAR SERVICE− A term which encompasses one or more of the following services based on the use of radar which can be provided by a controller to a pilot of a radar identified aircraft.

a. Radar Monitoring− The radar flight-following of aircraft, whose primary navigation is being performed by the pilot, to observe and note deviations from its authorized flight path, airway, or route. When being applied specifically to radar monitoring of instrument approaches; i.e., with precision approach radar (PAR) or radar monitoring of simultaneous ILS,RNAV and GLS approaches, it includes advice and instructions whenever an aircraft nears or exceeds the prescribed PAR safety limit or simultaneous ILS RNAV and GLS no transgression zone.
(See ADDITIONAL SERVICES.)
(See TRAFFIC ADVISORIES.)

b. Radar Navigational Guidance− Vectoring aircraft to provide course guidance.

c. Radar Separation− Radar spacing of aircraft in accordance with established minima.
(See ICAO term RADAR SERVICE.)

RADAR SERVICE [ICAO]− Term used to indicate a service provided directly by means of radar.

a. Monitoring− The use of radar for the purpose of providing aircraft with information and advice relative to significant deviations from nominal flight path.

b. Separation− The separation used when aircraft position information is derived from radar sources.

***RADAR SERVICE TERMINATED*−** Used by ATC to inform a pilot that he/she will no longer be provided any of the services that could be received while in radar contact. Radar service is automatically terminated, and the pilot is not advised in the following cases:

a. An aircraft cancels its IFR flight plan, except within Class B airspace, Class C airspace, a TRSA, or where Basic Radar service is provided.

b. An aircraft conducting an instrument, visual, or contact approach has landed or has been instructed to change to advisory frequency.

c. An arriving VFR aircraft, receiving radar service to a tower-controlled airport within Class B airspace, Class C airspace, a TRSA, or where sequencing service is provided, has landed; or to all other airports, is instructed to change to tower or advisory frequency.

d. An aircraft completes a radar approach.

RADAR SURVEILLANCE− The radar observation of a given geographical area for the purpose of performing some radar function.

RADAR TRAFFIC ADVISORIES− Advisories issued to alert pilots to known or observed radar traffic which may affect the intended route of flight of their aircraft.
(See TRAFFIC ADVISORIES.)

RADAR TRAFFIC INFORMATION SERVICE−
(See TRAFFIC ADVISORIES.)

RADAR VECTORING [ICAO]− Provision of navigational guidance to aircraft in the form of specific headings, based on the use of radar.

RADIAL− A magnetic bearing extending from a VOR/VORTAC/TACAN navigation facility.

RADIO−

a. A device used for communication.

b. Used to refer to a flight service station; e.g., "Seattle Radio" is used to call Seattle FSS.

RADIO ALTIMETER− Aircraft equipment which makes use of the reflection of radio waves from the ground to determine the height of the aircraft above the surface.

RADIO BEACON−
(See NONDIRECTIONAL BEACON.)

RADIO DETECTION AND RANGING−
(See RADAR.)

RADIO MAGNETIC INDICATOR− An aircraft navigational instrument coupled with a gyro compass or similar compass that indicates the direction of a selected NAVAID and indicates bearing with respect to the heading of the aircraft.

RAIS−
(See REMOTE AIRPORT INFORMATION SERVICE.)

RAMP−
(See APRON.)

RANDOM ALTITUDE− An altitude inappropriate for direction of flight and/or not in accordance with FAAO JO 7110.65, Para 4−5−1, VERTICAL SEPARATION MINIMA.

RANDOM ROUTE− Any route not established or charted/published or not otherwise available to all users.

RC−
(See ROAD RECONNAISSANCE.)

RCAG−
(See REMOTE COMMUNICATIONS AIR/GROUND FACILITY.)

RCC−
(See RESCUE COORDINATION CENTER.)

RCO−
(See REMOTE COMMUNICATIONS OUTLET.)

RCR−
(See RUNWAY CONDITION READING.)

***READ BACK*−** Repeat my message back to me.

RECEIVER AUTONOMOUS INTEGRITY MONITORING (RAIM)− A technique whereby a civil GNSS receiver/processor determines the integrity of the GNSS navigation signals without reference to sensors or non-DoD integrity systems other than the receiver itself. This determination is achieved by a consistency check among redundant pseudorange measurements.

RECEIVING CONTROLLER− A controller/facility receiving control of an aircraft from another controller/facility.

RECEIVING FACILITY−
(See RECEIVING CONTROLLER.)

RECONFORMANCE− The automated process of bringing an aircraft's Current Plan Trajectory into conformance with its track.

***REDUCE SPEED TO (SPEED)*−**
(See SPEED ADJUSTMENT.)

REIL−
(See RUNWAY END IDENTIFIER LIGHTS.)

RELEASE TIME− A departure time restriction issued to a pilot by ATC (either directly or through an authorized relay) when necessary to separate a departing aircraft from other traffic.
(See ICAO term RELEASE TIME.)

RELEASE TIME [ICAO]− Time prior to which an aircraft should be given further clearance or prior to which it should not proceed in case of radio failure.

REMOTE AIRPORT INFORMATION SERVICE (RAIS)− A temporary service provided by facilities, which are not located on the landing airport, but have communication capability and automated weather reporting available to the pilot at the landing airport.

REMOTE COMMUNICATIONS AIR/GROUND FACILITY− An unmanned VHF/UHF transmitter/receiver facility which is used to expand ARTCC air/ground communications coverage and to facilitate direct contact between pilots and controllers. RCAG facilities are sometimes not equipped with emergency frequencies 121.5 MHz and 243.0 MHz.
(Refer to AIM.)

REMOTE COMMUNICATIONS OUTLET− An unmanned communications facility remotely controlled by air traffic personnel. RCOs serve FSSs. RTRs serve terminal ATC facilities. An RCO or RTR may be UHF or VHF and will extend the communication range of the air traffic facility. There are several classes of RCOs and RTRs. The class is determined by the number of transmitters or receivers. Classes A through G are used primarily for air/ground purposes. RCO and RTR class O facilities are nonprotected outlets subject to undetected and prolonged outages. RCO (O's) and RTR (O's) were established for the express purpose of providing ground-to-ground communications between air traffic control specialists and pilots located at a satellite airport for delivering en route clearances, issuing departure authorizations, and acknowledging instrument flight rules cancellations or departure/landing times. As a secondary function, they may be used for advisory purposes whenever the aircraft is below the coverage of the primary air/ground frequency.

REMOTE TRANSMITTER/RECEIVER−
(See REMOTE COMMUNICATIONS OUTLET.)

***REPORT*−** Used to instruct pilots to advise ATC of specified information; e.g., "Report passing Hamilton VOR."

REPORTING POINT− A geographical location in relation to which the position of an aircraft is reported.
(See COMPULSORY REPORTING POINTS.)
(See ICAO term REPORTING POINT.)
(Refer to AIM.)

REPORTING POINT [ICAO]− A specified geographical location in relation to which the position of an aircraft can be reported.

REQUEST FULL ROUTE CLEARANCE− Used by pilots to request that the entire route of flight be read verbatim in an ATC clearance. Such request should be made to preclude receiving an ATC clearance based on the original filed flight plan when a filed IFR flight plan has been revised by the pilot, company, or operations prior to departure.

REQUIRED NAVIGATION PERFORMANCE (RNP)– A statement of the navigational performance necessary for operation within a defined airspace. The following terms are commonly associated with RNP:

a. Required Navigation Performance Level or Type (RNP-X). A value, in nautical miles (NM), from the intended horizontal position within which an aircraft would be at least 95-percent of the total flying time.

b. Required Navigation Performance (RNP) Airspace. A generic term designating airspace, route (s), leg (s), operation (s), or procedure (s) where minimum required navigational performance (RNP) have been established.

c. Actual Navigation Performance (ANP). A measure of the current estimated navigational performance. Also referred to as Estimated Position Error (EPE).

d. Estimated Position Error (EPE). A measure of the current estimated navigational performance. Also referred to as Actual Navigation Performance (ANP).

e. Lateral Navigation (LNAV). A function of area navigation (RNAV) equipment which calculates, displays, and provides lateral guidance to a profile or path.

f. Vertical Navigation (VNAV). A function of area navigation (RNAV) equipment which calculates, displays, and provides vertical guidance to a profile or path.

RESCUE COORDINATION CENTER− A search and rescue (SAR) facility equipped and manned to coordinate and control SAR operations in an area designated by the SAR plan. The U.S. Coast Guard and the U.S. Air Force have responsibility for the operation of RCCs.

(See ICAO term RESCUE CO-ORDINATION CENTRE.)

RESCUE CO-ORDINATION CENTRE [ICAO]− A unit responsible for promoting efficient organization of search and rescue service and for coordinating the conduct of search and rescue operations within a search and rescue region.

RESOLUTION ADVISORY−A display indication given to the pilot by the traffic alert and collision avoidance systems (TCAS II) recommending a maneuver to increase vertical separation relative to an intruding aircraft. Positive, negative, and vertical speed limit (VSL) advisories constitute the resolution advisories. A resolution advisory is also classified as corrective or preventive

RESTRICTED AREA−

(See SPECIAL USE AIRSPACE.)
(See ICAO term RESTRICTED AREA.)

RESTRICTED AREA [ICAO]− An airspace of defined dimensions, above the land areas or territorial waters of a State, within which the flight of aircraft is restricted in accordance with certain specified conditions.

RESUME NORMAL SPEED− Used by ATC to advise a pilot to resume an aircraft's normal operating speed. It is issued to terminate a speed adjustment where no published speed restrictions apply. It does not delete speed restrictions in published procedures of upcoming segments of flight. This does not relieve the pilot of those speed restrictions, which are applicable to 14 CFR Section 91.117.

RESUME OWN NAVIGATION− Used by ATC to advise a pilot to resume his/her own navigational responsibility. It is issued after completion of a radar vector or when radar contact is lost while the aircraft is being radar vectored.

(See RADAR CONTACT LOST.)
(See RADAR SERVICE TERMINATED.)

RESUME PUBLISHED SPEED- Used by ATC to advise a pilot to resume published speed restrictions that are applicable to a SID, STAR, or other instrument procedure. It is issued to terminate a speed adjustment where speed restrictions are published on a charted procedure.

RMI−

(See RADIO MAGNETIC INDICATOR.)

RNAV−

(See AREA NAVIGATION (RNAV).)

RNAV APPROACH− An instrument approach procedure which relies on aircraft area navigation equipment for navigational guidance.
(See AREA NAVIGATION (RNAV).)
(See INSTRUMENT APPROACH PROCEDURE.)

ROAD RECONNAISSANCE− Military activity requiring navigation along roads, railroads, and rivers. Reconnaissance route/route segments are seldom along a straight line and normally require a lateral route width of 10 NM to 30 NM and an altitude range of 500 feet to 10,000 feet AGL.

ROGER− I have received all of your last transmission. It should not be used to answer a question requiring a yes or a no answer.
(See AFFIRMATIVE.)
(See NEGATIVE.)

ROLLOUT RVR−
(See VISIBILITY.)

ROUTE− A defined path, consisting of one or more courses in a horizontal plane, which aircraft traverse over the surface of the earth.
(See AIRWAY.)
(See JET ROUTE.)
(See PUBLISHED ROUTE.)
(See UNPUBLISHED ROUTE.)

ROUTE ACTION NOTIFICATION− EDST notification that a PAR/PDR/PDAR has been applied to the flight plan.
(See ATC PREFERRED ROUTE NOTIFICATION.)
(See EN ROUTE DECISION SUPPORT TOOL)

ROUTE SEGMENT− As used in Air Traffic Control, a part of a route that can be defined by two navigational fixes, two NAVAIDs, or a fix and a NAVAID.
(See FIX.)
(See ROUTE.)
(See ICAO term ROUTE SEGMENT.)

ROUTE SEGMENT [ICAO]− A portion of a route to be flown, as defined by two consecutive significant points specified in a flight plan.

RSA−
(See RUNWAY SAFETY AREA.)

RTR−
(See REMOTE TRANSMITTER/RECEIVER.)

RUNWAY− A defined rectangular area on a land airport prepared for the landing and takeoff run of aircraft along its length. Runways are normally numbered in relation to their magnetic direction rounded off to the nearest 10 degrees; e.g., Runway 1, Runway 25.
(See PARALLEL RUNWAYS.)
(See ICAO term RUNWAY.)

RUNWAY [ICAO]− A defined rectangular area on a land aerodrome prepared for the landing and take-off of aircraft.

RUNWAY CENTERLINE LIGHTING−
(See AIRPORT LIGHTING.)

RUNWAY CONDITION READING− Numerical decelerometer readings relayed by air traffic controllers at USAF and certain civil bases for use by the pilot in determining runway braking action. These readings are routinely relayed only to USAF and Air National Guard Aircraft.
(See BRAKING ACTION.)

RUNWAY END IDENTIFIER LIGHTS−
(See AIRPORT LIGHTING.)

RUNWAY ENTRANCE LIGHTS (REL)—An array of red lights which include the first light at the hold line followed by a series of evenly spaced lights to the runway edge aligned with the taxiway centerline, and one additional light at the runway centerline in line with the last two lights before the runway edge.

RUNWAY GRADIENT− The average slope, measured in percent, between two ends or points on a runway. Runway gradient is depicted on Government aerodrome sketches when total runway gradient exceeds 0.3%.

RUNWAY HEADING− The magnetic direction that corresponds with the runway centerline extended, not the painted runway number. When cleared to "fly or maintain runway heading," pilots are expected to fly or maintain the heading that corresponds with the extended centerline of the departure runway. Drift correction shall not be applied; e.g., Runway 4, actual magnetic heading of the runway centerline 044, fly 044.

RUNWAY IN USE/ACTIVE RUNWAY/DUTY RUNWAY− Any runway or runways currently being used for takeoff or landing. When multiple runways are used, they are all considered active runways. In the metering sense, a selectable adapted item which specifies the landing runway configuration or direction of traffic flow. The adapted optimum flight plan from each transition fix to the vertex is determined by the runway configuration for arrival metering processing purposes.

RUNWAY LIGHTS−
(See AIRPORT LIGHTING.)

RUNWAY MARKINGS−
(See AIRPORT MARKING AIDS.)

RUNWAY OVERRUN− In military aviation exclusively, a stabilized or paved area beyond the end of a runway, of the same width as the runway plus shoulders, centered on the extended runway centerline.

RUNWAY PROFILE DESCENT− An instrument flight rules (IFR) air traffic control arrival procedure to a runway published for pilot use in graphic and/or textual form and may be associated with a STAR. Runway Profile Descents provide routing and may depict crossing altitudes, speed restrictions, and headings to be flown from the en route structure to the point where the pilot will receive clearance for and execute an instrument approach procedure. A Runway Profile Descent may apply to more than one runway if so stated on the chart.
(Refer to AIM.)

RUNWAY SAFETY AREA− A defined surface surrounding the runway prepared, or suitable, for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway. The dimensions of the RSA vary and can be determined by using the criteria contained within AC 150/5300-13, Airport Design, Chapter 3. Figure 3−1 in AC 150/5300-13 depicts the RSA. The design standards dictate that the RSA shall be:

a. Cleared, graded, and have no potentially hazardous ruts, humps, depressions, or other surface variations;

b. Drained by grading or storm sewers to prevent water accumulation;

c. Capable, under dry conditions, of supporting snow removal equipment, aircraft rescue and firefighting equipment, and the occasional passage of aircraft without causing structural damage to the aircraft; and,

d. Free of objects, except for objects that need to be located in the runway safety area because of their function. These objects shall be constructed on low impact resistant supports (frangible mounted structures) to the lowest practical height with the frangible point no higher than 3 inches above grade.
(Refer to AC 150/5300-13, Airport Design, Chapter 3.)

RUNWAY STATUS LIGHTS (RWSL) SYSTEM—The RWSL is a system of runway and taxiway lighting to provide pilots increased situational awareness by illuminating runway entry lights (REL) when the runway is unsafe for entry or crossing, and take-off hold lights (THL) when the runway is unsafe for departure.

RUNWAY TRANSITION−

a. Conventional STARs/SIDs. The portion of a STAR/SID that serves a particular runway or runways at an airport.

b. RNAV STARs/SIDs. Defines a path(s) from the common route to the final point(s) on a STAR. For a SID, the common route that serves a particular runway or runways at an airport.

RUNWAY USE PROGRAM− A noise abatement runway selection plan designed to enhance noise abatement efforts with regard to airport communities for arriving and departing aircraft. These plans are developed into runway use programs and apply to all turbojet aircraft 12,500 pounds or heavier; turbojet aircraft less than 12,500 pounds are included only if the airport proprietor determines that the aircraft creates a noise problem. Runway use programs are coordinated with FAA offices, and safety criteria used in these programs are developed by the Office of Flight Operations. Runway use programs are administered by the Air Traffic Service as "Formal" or "Informal" programs.

a. Formal Runway Use Program− An approved noise abatement program which is defined and acknowledged in a Letter of Understanding between Flight Operations, Air Traffic Service, the airport proprietor, and the users. Once established, participation in the program is mandatory for aircraft operators and pilots as provided for in 14 CFR Section 91.129.

b. Informal Runway Use Program− An approved noise abatement program which does not require a Letter of Understanding, and participation in the program is voluntary for aircraft operators/pilots.

RUNWAY VISIBILITY VALUE−
(See VISIBILITY.)

RUNWAY VISUAL RANGE−
(See VISIBILITY.)

S

SAA−
(See SPECIAL ACTIVITY AIRSPACE.)

SAFETY ALERT− A safety alert issued by ATC to aircraft under their control if ATC is aware the aircraft is at an altitude which, in the controller's judgment, places the aircraft in unsafe proximity to terrain, obstructions, or other aircraft. The controller may discontinue the issuance of further alerts if the pilot advises he/she is taking action to correct the situation or has the other aircraft in sight.

a. Terrain/Obstruction Alert− A safety alert issued by ATC to aircraft under their control if ATC is aware the aircraft is at an altitude which, in the controller's judgment, places the aircraft in unsafe proximity to terrain/obstructions; e.g., "Low Altitude Alert, check your altitude immediately."

b. Aircraft Conflict Alert− A safety alert issued by ATC to aircraft under their control if ATC is aware of an aircraft that is not under their control at an altitude which, in the controller's judgment, places both aircraft in unsafe proximity to each other. With the alert, ATC will offer the pilot an alternate course of action when feasible; e.g., "Traffic Alert, advise you turn right heading zero niner zero or climb to eight thousand immediately."

Note: The issuance of a safety alert is contingent upon the capability of the controller to have an awareness of an unsafe condition. The course of action provided will be predicated on other traffic under ATC control. Once the alert is issued, it is solely the pilot's prerogative to determine what course of action, if any, he/she will take.

SAFETY LOGIC SYSTEM− A software enhancement to ASDE−3, ASDE−X, and ASDE−3X, that predicts the path of aircraft landing and/or departing, and/or vehicular movements on runways. Visual and aural alarms are activated when the safety logic projects a potential collision. The Airport Movement Area Safety System (AMASS) is a safety logic system enhancement to the ASDE−3. The Safety Logic System for ASDE−X and ASDE−3X is an integral part of the software program.

SAFETY LOGIC SYSTEM ALERTS−

a. ALERT− An actual situation involving two real safety logic tracks (aircraft/aircraft, aircraft/vehicle, or aircraft/other tangible object) that safety logic has predicted will result in an imminent collision, based upon the current set of Safety Logic parameters.

b. FALSE ALERT−

1. Alerts generated by one or more false surface−radar targets that the system has interpreted as real tracks and placed into safety logic.

2. Alerts in which the safety logic software did not perform correctly, based upon the design specifications and the current set of Safety Logic parameters.

3. The alert is generated by surface radar targets caused by moderate or greater precipitation.

c. NUISANCE ALERT− An alert in which one or more of the following is true:

1. The alert is generated by a known situation that is not considered an unsafe operation, such as LAHSO or other approved operations.

2. The alert is generated by inaccurate secondary radar data received by the Safety Logic System.

3. One or more of the aircraft involved in the alert is not intending to use a runway (for example, helicopter, pipeline patrol, non−Mode C overflight, etc.).

d. VALID NON−ALERT− A situation in which the safety logic software correctly determines that an alert is not required, based upon the design specifications and the current set of Safety Logic parameters.

e. INVALID NON−ALERT− A situation in which the safety logic software did not issue an alert when an alert was required, based upon the design specifications.

SAIL BACK− A maneuver during high wind conditions (usually with power off) where float plane movement is controlled by water rudders/opening and closing cabin doors.

SAME DIRECTION AIRCRAFT− Aircraft are operating in the same direction when:

a. They are following the same track in the same direction; or

b. Their tracks are parallel and the aircraft are flying in the same direction; or

c. Their tracks intersect at an angle of less than 45 degrees.

SAR−
(See SEARCH AND RESCUE.)

***SAY AGAIN*−** Used to request a repeat of the last transmission. Usually specifies transmission or portion thereof not understood or received; e.g., "Say again all after ABRAM VOR."

***SAY ALTITUDE*−** Used by ATC to ascertain an aircraft's specific altitude/flight level. When the aircraft is climbing or descending, the pilot should state the indicated altitude rounded to the nearest 100 feet.

***SAY HEADING*−** Used by ATC to request an aircraft heading. The pilot should state the actual heading of the aircraft.

SCHEDULED TIME OF ARRIVAL (STA)− A STA is the desired time that an aircraft should cross a certain point (landing or metering fix). It takes other traffic and airspace configuration into account. A STA time shows the results of the TBFM scheduler that has calculated an arrival time according to parameters such as optimized spacing, aircraft performance, and weather.

SDF−
(See SIMPLIFIED DIRECTIONAL FACILITY.)

SEA LANE− A designated portion of water outlined by visual surface markers for and intended to be used by aircraft designed to operate on water.

SEARCH AND RESCUE− A service which seeks missing aircraft and assists those found to be in need of assistance. It is a cooperative effort using the facilities and services of available Federal, state and local agencies. The U.S. Coast Guard is responsible for coordination of search and rescue for the Maritime Region, and the U.S. Air Force is responsible for search and rescue for the Inland Region. Information pertinent to search and rescue should be passed through any air traffic facility or be transmitted directly to the Rescue Coordination Center by telephone.
(See FLIGHT SERVICE STATION.)
(See RESCUE COORDINATION CENTER.)
(Refer to AIM.)

SEARCH AND RESCUE FACILITY− A facility responsible for maintaining and operating a search and rescue (SAR) service to render aid to persons and property in distress. It is any SAR unit, station, NET, or other operational activity which can be usefully employed during an SAR Mission; e.g., a Civil Air Patrol Wing, or a Coast Guard Station.
(See SEARCH AND RESCUE.)

SECNOT−
(See SECURITY NOTICE.)

SECONDARY RADAR TARGET− A target derived from a transponder return presented on a radar display.

SECTIONAL AERONAUTICAL CHARTS−
(See AERONAUTICAL CHART.)

SECTOR LIST DROP INTERVAL− A parameter number of minutes after the meter fix time when arrival aircraft will be deleted from the arrival sector list.

SECURITY NOTICE (SECNOT) − A SECNOT is a request originated by the Air Traffic Security Coordinator (ATSC) for an extensive communications search for aircraft involved, or suspected of being involved, in a security violation, or are considered a security risk. A SECNOT will include the aircraft identification, search area, and expiration time. The search area, as defined by the ATSC, could be a single airport, multiple airports, a radius of an airport or fix, or a route of flight. Once the expiration time has been reached, the SECNOT is considered to be cancelled.

SECURITY SERVICES AIRSPACE − Areas established through the regulatory process or by NOTAM, issued by the Administrator under title 14, CFR, sections 99.7, 91.141, and 91.139, which specify that ATC security services are required; i.e., ADIZ or temporary flight rules areas.

SEE AND AVOID− When weather conditions permit, pilots operating IFR or VFR are required to observe and maneuver to avoid other aircraft. Right-of-way rules are contained in 14 CFR Part 91.

SEGMENTED CIRCLE− A system of visual indicators designed to provide traffic pattern information at airports without operating control towers.
(Refer to AIM.)

SEGMENTS OF AN INSTRUMENT APPROACH PROCEDURE− An instrument approach procedure may have as many as four separate segments depending on how the approach procedure is structured.

a. Initial Approach− The segment between the initial approach fix and the intermediate fix or the maintained. Aircraft are not permitted to pass each other during simultaneous dependent operations. Integral parts of a total system ATC procedures, and appropriate airborne and ground based equipment.

SINGLE DIRECTION ROUTES− Preferred IFR Routes which are sometimes depicted on high altitude en route charts and which are normally flown in one direction only.

(See PREFERRED IFR ROUTES.)
(Refer to CHART SUPPLEMENT U.S.)

SINGLE FREQUENCY APPROACH− A service provided under a letter of agreement to military single-piloted turbojet aircraft which permits use of a single UHF frequency during approach for landing. Pilots will not normally be required to change frequency from the beginning of the approach to touchdown except that pilots conducting an en route descent are required to change frequency when control is transferred from the air route traffic control center to the terminal facility. The abbreviation "SFA" in the DOD FLIP IFR Supplement under "Communications" indicates this service is available at an aerodrome.

SINGLE-PILOTED AIRCRAFT− A military turbojet aircraft possessing one set of flight controls, tandem cockpits, or two sets of flight controls but operated by one pilot is considered single-piloted by ATC when determining the appropriate air traffic service to be applied.

(See SINGLE FREQUENCY APPROACH.)

SKYSPOTTER− A pilot who has received specialized training in observing and reporting inflight weather phenomena.

SLASH− A radar beacon reply displayed as an elongated target.

SLDI−

(See SECTOR LIST DROP INTERVAL.)

SLOT TIME−

(See METER FIX TIME/SLOT TIME.)

SLOW TAXI− To taxi a float plane at low power or low RPM.

SN−

(See SYSTEM STRATEGIC NAVIGATION.)

SPEAK SLOWER− Used in verbal communications as a request to reduce speech rate.

SPECIAL ACTIVITY AIRSPACE (SAA)− Any airspace with defined dimensions within the National Airspace System wherein limitations may be imposed upon aircraft operations. This airspace may be restricted areas, prohibited areas, military operations areas, air ATC assigned airspace, and any other designated airspace areas. The dimensions of this airspace are programmed into EDST and can be designated as either active or inactive by screen entry. Aircraft trajectories are constantly tested against the dimensions of active areas and alerts issued to the applicable sectors when violations are predicted.

(See EN ROUTE DECISION SUPPORT TOOL.)

SPECIAL EMERGENCY− A condition of air piracy or other hostile act by a person(s) aboard an aircraft which threatens the safety of the aircraft or its passengers.

SPECIAL INSTRUMENT APPROACH PROCEDURE−

(See INSTRUMENT APPROACH PROCEDURE.)

SPECIAL USE AIRSPACE− Airspace of defined dimensions identified by an area on the surface of the earth wherein activities must be confined because of their nature and/or wherein limitations may be imposed upon aircraft operations that are not a part of those activities. Types of special use airspace are:

a. Alert Area− Airspace which may contain a high volume of pilot training activities or an unusual type of aerial activity, neither of which is hazardous to aircraft. Alert Areas are depicted on aeronautical charts for the information of nonparticipating pilots. All activities within an Alert Area are conducted in accordance with Federal Aviation Regulations, and pilots of participating aircraft as well as pilots transiting the area are equally responsible for collision avoidance.

b. Controlled Firing Area− Airspace wherein activities are conducted under conditions so controlled as to eliminate hazards to nonparticipating aircraft and to ensure the safety of persons and property on the ground.

c. Military Operations Area (MOA)− A MOA is airspace established outside of Class A airspace area to separate or segregate certain nonhazardous military activities from IFR traffic and to identify for VFR traffic where these activities are conducted.

(Refer to AIM.)

d. Prohibited Area− Airspace designated under 14 CFR Part 73 within which no person may operate an aircraft without the permission of the using agency.

(Refer to AIM.)
(Refer to En Route Charts.)

e. Restricted Area− Airspace designated under 14 CFR Part 73, within which the flight of aircraft, while not wholly prohibited, is subject to restriction. Most restricted areas are designated joint use and IFR/VFR operations in the area may be authorized by the controlling ATC facility when it is not being utilized by the using agency. Restricted areas are depicted on en route charts. Where joint use is authorized, the name of the ATC controlling facility is also shown.

(Refer to 14 CFR Part 73.)
(Refer to AIM.)

f. Warning Area− A warning area is airspace of defined dimensions extending from 3 nautical miles outward from the coast of the United States, that contains activity that may be hazardous to nonparticipating aircraft. The purpose of such warning area is to warn nonparticipating pilots of the potential danger. A warning area may be located over domestic or international waters or both.

SPECIAL VFR CONDITIONS− Meteorological conditions that are less than those required for basic VFR flight in Class B, C, D, or E surface areas and in which some aircraft are permitted flight under visual flight rules.

(See SPECIAL VFR OPERATIONS.)
(Refer to 14 CFR Part 91.)

SPECIAL VFR FLIGHT [ICAO]− A VFR flight cleared by air traffic control to operate within Class B, C, D, and E surface areas in metrological conditions below VMC.

SPECIAL VFR OPERATIONS− Aircraft operating in accordance with clearances within Class B, C, D, and E surface areas in weather conditions less than the basic VFR weather minima. Such operations must be requested by the pilot and approved by ATC.

(See SPECIAL VFR CONDITIONS.)
(See ICAO term SPECIAL VFR FLIGHT.)

SPEED−

(See AIRSPEED.)
(See GROUND SPEED.)

SPEED ADJUSTMENT− An ATC procedure used to request pilots to adjust aircraft speed to a specific value for the purpose of providing desired spacing. Pilots are expected to maintain a speed of plus or minus 10 knots or 0.02 Mach number of the specified speed. Examples of speed adjustments are:

a. "Increase/reduce speed to Mach point (number.)"

b. "Increase/reduce speed to (speed in knots)" or "Increase/reduce speed (number of knots) knots."

SPEED BRAKES− Moveable aerodynamic devices on aircraft that reduce airspeed during descent and landing.

SPEED SEGMENTS− Portions of the arrival route between the transition point and the vertex along the optimum flight path for which speeds and altitudes are specified. There is one set of arrival speed segments adapted from each transition point to each vertex. Each set may contain up to six segments.

SQUAWK (Mode, Code, Function)**−** Activate specific modes/codes/functions on the aircraft transponder; e.g., "Squawk three/alpha, two one zero five, low."

(See TRANSPONDER.)

STA−

(See SCHEDULED TIME OF ARRIVAL.)

STAGING/QUEUING− The placement, integration, and segregation of departure aircraft in designated movement areas of an airport by departure fix, EDCT, and/or restriction.

STAND BY**−** Means the controller or pilot must pause for a few seconds, usually to attend to other duties of a higher priority. Also means to wait as in "stand by for clearance." The caller should reestablish contact if a delay is lengthy. "Stand by" is not an approval or denial.

STANDARD INSTRUMENT APPROACH PROCEDURE (SIAP)−

(See INSTRUMENT APPROACH PROCEDURE.)

STANDARD INSTRUMENT DEPARTURE (SID)− A preplanned instrument flight rule (IFR) air traffic control (ATC) departure procedure printed for pilot/controller use in graphic form to provide obstacle clearance and a transition from the terminal area to the appropriate en route structure. SIDs are primarily designed for system enhancement to expedite traffic flow and to reduce pilot/controller workload. ATC clearance must always be received prior to flying a SID.

(See IFR TAKEOFF MINIMUMS AND DEPARTURE PROCEDURES.)
(See OBSTACLE DEPARTURE PROCEDURE.)
(Refer to AIM.)

STANDARD RATE TURN− A turn of three degrees per second.

STANDARD TERMINAL ARRIVAL− A preplanned instrument flight rule (IFR) air traffic control arrival procedure published for pilot use in graphic and/or textual form. STARs provide transition from the en route structure to an outer fix or an instrument approach fix/arrival waypoint in the terminal area.

STANDARD TERMINAL ARRIVAL CHARTS−
(See AERONAUTICAL CHART.)

STANDARD TERMINAL AUTOMATION REPLACEMENT SYSTEM (STARS)−
(See DTAS.)

STAR−
(See STANDARD TERMINAL ARRIVAL.)

STATE AIRCRAFT− Aircraft used in military, customs and police service, in the exclusive service of any government, or of any political subdivision, thereof including the government of any state, territory, or possession of the United States or the District of Columbia, but not including any government-owned aircraft engaged in carrying persons or property for commercial purposes.

STATIC RESTRICTIONS− Those restrictions that are usually not subject to change, fixed, in place, and/or published.

STATIONARY RESERVATIONS− Altitude reservations which encompass activities in a fixed area. Stationary reservations may include activities, such as special tests of weapons systems or equipment, certain U.S. Navy carrier, fleet, and anti-submarine operations, rocket, missile and drone operations, and certain aerial refueling or similar operations.

STEP TAXI− To taxi a float plane at full power or high RPM.

STEP TURN− A maneuver used to put a float plane in a planing configuration prior to entering an active sea lane for takeoff. The STEP TURN maneuver should only be used upon pilot request.

STEPDOWN FIX− A fix permitting additional descent within a segment of an instrument approach procedure by identifying a point at which a controlling obstacle has been safely overflown.

STEREO ROUTE− A routinely used route of flight established by users and ARTCCs identified by a coded name; e.g., ALPHA 2. These routes minimize flight plan handling and communications.

STOL AIRCRAFT−
(See SHORT TAKEOFF AND LANDING AIRCRAFT.)

STOP ALTITUDE SQUAWK− Used by ATC to inform an aircraft to turn-off the automatic altitude reporting feature of its transponder. It is issued when the verbally reported altitude varies 300 feet or more from the automatic altitude report.
(See ALTITUDE READOUT.)
(See TRANSPONDER.)

STOP AND GO− A procedure wherein an aircraft will land, make a complete stop on the runway, and then commence a takeoff from that point.
(See LOW APPROACH.)
(See OPTION APPROACH.)

STOP BURST−
(See STOP STREAM.)

STOP BUZZER−
(See STOP STREAM.)

STOP SQUAWK (Mode or Code)− Used by ATC to tell the pilot to turn specified functions of the aircraft transponder off.
(See STOP ALTITUDE SQUAWK.)
(See TRANSPONDER.)

STOP STREAM− Used by ATC to request a pilot to suspend electronic attack activity.
(See JAMMING.)

STOPOVER FLIGHT PLAN− A flight plan format which permits in a single submission the filing of a sequence of flight plans through interim full-stop destinations to a final destination.

STOPWAY− An area beyond the takeoff runway no less wide than the runway and centered upon the extended centerline of the runway, able to support the airplane during an aborted takeoff, without causing structural damage to the airplane, and designated by the airport authorities for use in decelerating the airplane during an aborted takeoff.

STRAIGHT-IN APPROACH IFR− An instrument approach wherein final approach is begun without first having executed a procedure turn, not necessarily completed with a straight-in landing or made to straight-in landing minimums.

(See LANDING MINIMUMS.)
(See STRAIGHT-IN APPROACH VFR.)
(See STRAIGHT-IN LANDING.)

STRAIGHT-IN APPROACH VFR− Entry into the traffic pattern by interception of the extended runway centerline (final approach course) without executing any other portion of the traffic pattern.

(See TRAFFIC PATTERN.)

STRAIGHT-IN LANDING− A landing made on a runway aligned within 30° of the final approach course following completion of an instrument approach.

(See STRAIGHT-IN APPROACH IFR.)

STRAIGHT-IN LANDING MINIMUMS−
(See LANDING MINIMUMS.)

STRAIGHT-IN MINIMUMS−
(See STRAIGHT-IN LANDING MINIMUMS.)

STRATEGIC PLANNING− Planning whereby solutions are sought to resolve potential conflicts.

SUBSTITUTE ROUTE− A route assigned to pilots when any part of an airway or route is unusable because of NAVAID status. These routes consist of:

a. Substitute routes which are shown on U.S. Government charts.

b. Routes defined by ATC as specific NAVAID radials or courses.

c. Routes defined by ATC as direct to or between NAVAIDs.

SUNSET AND SUNRISE− The mean solar times of sunset and sunrise as published in the Nautical Almanac, converted to local standard time for the locality concerned. Within Alaska, the end of evening civil twilight and the beginning of morning civil twilight, as defined for each locality.

SUPPLEMENTAL WEATHER SERVICE LOCATION− Airport facilities staffed with contract personnel who take weather observations and provide current local weather to pilots via telephone or radio. (All other services are provided by the parent FSS.)

SUPPS− Refers to ICAO Document 7030 Regional Supplementary Procedures. SUPPS contain procedures for each ICAO Region which are unique to that Region and are not covered in the worldwide provisions identified in the ICAO Air Navigation Plan. Procedures contained in Chapter 8 are based in part on those published in SUPPS.

SURFACE AREA− The airspace contained by the lateral boundary of the Class B, C, D, or E airspace designated for an airport that begins at the surface and extends upward.

SURPIC− A description of surface vessels in the area of a Search and Rescue incident including their predicted positions and their characteristics.

(Refer to FAAO JO 7110.65, Para 10−6−4, INFLIGHT CONTINGENCIES.)

SURVEILLANCE APPROACH− An instrument approach wherein the air traffic controller issues instructions, for pilot compliance, based on aircraft position in relation to the final approach course (azimuth), and the distance (range) from the end of the runway as displayed on the controller's radar scope. The controller will provide recommended altitudes on final approach if requested by the pilot.

(Refer to AIM.)

SWAP−
(See SEVERE WEATHER AVOIDANCE PLAN.)

SWSL−
(See SUPPLEMENTAL WEATHER SERVICE LOCATION.)

SYSTEM STRATEGIC NAVIGATION− Military activity accomplished by navigating along a preplanned route using internal aircraft systems to maintain a desired track. This activity normally requires a lateral route width of 10 NM and altitude range of 1,000 feet to 6,000 feet AGL with some route segments that permit terrain following.

radio frequency and also, for subscribers, in a text message via data link to the cockpit or to a gate printer. TDLS also provides 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 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 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 U.S.

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 OMNI-DIRECTIONAL RANGE STATION− 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.)

THAT IS CORRECT− The understanding you have is right.

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.)

TIBS−
(See TELEPHONE INFORMATION BRIEFING SERVICE.)

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 U.S., the Alaska Supplement, the Pacific Supplement, and FAA Order JO 7350.8, 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)− The hardware, software, methods, processes, and initiatives to manage air traffic flows based on time to balance air traffic demand with system capacity, and support the management of PBN. This includes, but not limited to, Adjacent Center Metering (ACM). En Route Departure Capability (EDC), Ground-Interval Management-Spacing (GIM-S), Integrated Departure/Arrival Capability (IDAC), Single Center Metering (SCM), Time-Based Metering (TBM), Time-Based Scheduling (TBS), and Extended/Coupled Metering.

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 shall 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.

TIS−B−
(See TRAFFIC INFORMATION SERVICE−BROADCAST.)

TMPA−
(See TRAFFIC MANAGEMENT PROGRAM ALERT.)

TMU−
(See TRAFFIC MANAGEMENT UNIT.)

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.

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 take-off 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 take-off 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/AWSS 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− 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 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 either the Notices to Airmen publication or 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 upwind leg, crosswind leg, downwind leg, base leg, and final approach.

a. Upwind Leg− A flight path parallel to the landing runway in the direction of landing.

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.

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.

(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 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.

TRANSCRIBED WEATHER BROADCAST− A continuous recording of meteorological and aeronautical information that is broadcast on L/MF and VOR facilities for pilots. (Provided only in Alaska.)

(Refer to AIM.)

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−

a. 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.

b. A published procedure (DP Transition) used to connect the basic DP to one of several en route airways/jet routes, or a published procedure (STAR

Transition) used to connect one of several en route airways/jet routes to the basic STAR.
(Refer to DP/STAR Charts.)

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.

TRANSITION WAYPOINT− The waypoint that defines the beginning of a runway or en route transition on an RNAV SID or STAR.

TRANSITIONAL AIRSPACE− That portion of controlled airspace wherein aircraft change from one phase of flight or flight condition to another.

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) and runway visibility value (RVV).
(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.)

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.

TURN ANTICIPATION− (maneuver anticipation).

TVOR−
(See TERMINAL-VERY HIGH FREQUENCY OMNIDIRECTIONAL RANGE STATION.)

TWEB−
(See TRANSCRIBED WEATHER BROADCAST.)

TWO-WAY RADIO COMMUNICATIONS FAILURE−
(See LOST COMMUNICATIONS.)

U

UHF−
(See ULTRAHIGH FREQUENCY.)

ULTRAHIGH FREQUENCY− 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, nor 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.)

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 U.S.)
(Refer to AIM.)

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.

UPWIND LEG−
(See TRAFFIC PATTERN.)

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.)

3. Rollout RVR− The RVR readout values obtained from RVR equipment located nearest the rollout end of the runway.

(See ICAO term FLIGHT VISIBILITY.)
(See ICAO term GROUND VISIBILITY.)
(See ICAO term RUNWAY VISUAL RANGE.)
(See ICAO term VISIBILITY.)

VISIBILITY [ICAO]− The ability, as determined by atmospheric conditions and expressed in units of distance, to see and identify prominent unlighted objects by day and prominent lighted objects by night.

a. Flight Visibility−The visibility forward from the cockpit of an aircraft in flight.

b. Ground Visibility−The visibility at an aerodrome as reported by an accredited observer.

c. Runway Visual Range [RVR]−The range over which the pilot of an aircraft on the centerline of a runway can see the runway surface markings or the lights delineating the runway or identifying its centerline.

VISUAL APPROACH− An approach conducted on an instrument flight rules (IFR) flight plan which authorizes the pilot to proceed visually and clear of clouds to the airport. The pilot must, at all times, have either the airport or the preceding aircraft in sight. This approach must be authorized and under the control of the appropriate air traffic control facility. Reported weather at the airport must be ceiling at or above 1,000 feet and visibility of 3 miles or greater.

(See ICAO term VISUAL APPROACH.)

VISUAL APPROACH [ICAO]− An approach by an IFR flight when either part or all of an instrument approach procedure is not completed and the approach is executed in visual reference to terrain.

VISUAL APPROACH SLOPE INDICATOR−
(See AIRPORT LIGHTING.)

VISUAL CLIMB OVER AIRPORT (VCOA)− A departure option for an IFR aircraft, operating in visual meteorological conditions equal to or greater than the specified visibility and ceiling, to visually conduct climbing turns over the airport to the published "climb−to" altitude from which to proceed with the instrument portion of the departure. VCOA procedures are developed to avoid obstacles greater than 3 statute miles from the departure end of the runway as an alternative to complying with climb gradients greater than 200 feet per nautical mile. Pilots are responsible to advise ATC as early as possible of the intent to fly the VCOA option prior to departure. These textual procedures are published in the 'Take−Off Minimums and (Obstacle) Departure Procedures' section of the Terminal Procedures Publications and/or appear as an option on a Graphic ODP.

(See AIM.)

VISUAL DESCENT POINT− A defined point on the final approach course of a nonprecision straight-in approach procedure from which normal descent from the MDA to the runway touchdown point may be commenced, provided the approach threshold of that runway, or approach lights, or other markings identifiable with the approach end of that runway are clearly visible to the pilot.

VISUAL FLIGHT RULES− Rules that govern the procedures for conducting flight under visual conditions. The term "VFR" is also used in the United States to indicate weather conditions that are equal to or greater than minimum VFR requirements. In addition, it is used by pilots and controllers to indicate type of flight plan.

(See INSTRUMENT FLIGHT RULES.)
(See INSTRUMENT METEOROLOGICAL CONDITIONS.)
(See VISUAL METEOROLOGICAL CONDITIONS.)
(Refer to 14 CFR Part 91.)
(Refer to AIM.)

VISUAL HOLDING− The holding of aircraft at selected, prominent geographical fixes which can be easily recognized from the air.

(See HOLDING FIX.)

VISUAL METEOROLOGICAL CONDITIONS− Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling equal to or better than specified minima.

(See INSTRUMENT FLIGHT RULES.)
(See INSTRUMENT METEOROLOGICAL CONDITIONS.)
(See VISUAL FLIGHT RULES.)

VISUAL SEGMENT−
(See PUBLISHED INSTRUMENT APPROACH PROCEDURE VISUAL SEGMENT.)

VISUAL SEPARATION− A means employed by ATC to separate aircraft in terminal areas and en route airspace in the NAS. There are two ways to effect this separation:

a. The tower controller sees the aircraft involved and issues instructions, as necessary, to ensure that the aircraft avoid each other.

b. A pilot sees the other aircraft involved and upon instructions from the controller provides his/her own separation by maneuvering his/her aircraft as necessary to avoid it. This may involve following another aircraft or keeping it in sight until it is no longer a factor.

(See SEE AND AVOID.)
(Refer to 14 CFR Part 91.)

VLF−
(See VERY LOW FREQUENCY.)

VMC−
(See VISUAL METEOROLOGICAL CONDITIONS.)

VOICE SWITCHING AND CONTROL SYSTEM− The VSCS is a computer controlled switching system that provides air traffic controllers with all voice circuits (air to ground and ground to ground) necessary for air traffic control.
(See VOICE SWITCHING AND CONTROL SYSTEM.)
(Refer to AIM.)

VOR− A ground-based electronic navigation aid transmitting very high frequency navigation signals, 360 degrees in azimuth, oriented from magnetic north. Used as the basis for navigation in the National Airspace System. The VOR periodically identifies itself by Morse Code and may have an additional voice identification feature. Voice features may be used by ATC or FSS for transmitting instructions/ information to pilots.
(See NAVIGATIONAL AID.)
(Refer to AIM.)

VOR TEST SIGNAL−
(See VOT.)

VORTAC− A navigation aid providing VOR azimuth, TACAN azimuth, and TACAN distance measuring equipment (DME) at one site.
(See DISTANCE MEASURING EQUIPMENT.)
(See NAVIGATIONAL AID.)
(See TACAN.)
(See VOR.)
(Refer to AIM.)

VORTICES− Circular patterns of air created by the movement of an airfoil through the air when generating lift. As an airfoil moves through the atmosphere in sustained flight, an area of area of low pressure is created above it. The air flowing from the high pressure area to the low pressure area around and about the tips of the airfoil tends to roll up into two rapidly rotating vortices, cylindrical in shape. These vortices are the most predominant parts of aircraft wake turbulence and their rotational force is dependent upon the wing loading, gross weight, and speed of the generating aircraft. The vortices from medium to super aircraft can be of extremely high velocity and hazardous to smaller aircraft.
(See AIRCRAFT CLASSES.)
(See WAKE TURBULENCE.)
(Refer to AIM.)

VOT− A ground facility which emits a test signal to check VOR receiver accuracy. Some VOTs are available to the user while airborne, and others are limited to ground use only.
(See CHART SUPPLEMENT U.S.)
(Refer to 14 CFR Part 91.)
(Refer to AIM.)

VR−
(See VFR MILITARY TRAINING ROUTES.)

VSCS−
(See VOICE SWITCHING AND CONTROL SYSTEM.)

VTA−
(See VERTEX TIME OF ARRIVAL.)

VTOL AIRCRAFT−
(See VERTICAL TAKEOFF AND LANDING AIRCRAFT.)

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