



U.S. Department  
of Transportation

**Federal Aviation  
Administration**

# ***AERONAUTICAL INFORMATION MANUAL***

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***Change 2  
July 16, 2020***

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**DO NOT DESTROY  
BASIC DATED  
AUGUST 15, 2019**



# Aeronautical Information Manual

## Explanation of Changes

**Effective: July 16, 2020**

### **a. 1-1-4. VOR RECEIVER CHECK**

This change adds an additional means of checking VOR receivers to ensure satisfactory operation of the airborne system per the Code of Federal Regulations, Part 91.171.

### **b. 3-2-3. CLASS B AIRSPACE**

This change revises the AIM, paragraph 3-2-3, Class B Airspace, to reflect the statutory authority of 14 CFR 91.131. The proposed change adds text to the AIM that reflects the authority in 14 CFR 91.131 for student pilots seeking a sport pilot certificate to operate in Class B airspace after satisfying the requirements of 14 CFR 61.94.

### **c. 3-4-1. GENERAL**

#### **5-1-1. PREFLIGHT PREPARATION**

#### **5-1-3. NOTICE TO AIRMEN (NOTAM) SYSTEM**

#### **5-1-11. FLIGHTS OUTSIDE U.S. TERRITORIAL AIRSPACE**

#### **7-1-5. PREFLIGHT BRIEFING**

#### **APPENDIX 3 ABBREVIATIONS/ACRONYMS**

This change removes all mention of the discontinued Notices to Airmen Publication (NTAP). This change also provides guidance to pilot weather briefers and pilots on the location of Domestic Notices and International Notices migrated from the NTAP. Also added to paragraph 5-1-3 are Security NOTAMS with both Domestic and International location identifiers for NOTAM search purposes.

### **d. 3-4-9. OBTAINING SPECIAL USE AIRSPACE STATUS**

#### **3-5-9. OTHER NON-CHARTED AIRSPACE AREAS**

This change clarifies where pilots may find the most current information about the status of SUA when flight planning.

### **e. 4-2-4. AIRCRAFT CALL SIGNS**

This change clarifies use of the term “MEDEVAC” to identify a flight as a MEDEVAC mission for ATC priority handling. This change re-formats the subparagraph, deletes obsolete references, and updates language to provide clarity for pilots of MEDEVAC flights requiring priority handling from ATC. Also, clarification for flight planning is added. A NOTE is added for pilots operating VFR without a filed flight plan.

### **f. 4-5-6. TRAFFIC INFORMATION SERVICE (TIS)**

#### **4-5-7. AUTOMATIC DEPENDENT SURVEILLANCE BROADCAST (ADS-B) SERVICES**

#### **4-5-8. TRAFFIC INFORMATION SERVICE BROADCAST (TIS-B)**

#### **4-5-9. FLIGHT INFORMATION SERVICE BROADCAST (FIS-B)**

#### **4-5-10. AUTOMATIC DEPENDENT SURVEILLANCE REBROADCAST (ADS-R)**

#### **7-1-11. FLIGHT INFORMATION SERVICES (FIS)**

This change adds an email address where pilots can directly report observed malfunctions of ADS-B and ADS-B-related services, updates the table describing Flight Information Service-Broadcast (FISB) products, and adds a note to paragraph 4-5-6 clarifying that Traffic Information Service (TIS) is not related to Traffic Information Service-Broadcast (TIS-B). This change also reorganizes the hierarchical structure of paragraph 7-1-11 to meet the Section 508 compliance requirements specified in FAA Order JO 7000.5E, which states that the paragraph

breakdown structure must not exceed four levels, as well as makes other minor editorial corrections.

**g. 7-2-1. GENERAL**

**7-2-2. PROCEDURES**

**7-2-3. ALTIMETER ERRORS**

**7-2-4. HIGH BAROMETRIC PRESSURES**

**7-2-5. LOW BAROMETRIC PRESSURE**

**7-3-1. EFFECT OF COLD TEMPERATURE ON BAROMETRIC ALTIMETERS**

**7-3-2. FLIGHT PLANNING FOR COLD TEMPERATURE ALTIMETER ERRORS**

**7-3-3. EFFECTS OF COLD TEMPERATURE ON BARO VNAV VERTICAL GUIDANCE**

**7-3-4. COLD TEMPERATURE AIRPORTS**

**7-3-5. COLD TEMPERATURE AIRPORTS PROCEDURES**

**7-3-6. EXAMPLES FOR CALCULATING ALTITUDE CORRECTIONS ON CTAS**

The change will include adding a new section,

Section 3, Cold Temperature Barometric Altimeter Errors, Setting Procedures and Cold Temperature Airports (CTA), updating Section 2, and renumbering the rest of the sections in Chapter 7. Cold Temperature Restricted Airports (CTRA) will also be renamed Cold Temperature Airports (CTA).

**h. 9-1-4. THE DIGITAL AERONAUTICAL CHART SUPPLEMENT (DACS)**

All references to The Digital Aeronautical Chart Supplement (DACS) data files will be removed from the AIM by removing paragraph 9-1-4 e1(c).

**i. Editorial Changes**

Editorial changes include a LAHSO correction in paragraph 2-1-6. Also includes various reference updates.

**j. Entire Publication**

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

## AIM Change 2

### Page Control Chart

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## Federal Aviation Administration (FAA)

The Federal Aviation Administration is responsible for ensuring 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:

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 approved print providers. A listing of products, dates of latest editions, and print providers is available on the Aeronautical Information Services (AIS) website at: [http://www.faa.gov/air\\_traffic/flight\\_info/aeronav/print\\_providers/](http://www.faa.gov/air_traffic/flight_info/aeronav/print_providers/).

Publication Schedule		
Basic or Change	Cutoff Date for Completion	Effective Date of Publication
Basic Manual	2/28/19	8/15/19
Change 1	8/15/19	1/30/20
Change 2	1/30/20	7/16/20
Change 3	7/16/20	12/31/20
Basic Manual	12/31/20	6/17/21





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of an airport with an instrument approach that is not dependent on GPS. (See paragraph 1-1-8.) If the pilot encounters a GPS outage, the pilot will be able to proceed via VOR-to-VOR navigation at 5,000 feet AGL through the GPS outage area or to a safe landing at a MON airport or another suitable airport, as appropriate. Nearly all VORs inside of the WUSMA and outside the CONUS are being retained. In these areas, pilots use the existing (Victor and Jet) route structure and VORs to proceed through a GPS outage or to a landing.

### 3. Using the VOR MON.

(a) In the case of a planned GPS outage (for example, one that is in a published NOTAM), pilots may plan to fly through the outage using the MON as appropriate and as cleared by ATC. Similarly, aircraft not equipped with GPS may plan to fly and land using the MON, as appropriate and as cleared by ATC.

#### **NOTE-**

*In many cases, flying using the MON may involve a more circuitous route than flying GPS-enabled RNAV.*

(b) In the case of an unscheduled GPS outage, pilots and ATC will need to coordinate the best outcome for all aircraft. It is possible that a GPS outage could be disruptive, causing high workload and demand for ATC service. Generally, the VOR MON concept will enable pilots to navigate through the GPS outage or land at a MON airport or at another airport that may have an appropriate approach or may be in visual conditions.

(1) The VOR MON is a reversionary service provided by the FAA for use by aircraft that are unable to continue RNAV during a GPS disruption. The FAA has not mandated that preflight or inflight planning include provisions for GPS- or WAAS-equipped aircraft to carry sufficient fuel to proceed to a MON airport in case of an unforeseen GPS outage. Specifically, flying to a MON airport as a filed alternate will not be explicitly required. Of course, consideration for the possibility of a GPS outage is prudent during flight planning as is maintaining proficiency with VOR navigation.

(2) Also, in case of a GPS outage, pilots may coordinate with ATC and elect to continue through the outage or land. The VOR MON is designed to ensure that an aircraft is within 100 NM of an airport, but pilots may decide to proceed to any appropriate airport where a landing can be made.

WAAS users flying under Part 91 are not required to carry VOR avionics. These users do not have the ability or requirement to use the VOR MON. Prudent flight planning, by these WAAS-only aircraft, should consider the possibility of a GPS outage.

#### **NOTE-**

*The FAA recognizes that non-GPS-based approaches will be reduced when VORs are eliminated, and that most airports with an instrument approach may only have GPS- or WAAS-based approaches. Pilots flying GPS- or WAAS-equipped aircraft that also have VOR/ILS avionics should be diligent to maintain proficiency in VOR and ILS approaches in the event of a GPS outage.*

### 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 checkpoints and airways.

3. Certified checkpoints on the airport surface.

4. If an airborne checkpoint is not available, select an established VOR airway. Select a prominent ground point, preferably more than 20 NM from the VOR ground facility and maneuver the aircraft directly over the point at a reasonably low altitude above terrain and obstructions.

**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  $\frac{1}{2}$  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.

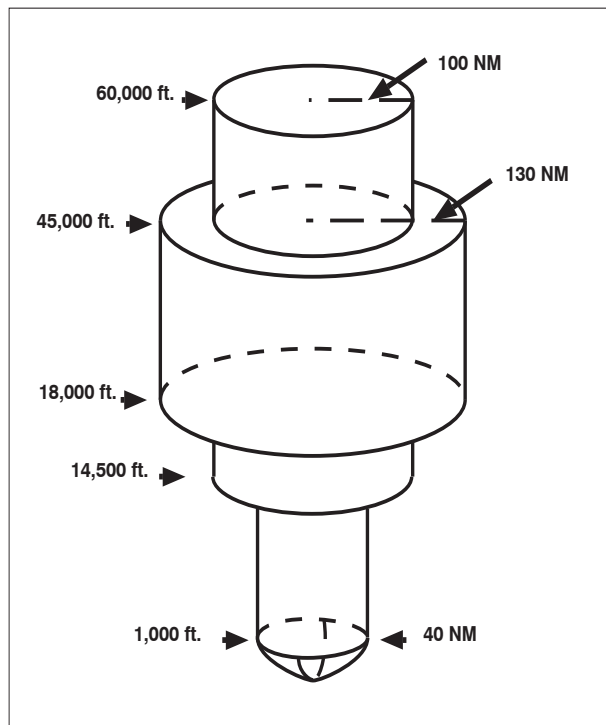
**EXAMPLE-**

*TVOR, LDME, and HVORTAC.*

**FIG 1-1-1**

**Standard High Altitude Service Volume**

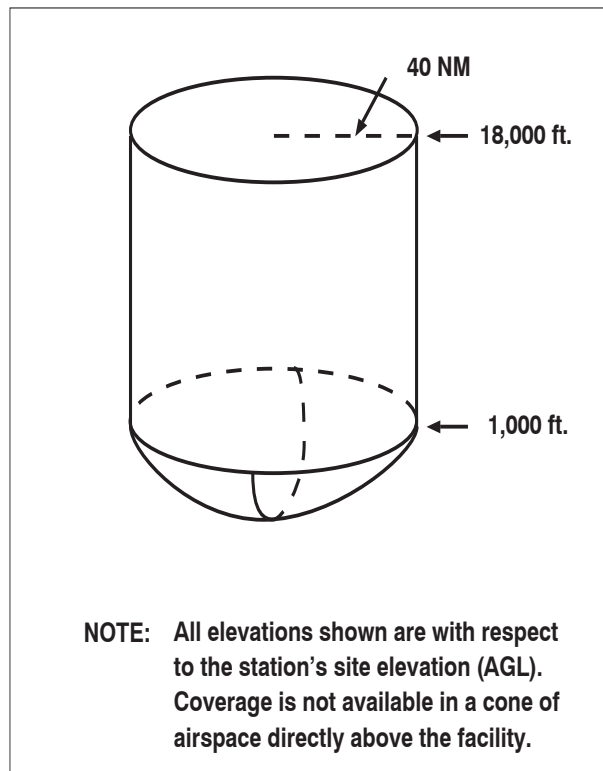
(See FIG 1-1-5 for altitudes below 1,000 feet).



**FIG 1-1-2**

**Standard Low Altitude Service Volume**

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



**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.



continuing the takeoff is unsafe. Contact ATC at the earliest possible opportunity.

**d. Runway Intersection Lights (RIL):** The RIL system is composed of flush mounted, in-pavement, unidirectional light fixtures in a double longitudinal row aligned either side of the runway centerline lighting in the same manner as THLs. Their appearance to a pilot is similar to that of THLs. Fixtures are focused toward the arrival end of the runway, and they extend for 3,000 feet in front of an aircraft that is approaching an intersecting runway. They end at the Land and Hold Short Operation (LAHSO) light bar or the hold short line for the intersecting runway.

#### 1. RIL Operating Characteristics – Departing Aircraft:

RILs will illuminate for an aircraft departing or in position to depart when there is high speed traffic operating on the intersecting runway (see FIG 2-1-9). Note that there must be an aircraft or vehicle in a position to observe the RILs for them to illuminate. Once the conflicting traffic passes through the intersection, the RILs extinguish.

#### 2. RIL Operating Characteristics – Arriving Aircraft:

RILs will illuminate for an aircraft that has landed and is rolling out when there is high speed traffic on the intersecting runway that is  $\pm 5$  seconds of meeting at the intersection. Once the conflicting traffic passes through the intersection, the RILs extinguish.

**3. What a pilot would observe:** A pilot departing or arriving will observe RILs illuminate in reaction to the high speed traffic operation on the intersecting runway. The lights will extinguish when that traffic has passed through the runway intersection.

**4. Whenever a pilot observes the red light of the RIL array,** the pilot will stop before the LAHSO stop bar or the hold line for the intersecting runway. If a departing aircraft is already at high speed in the takeoff roll when the RILs illuminate, it may be impractical to stop for safety reasons. The crew should safely operate according to their best judgment while understanding the illuminated lights indicate that continuing the takeoff is unsafe. Contact ATC at the earliest possible opportunity.

**e. The Final Approach Runway Occupancy Signal (FAROS)** is communicated by flashing of the Precision Approach Path Indicator (PAPI) (see FIG 2-1-9). When activated, the light fixtures of the PAPI flash or pulse to indicate to the pilot on an approach that the runway is occupied and that it may be unsafe to land.

#### **NOTE–**

*FAROS is an independent automatic alerting system that does not rely on ATC control or input.*

#### 1. FAROS Operating Characteristics:

If an aircraft or surface vehicle occupies a FAROS equipped runway, the PAPI(s) on that runway will flash. The glide path indication will not be affected, and the allotment of red and white PAPI lights observed by the pilot on approach will not change. The FAROS system will flash the PAPI when traffic enters the runway and there is an aircraft on approach and within 1.5 nautical miles of the landing threshold.

**2. What a pilot would observe:** A pilot on approach to the runway will observe the PAPI flash if there is traffic on the runway and will notice the PAPI ceases to flash when the traffic moves outside the hold short lines for the runway.

**3. When a pilot observes a flashing PAPI at 500 feet above ground level (AGL),** the contact height, the pilot must look for and acquire the traffic on the runway. At 300 feet AGL, the pilot must contact ATC for resolution if the FAROS indication is in conflict with the clearance. If the PAPI continues to flash, the pilot must execute an immediate “go around” and contact ATC at the earliest possible opportunity.

#### **f. Pilot Actions:**

**1. When operating at airports with RWSL,** pilots will operate with the transponder/ADS-B “On” when departing the gate or parking area until it is shut down upon arrival at the gate or parking area. This ensures interaction with the FAA surveillance systems such as ASDE-X/Airport Surface Surveillance Capability (ASSC) which provide information to the RWSL system.

**2. Pilots must always inform the ATCT** when they have either stopped, are verifying a landing clearance, or are executing a go-around due to RWSL or FAROS indication that are in conflict with ATC instructions. Pilots must request clarification of the taxi, takeoff, or landing clearance.

3. Never cross over illuminated red lights. Under normal circumstances, RWSL will confirm the pilot's taxi or takeoff clearance previously issued by ATC. If RWSL indicates that it is unsafe to takeoff from, land on, cross, or enter a runway, immediately notify ATC of the conflict and re-confirm the clearance.

4. Do not proceed when lights have extinguished without an ATC clearance. RWSL verifies an ATC clearance; it does not substitute for an ATC clearance.

5. Never land if PAPI continues to flash. Execute a go around and notify ATC.

**g. ATC Control of RWSL System:**

1. Controllers can set in-pavement lights to one of five (5) brightness levels to assure maximum conspicuity under all visibility and lighting conditions. REL, THL, and RIL subsystems may be independently set.

2. System lights can be disabled should RWSL operations impact the efficient movement of air traffic or contribute, in the opinion of the assigned ATC Manager, to unsafe operations. REL, THL, RIL, and FAROS light fixtures may be disabled separately. Disabling of the FAROS subsystem does not extinguish PAPI lights or impact its glide path function. Whenever the system or a component is disabled, a NOTAM must be issued, and the

Automatic Terminal Information System (ATIS) must be updated.

## 2-1-7. Stand-Alone Final Approach Runway Occupancy Signal (FAROS)

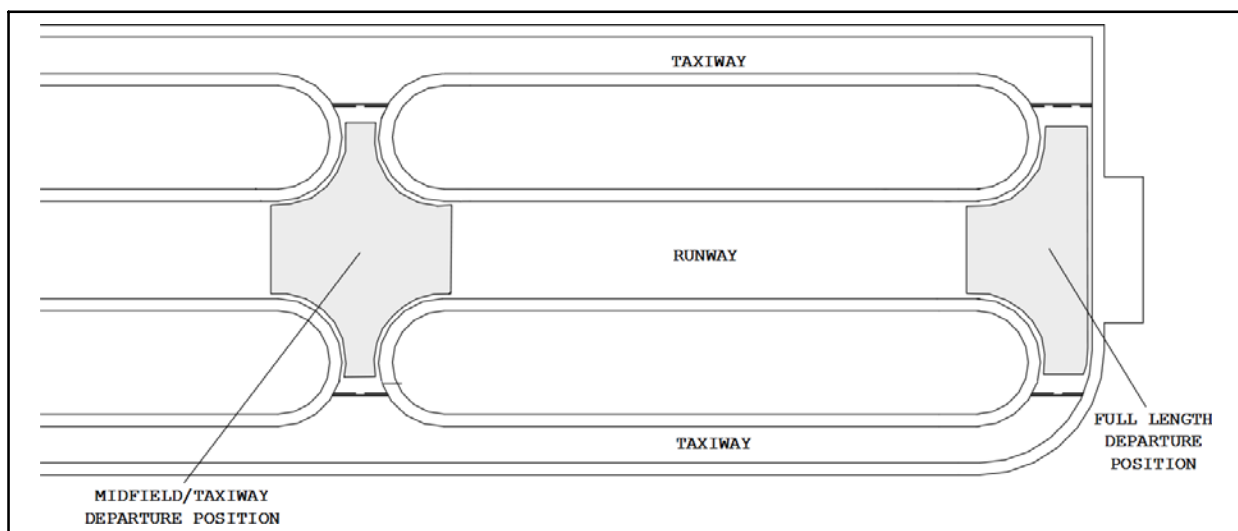
### a. Introduction:

The stand-alone FAROS system is a fully automated system that provides runway occupancy status to pilots on final approach to indicate whether it may be unsafe to land. When an aircraft or vehicle is detected on the runway, the Precision Approach Path Indicator (PAPI) light fixtures flash as a signal to indicate that the runway is occupied and that it may be unsafe to land. The stand-alone FAROS system is activated by localized or comprehensive sensors detecting aircraft or ground vehicles occupying activation zones.

The stand-alone FAROS system monitors specific areas of the runway, called activation zones, to determine the presence of aircraft or ground vehicles in the zone (see FIG 2-1-10). These activation zones are defined as areas on the runway that are frequently occupied by ground traffic during normal airport operations and could present a hazard to landing aircraft. Activation zones may include the full-length departure position, the midfield departure position, or the entire runway.

Pilots can refer to the airport specific FAROS pilot information sheet for activation zone configuration.

**FIG 2-1-10  
FAROS Activation Zones**



Clearance to land on a runway must be issued by Air Traffic Control (ATC). ATC personnel have limited

control over the system and may not be able to view the FAROS signal.

(b) The pilot-in-command holds a recreational pilot certificate and has met the requirements of 14 CFR Section 61.101; or

(c) The pilot-in-command holds a sport pilot certificate and has met the requirements of 14 CFR Section 61.325; or

(d) The aircraft is operated by a student pilot:

(1) Who seeks a private pilot certificate and has met the requirements of 14 CFR Section 61.95.

(2) Who seeks a recreational pilot or sport pilot certificate and has met the requirements of 14 CFR Section 61.94.

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 capability and operable ADS-B Out 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. A request for a deviation from the ADS-B equipage requirement must be submitted using the FAA's automated web authorization tool at least one hour but not more than 24 hours before the proposed operation.*

#### **REFERENCE—**

*AIM, Paragraph 4-1-20, Transponder and ADS-B Out Operation  
AC 90-114, Automatic Dependent Surveillance—Broadcast Operations*

**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 an operable radar beacon transponder with automatic altitude reporting capability and operable ADS-B Out equipment.

However, aircraft that were not originally certificated with an engine-driven electrical system or that have 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

## Section 4. Special Use Airspace

### 3-4-1. General

**a.** Special use airspace (SUA) consists of that airspace wherein activities must be confined because of their nature, or wherein limitations are imposed upon aircraft operations that are not a part of those activities, or both. SUA areas are depicted on aeronautical charts, except for controlled firing areas (CFA), temporary military operations areas (MOA), and temporary restricted areas.

**b.** Prohibited and restricted areas are regulatory special use airspace and are established in 14 CFR Part 73 through the rulemaking process.

**c.** Warning areas, MOAs, alert areas, CFAs, and national security areas (NSA) are nonregulatory special use airspace.

**d.** Special use airspace descriptions (except CFAs) are contained in FAA Order JO 7400.8, Special Use Airspace.

**e.** Permanent SUA (except CFAs) is charted on Sectional Aeronautical, VFR Terminal Area, and applicable En Route charts, and include the hours of operation, altitudes, and the controlling agency.

#### **NOTE—**

*For temporary restricted areas and temporary MOAs, pilots should review the Domestic Notices found on the Federal NOTAM System (FNS) NOTAM Search website under External Links or the Air Traffic Plans and Publications website, the FAA SUA website, and/or contact the appropriate overlying ATC facility to determine the effect of non-depicted SUA areas along their routes of flight.*

### 3-4-2. Prohibited Areas

Prohibited areas contain airspace of defined dimensions identified by an area on the surface of the earth within which the flight of aircraft is prohibited. Such areas are established for security or other reasons associated with the national welfare. These areas are published in the Federal Register and are depicted on aeronautical charts.

### 3-4-3. Restricted Areas

**a.** Restricted areas contain airspace identified by an area on the surface of the earth within which the flight of aircraft, while not wholly prohibited, is subject to restrictions. Activities within these areas must be confined because of their nature or limitations imposed upon aircraft operations that are not a part of those activities or both. Restricted areas denote the existence of unusual, often invisible, hazards to aircraft such as artillery firing, aerial gunnery, or guided missiles. Penetration of restricted areas without authorization from the using or controlling agency may be extremely hazardous to the aircraft and its occupants. Restricted areas are published in the Federal Register and constitute 14 CFR Part 73.

**b.** ATC facilities apply the following procedures when aircraft are operating on an IFR clearance (including those cleared by ATC to maintain VFR-on-top) via a route which lies within joint-use restricted airspace.

**1.** If the restricted area is not active and has been released to the controlling agency (FAA), the ATC facility will allow the aircraft to operate in the restricted airspace without issuing specific clearance for it to do so.

**2.** If the restricted area is active and has not been released to the controlling agency (FAA), the ATC facility will issue a clearance which will ensure the aircraft avoids the restricted airspace unless it is on an approved altitude reservation mission or has obtained its own permission to operate in the airspace and so informs the controlling facility.

#### **NOTE—**

*The above apply only to joint-use restricted airspace and not to prohibited and nonjoint-use airspace. For the latter categories, the ATC facility will issue a clearance so the aircraft will avoid the restricted airspace unless it is on an approved altitude reservation mission or has obtained its own permission to operate in the airspace and so informs the controlling facility.*

**c.** Permanent restricted areas are charted on Sectional Aeronautical, VFR Terminal Area, and the appropriate En Route charts.

**NOTE—**

*Temporary restricted areas are not charted.*

**3-4-4. Warning Areas**

A warning area is airspace of defined dimensions, extending from three nautical miles outward from the coast of the U.S., that contains activity that may be hazardous to nonparticipating aircraft. The purpose of such warning areas is to warn nonparticipating pilots of the potential danger. A warning area may be located over domestic or international waters or both.

**3-4-5. Military Operations Areas**

a. MOAs consist of airspace of defined vertical and lateral limits established for the purpose of separating certain military training activities from IFR traffic. Whenever a MOA is being used, nonparticipating IFR traffic may be cleared through a MOA if IFR separation can be provided by ATC. Otherwise, ATC will reroute or restrict nonparticipating IFR traffic.

b. Examples of activities conducted in MOAs include, but are not limited to: air combat tactics, air intercepts, aerobatics, formation training, and low-altitude tactics. Military pilots flying in an active MOA are exempted from the provisions of 14 CFR Section 91.303(c) and (d) which prohibits aerobatic flight within Class D and Class E surface areas, and within Federal airways. Additionally, the Department of Defense has been issued an authorization to operate aircraft at indicated airspeeds in excess of 250 knots below 10,000 feet MSL within active MOAs.

c. Pilots operating under VFR should exercise extreme caution while flying within a MOA when military activity is being conducted. The activity status (active/inactive) of MOAs may change frequently. Therefore, pilots should contact any FSS within 100 miles of the area to obtain accurate real-time information concerning the MOA hours of operation. Prior to entering an active MOA, pilots should contact the controlling agency for traffic advisories.

d. Permanent MOAs are charted on Sectional Aeronautical, VFR Terminal Area, and the appropriate En Route Low Altitude charts.

**NOTE—**

*Temporary MOAs are not charted.*

**3-4-6. Alert Areas**

Alert areas are depicted on aeronautical charts to inform nonparticipating pilots of areas that may contain a high volume of pilot training or an unusual type of aerial activity. Pilots should be particularly alert when flying in these areas. All activity within an alert area must be conducted in accordance with CFRs, without waiver, and pilots of participating aircraft as well as pilots transiting the area must be equally responsible for collision avoidance.

**3-4-7. Controlled Firing Areas**

CFAs contain activities which, if not conducted in a controlled environment, could be hazardous to nonparticipating aircraft. The distinguishing feature of the CFA, as compared to other special use airspace, is that its activities are suspended immediately when spotter aircraft, radar, or ground lookout positions indicate an aircraft might be approaching the area. There is no need to chart CFAs since they do not cause a nonparticipating aircraft to change its flight path.

**3-4-8. National Security Areas**

NSAs consist of airspace of defined vertical and lateral dimensions established at locations where there is a requirement for increased security and safety of ground facilities. Pilots are requested to voluntarily avoid flying through the depicted NSA. When it is necessary to provide a greater level of security and safety, flight in NSAs may be temporarily prohibited by regulation under the provisions of 14 CFR Section 99.7. Regulatory prohibitions will be issued by System Operations Security and disseminated via NOTAM. Inquiries about NSAs should be directed to System Operations Security.

**REFERENCE—**

*AIM, Para 5-6-1, National Security*

**3-4-9. Obtaining Special Use Airspace Status**

a. Pilots can request the status of SUA by contacting the using or controlling agency. The frequency for the controlling agency is tabulated in the margins of the applicable IFR and VFR charts.

b. An airspace NOTAM will be issued for SUA when the SUA airspace (permanent and/or temporary) requires a NOTAM for activation. Pilots should check ARTCC NOTAMs for airspace activation.

**c. Special Use Airspace Information Service (SUAIS) (Alaska Only).** The SUAIS is a 24-hour service operated by the military that provides civilian pilots, flying VFR, with information regarding military flight operations in certain MOAs and restricted airspace within central Alaska. The service provides “near real time” information on military flight activity in the interior Alaska MOA and Restricted Area complex. SUAIS also provides

information on artillery firing, known helicopter operations, and unmanned aerial vehicle operations. Pilots flying VFR are encouraged to use SUAIS. See the Alaska Chart Supplement for hours of operation, phone numbers, and radio frequencies.

**d. Special use airspace scheduling data for preflight planning** is available via the FAA SUA website.





### 3-5-6. Terminal Radar Service Area (TRSA)

**a. Background.** TRSAs were originally established as part of the Terminal Radar Program at selected airports. TRSAs were never controlled airspace from a regulatory standpoint because the establishment of TRSAs was never subject to the rulemaking process; consequently, TRSAs are not contained in 14 CFR Part 71 nor are there any TRSA operating rules in 14 CFR Part 91. Part of the Airport Radar Service Area (ARSA) program was to eventually replace all TRSAs. However, the ARSA requirements became relatively stringent and it was subsequently decided that TRSAs would have to meet ARSA criteria before they would be converted. TRSAs do not fit into any of the U.S. airspace classes; therefore, they will continue to be non-Part 71 airspace areas where participating pilots can receive additional radar services which have been redefined as TRSA Service.

**b. TRSAs.** The primary airport(s) within the TRSA become(s) Class D airspace. The remaining portion of the TRSA overlies other controlled airspace which is normally Class E airspace beginning at 700 or 1,200 feet and established to transition to/from the en route/terminal environment.

**c. Participation.** Pilots operating under VFR are encouraged to contact the radar approach control and avail themselves of the TRSA Services. However, participation is voluntary on the part of the pilot. See Chapter 4, Air Traffic Control, for details and procedures.

**d. Charts.** TRSAs are depicted on VFR sectional and terminal area charts with a solid black line and altitudes for each segment. The Class D portion is charted with a blue segmented line.

### 3-5-7. Special Air Traffic Rules (SATR) and Special Flight Rules Area (SFRA)

**a. Background.** The Code of Federal Regulations (CFR) prescribes special air traffic rules for aircraft operating within the boundaries of certain designated airspace. These areas are listed in 14 CFR Part 93 and can be found throughout the NAS. Procedures, nature of operations, configuration, size, and density of traffic vary among the identified areas.

**b. SFRAs.** Airspace of defined dimensions, above land areas or territorial waters, within which the flight of aircraft is subject to the rules set forth in 14 CFR

Part 93, unless otherwise authorized by air traffic control. Not all areas listed in 14 CFR Part 93 are designated SFRA, but special air traffic rules apply to all areas described in 14 CFR Part 93.

#### REFERENCE-

14 CFR Part 93, Special Air Traffic Rules

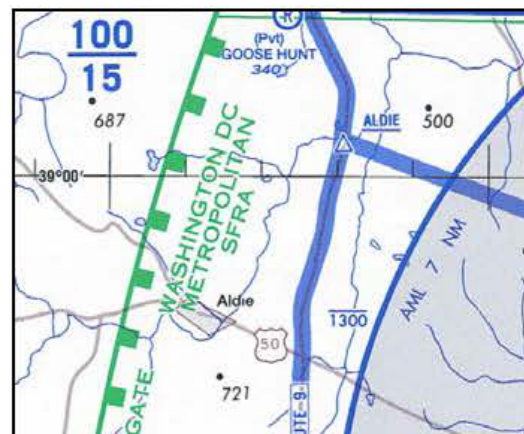
FAA Order JO 7110.65, Para 9-2-10, Special Air Traffic Rules (SATR) and Special Flight Rules Area (SFRA)

PCG - Special Air Traffic Rules (SATR)

**c. Participation.** Each person operating an aircraft to, from, or within airspace designated as a SATR area or SFRA must adhere to the special air traffic rules set forth in 14 CFR Part 93, as applicable, unless otherwise authorized or required by ATC.

**d. Charts.** SFRAs are depicted on VFR sectional, terminal area, and helicopter route charts. (See FIG 3-5-4.)

FIG 3-5-4  
SFRA Boundary



**e.** Additional information and resources regarding SFRA, including procedures for flight in individual areas, may be found on the FAA Safety website at [www.faasafety.gov](http://www.faasafety.gov).

### 3-5-8. Weather Reconnaissance Area (WRA)

**a. General.** Hurricane Hunters from the United States Air Force Reserve 53<sup>rd</sup> Weather Reconnaissance Squadron (WRS) and the National Oceanic and Atmospheric Administration (NOAA) Aircraft Operations Center (AOC) operate weather reconnaissance/research aircraft missions, in support of the National Hurricane Operations Plan (NHOP), to gather meteorological data on hurricanes and tropical cyclones. 53<sup>rd</sup> WRS and NOAA AOC aircraft normally conduct these missions in airspace

identified in a published WRA Notice to Airmen (NOTAM).

**b. WRAs.** Airspace with defined dimensions and published by a NOTAM, which is established to support weather reconnaissance/research flights. ATC services are not provided within WRAs. Only participating weather reconnaissance/research aircraft from the 53<sup>rd</sup> WRS and NOAA AOC are permitted to operate within a WRA. A WRA may only be established in airspace within U. S. Flight Information Regions (FIR) outside of U. S. territorial airspace.

**c.** A published WRA NOTAM describes the airspace dimensions of the WRA and the expected activities within the WRA. WRAs may border adjacent foreign FIRs, but are wholly contained within U.S. FIRs. As ATC services are not provided within a WRA, non-participating aircraft should avoid WRAs, and IFR aircraft should expect to be rerouted to avoid WRAs.

### **3-5-9. Other Non-Charted Airspace Areas**

**a. Stationary or Moving Altitude Reservation (ALTRV).** A Stationary or Moving ALTRV is announced via an airspace NOTAM issued by the Central Altitude Reservation Facility (CARF) or ARTCC. These announcements will appear in CARF and/or ARTCC NOTAMS. This airspace ensures non-participating IFR aircraft remain separated from special activity. Non-participating VFR aircraft are permitted to fly through the area but should exercise vigilance.

**b. 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. ATCAA locations and scheduled activation information can be found on the FAA SUA website; a NOTAM will not be issued to announce the activation of this airspace.

2. At times, a controller/specialist may be working a sector with multiple frequency assignments. In order to eliminate unnecessary verbiage and to free the controller/specialist for higher priority transmissions, the controller/specialist may request the pilot “(Identification), change to my frequency 123.4.” This phrase should alert the pilot that the controller/specialist is only changing frequencies, not controller/specialist, and that initial callup phraseology may be abbreviated.

**EXAMPLE–**

*“United Two Twenty–Two on one two three point four” or “one two three point four, United Two Twenty–Two.”*

**e. Compliance with Frequency Changes.**

When instructed by ATC to change frequencies, select the new frequency as soon as possible unless instructed to make the change at a specific time, fix, or altitude. A delay in making the change could result in an untimely receipt of important information. If you are instructed to make the frequency change at a specific time, fix, or altitude, monitor the frequency you are on until reaching the specified time, fix, or altitudes unless instructed otherwise by ATC.

**REFERENCE–**

*AIM, Paragraph 5–3–1, ARTCC Communications*

## 4–2–4. Aircraft Call Signs

**a. Precautions in the Use of Call Signs.**

1. Improper use of call signs can result in pilots executing a clearance intended for another aircraft. Call signs should *never be abbreviated on an initial contact or at any time when other aircraft call signs have similar numbers/sounds or identical letters/number*; e.g., Cessna 6132F, Cessna 1622F, Baron 123F, Cherokee 7732F, etc.

**EXAMPLE–**

*Assume that a controller issues an approach clearance to an aircraft at the bottom of a holding stack and an aircraft with a similar call sign (at the top of the stack) acknowledges the clearance with the last two or three numbers of the aircraft’s call sign. If the aircraft at the bottom of the stack did not hear the clearance and intervene, flight safety would be affected, and there would be no reason for either the controller or pilot to suspect that anything is wrong. This kind of “human factors” error can strike swiftly and is extremely difficult to rectify.*

2. Pilots, therefore, must be certain that aircraft identification is complete and clearly identified

before taking action on an ATC clearance. ATC specialists will not abbreviate call signs of air carrier or other civil aircraft having authorized call signs. ATC specialists may initiate abbreviated call signs of other aircraft by using the *prefix and the last three digits/letters* of the aircraft identification after communications are established. The pilot may use the abbreviated call sign in subsequent contacts with the ATC specialist. When aware of similar/identical call signs, ATC specialists will take action to minimize errors by emphasizing certain numbers/letters, by repeating the entire call sign, by repeating the prefix, or by asking pilots to use a different call sign temporarily. Pilots should use the phrase “VERIFY CLEARANCE FOR (your complete call sign)” if doubt exists concerning proper identity.

3. Civil aircraft pilots should state the aircraft type, model or manufacturer’s name, followed by the digits/letters of the registration number. When the aircraft manufacturer’s name or model is stated, the prefix “N” is dropped; e.g., Aztec Two Four Six Four Alpha.

**EXAMPLE–**

1. *Bonanza Six Five Five Golf.*

2. *Breezy Six One Three Romeo Experimental (omit “Experimental” after initial contact).*

4. Air Taxi or other commercial operators *not* having FAA authorized call signs should prefix their normal identification with the phonetic word “Tango.”

**EXAMPLE–**

*Tango Aztec Two Four Six Four Alpha.*

5. Air carriers and commuter air carriers having FAA authorized call signs should identify themselves by stating the complete call sign (using group form for the numbers) and the word “super” or “heavy” if appropriate.

**EXAMPLE–**

1. *United Twenty–Five Heavy.*

2. *Midwest Commuter Seven Eleven.*

6. Military aircraft use a variety of systems including serial numbers, word call signs, and combinations of letters/numbers. Examples include Army Copter 48931; Air Force 61782; REACH 31792; Pat 157; Air Evac 17652; Navy Golf Alfa Kilo 21; Marine 4 Charlie 36, etc.

## b. Air Ambulance Flights.

Because of the priority afforded air ambulance flights in the ATC system, extreme discretion is necessary when using the term “MEDEVAC.” It is only intended for those missions of an urgent medical nature and to be utilized only for that portion of the flight requiring priority handling. It is important for ATC to be aware of a flight’s MEDEVAC status, and it is the pilot’s responsibility to ensure that this information is provided to ATC.

1. To receive priority handling from ATC, the pilot must verbally identify the flight in radio transmissions by stating “MEDEVAC” followed by the FAA authorized call sign (ICAO 3LD, US Special, or local) or the aircraft civil “N” registration numbers/letters.

### EXAMPLE–

*If the aircraft identification of the flight indicates DAL51, the pilot states “MEDEVAC Delta Fifty One.”*

*If the aircraft identification of the flight indicates MDSTR1, the pilot states “MEDEVAC Medstar One.”*

*If the aircraft identification of the flight indicates N123G or LN123G, the pilot states “MEDEVAC One Two Three Golf”.*

2. If requested by the pilot, ATC will provide additional assistance (e.g., landline notifications) to expedite ground handling of patients, vital organs, or urgently needed medical materials. When possible make these requests to ATC via methods other than through ATC radio frequencies.

3. MEDEVAC flights may include:

(a) Civilian air ambulance flights responding to medical emergencies (e.g., first call to an accident scene, carrying patients, organ donors, organs, or other urgently needed lifesaving medical material).

(b) Air carrier and air taxi flights responding to medical emergencies. The nature of these medical emergency flights usually concerns the transportation of urgently needed lifesaving medical materials or vital organs, but can include inflight medical emergencies. It is imperative that the company/pilot determine, by the nature/urgency of the specific medical cargo, if priority ATC assistance is required.

4. When filing a flight plan, pilots may include “L” for MEDEVAC with the aircraft registration letters/digits and/or include “MEDEVAC” in Item 11

(Remarks) of the flight plan or Item 18 (Other Information) of an international flight plan. However, ATC will only use these flight plan entries for informational purposes or as a visual indicator. ATC will only provide priority handling when the pilot verbally identifies the “MEDEVAC” status of the flight as described in subparagraph b1 above.

### NOTE–

*Civilian air ambulance aircraft operating VFR and without a filed flight plan are eligible for priority handling in accordance with subparagraph b1 above.*

### REFERENCE–

*AIM, Para 5–1–8, Flight Plan (FAA Form 7233–1)– Domestic Flights*

*AIM, Para 5–1–9, International Flight Plan (FAA Form 7233–4)– IFR Flights (For Domestic or International Flights)*

5. ATC will also provide priority handling to HOSP and AIR EVAC flights when verbally requested. These aircraft may file “HOSP” or “AIR EVAC” in either Item 11 (Remarks) of the flight plan or Item 18 of an international flight plan. For aircraft identification in radio transmissions, civilian pilots will use normal call signs when filing “HOSP” and military pilots will use the “EVAC” call sign.

## c. Student Pilots Radio Identification.

1. The FAA desires to help student pilots in acquiring sufficient practical experience in the environment in which they will be required to operate. To receive additional assistance while operating in areas of concentrated air traffic, student pilots need only identify themselves as a student pilot during their initial call to an FAA radio facility.

### EXAMPLE–

*Dayton tower, Fleetwing One Two Three Four, student pilot.*

2. This special identification will alert FAA ATC personnel and enable them to provide student pilots with such extra assistance and consideration as they may need. It is recommended that student pilots identify themselves as such, on initial contact with each clearance delivery prior to taxiing, ground control, tower, approach and departure control frequency, or FSS contact.

## 4–2–5. Description of Interchange or Leased Aircraft

a. Controllers issue traffic information based on familiarity with airline equipment and color/markings. When an air carrier dispatches a flight using another company’s equipment and the pilot

markings. When an air carrier dispatches a flight using another company's equipment and the pilot does not advise the terminal ATC facility, the possible confusion in aircraft identification can compromise safety.

**b.** Pilots flying an “interchange” or “leased” aircraft not bearing the colors/markings of the company operating the aircraft should inform the terminal ATC facility on first contact the name of the operating company and trip number, followed by the company name as displayed on the aircraft, and aircraft type.

**EXAMPLE–**

*Air Cal Three Eleven, United (interchange/lease), Boeing Seven Two Seven.*

#### 4–2–6. Ground Station Call Signs

Pilots, when calling a ground station, should begin with the name of the facility being called followed by the type of the facility being called as indicated in TBL 4–2–1.

**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

#### 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/departure (*Runway XX APPCH/Runway XX DEP*) hold 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.

10. 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 7-4-1, 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, runway two seven, 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.”

e. During ground operations, jet blast, prop wash, and rotor wash can cause damage and upsets if encountered at close range. Pilots should consider the effects of jet blast, prop wash, and rotor wash on aircraft, vehicles, and maintenance equipment during ground operations.

#### 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



altitude encoder malfunctions, as TIS has no mechanism to determine if client altitude reporting is correct. A failure of this nature will cause erroneous and possibly unpredictable TIS operation. If this malfunction is suspected, confirmation of altitude reporting with ATC is suggested.

**(c) Intruder Altitude Reporting.** Intruders without altitude reporting capability will be displayed without the accompanying altitude tag. Additionally, nonaltitude reporting intruders are assumed to be at the same altitude as the TIS client for alert computations. This helps to ensure that the pilot will be alerted to all traffic under radar coverage, but the actual altitude difference may be substantial. Therefore, visual acquisition may be difficult in this instance.

**(d) Coverage Limitations.** Since TIS is provided by ground-based, secondary surveillance radar, it is subject to all limitations of that radar. If an aircraft is not detected by the radar, it cannot be displayed on TIS. Examples of these limitations are as follows:

**(1)** TIS will typically be provided within 55 NM of the radars depicted in FIG 4-5-5, Terminal Mode S Radar Sites. This maximum range can vary by radar site and is always subject to “line of sight” limitations; the radar and data link signals will be blocked by obstructions, terrain, and curvature of the earth.

**(2)** TIS will be unavailable at low altitudes in many areas of the country, particularly in mountainous regions. Also, when flying near the “floor” of radar coverage in a particular area, intruders below the client aircraft may not be detected by TIS.

**(3)** TIS will be temporarily disrupted when flying directly over the radar site providing coverage if no adjacent site assumes the service. A ground-based radar, similar to a VOR or NDB, has a zenith cone, sometimes referred to as the cone of confusion or cone of silence. This is the area of ambiguity directly above the station where bearing information is unreliable. The zenith cone setting for TIS is 34 degrees: Any aircraft above that angle with respect to the radar horizon will lose TIS coverage from that radar until it is below this 34 degree angle. The aircraft may not actually lose service in areas of multiple radar coverage since an adjacent radar will

provide TIS. If no other TIS-capable radar is available, the “Good-bye” message will be received and TIS terminated until coverage is resumed.

**(e) Intermittent Operations.** TIS operation may be intermittent during turns or other maneuvering, particularly if the transponder system does not include antenna diversity (antenna mounted on the top and bottom of the aircraft). As in (d) above, TIS is dependent on two-way, “line of sight” communications between the aircraft and the Mode S radar. Whenever the structure of the client aircraft comes between the transponder antenna (usually located on the underside of the aircraft) and the ground-based radar antenna, the signal may be temporarily interrupted.

**(f) TIS Predictive Algorithm.** TIS information is collected one radar scan prior to the scan during which the uplink occurs. Therefore, the surveillance information is approximately 5 seconds old. In order to present the intruders in a “real time” position, TIS uses a “predictive algorithm” in its tracking software. This algorithm uses track history data to extrapolate intruders to their expected positions consistent with the time of display in the cockpit. Occasionally, aircraft maneuvering will cause this algorithm to induce errors in the TIS display. These errors primarily affect relative bearing information; intruder distance and altitude will remain relatively accurate and may be used to assist in “see and avoid.” Some of the more common examples of these errors are as follows:

**(1)** When client or intruder aircraft maneuver excessively or abruptly, the tracking algorithm will report incorrect horizontal position until the maneuvering aircraft stabilizes.

**(2)** When a rapidly closing intruder is on a course that crosses the client at a shallow angle (either overtaking or head on) and either aircraft abruptly changes course within  $\frac{1}{4}$  NM, TIS will display the intruder on the opposite side of the client than it actually is.

These are relatively rare occurrences and will be corrected in a few radar scans once the course has stabilized.

**(g) Heading/Course Reference.** Not all TIS aircraft installations will have onboard heading reference information. In these installations, aircraft course reference to the TIS display is provided by the Mode S radar. The radar only determines ground

track information and has no indication of the client aircraft heading. In these installations, all intruder bearing information is referenced to ground track and does not account for wind correction. Additionally, since ground-based radar will require several scans to determine aircraft course following a course change, a lag in TIS display orientation (intruder aircraft bearing) will occur. As in (f) above, intruder distance and altitude are still usable.

#### (h) Closely-Spaced Intruder Errors.

When operating more than 30 NM from the Mode S sensor, TIS forces any intruder within 3/8 NM of the TIS client to appear at the same horizontal position as the client aircraft. Without this feature, TIS could display intruders in a manner confusing to the pilot in critical situations (for example, a closely-spaced intruder that is actually to the right of the client may appear on the TIS display to the left). At longer distances from the radar, TIS cannot accurately determine relative bearing/distance information on intruder aircraft that are in close proximity to the client.

Because TIS uses a ground-based, rotating radar for surveillance information, the accuracy of TIS data is dependent on the distance from the sensor (radar) providing the service. This is much the same phenomenon as experienced with ground-based navigational aids, such as a VOR. As distance from the radar increases, the accuracy of surveillance decreases. Since TIS does not inform the pilot of distance from the Mode S radar, the pilot must assume that any intruder appearing at the same position as the client aircraft may actually be up to 3/8 NM away in any direction. Consistent with the operation of TIS, an alert on the display (regardless of distance from the radar) should stimulate an outside visual scan, intruder acquisition, and traffic avoidance based on outside reference.

#### e. Reports of TIS Malfunctions.

1. Users of TIS can render valuable assistance in the early correction of malfunctions by reporting their observations of undesirable performance. Reporters should identify the time of observation, location, type and identity of aircraft, and describe the condition observed; the type of transponder processor, and software in use can also be useful information. Since TIS performance is monitored by maintenance personnel rather than ATC, it is suggested that

malfunctions be reported by radio or telephone to the nearest Flight Service Station (FSS) facility.

#### NOTE—

*TIS operates at only those terminal Mode S radar sites depicted in FIG 4-5-5. Though similar in some ways, TIS is not related to TIS-B (Traffic Information Service-Broadcast).*

### 4-5-7. Automatic Dependent Surveillance-Broadcast (ADS-B) Services

#### a. Introduction.

1. Automatic Dependent Surveillance-Broadcast (ADS-B) is a surveillance technology deployed throughout the NAS (see FIG 4-5-7). The ADS-B system is composed of aircraft avionics and a ground infrastructure. Onboard avionics determine the position of the aircraft by using the GNSS and transmit its position along with additional information about the aircraft to ground stations for use by ATC and other ADS-B services. This information is transmitted at a rate of approximately once per second. (See FIG 4-5-8 and FIG 4-5-9.)

2. In the United States, ADS-B equipped aircraft exchange information is on one of two frequencies: 978 or 1090 MHz. The 1090 MHz frequency is also associated with Mode A, C, and S transponder operations. 1090 MHz transponders with integrated ADS-B functionality extend the transponder message sets with additional ADS-B information. This additional information is known as an “extended squitter” message and is referred to as 1090ES. ADS-B equipment operating on 978 MHz is known as the Universal Access Transceiver (UAT).

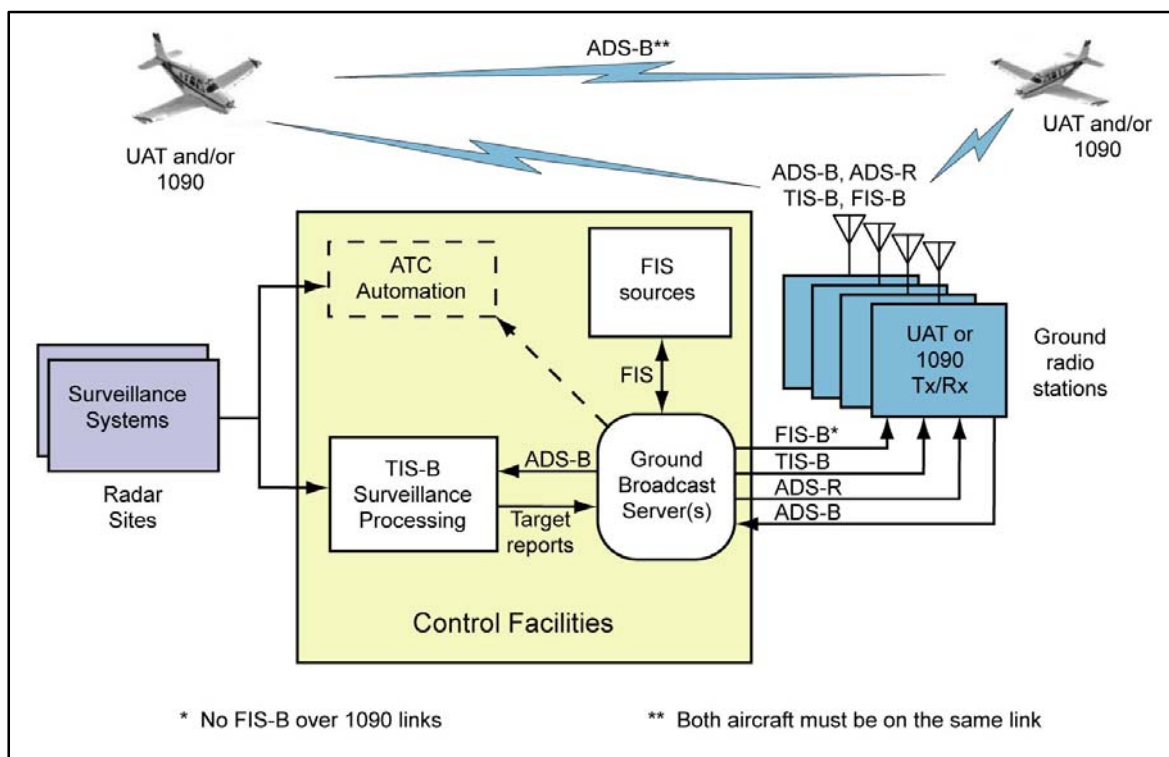
3. ADS-B avionics can have the ability to both transmit and receive information. The transmission of ADS-B information from an aircraft is known as ADS-B Out. The receipt of ADS-B information by an aircraft is known as ADS-B In. All aircraft operating within the airspace defined in 14 CFR § 91.225 are required to transmit the information defined in § 91.227 using ADS-B Out avionics.

4. In general, operators flying at 18,000 feet and above (Class A airspace) are required to have 1090ES equipment. Those that do not fly above 18,000 may use either UAT or 1090ES equipment. (Refer to 14 CFR §§ 91.225 and 91.227.) While the regulations do not require it, operators equipped with ADS-B In will realize additional benefits from ADS-B broadcast

services: Traffic Information Service – Broadcast (TIS-B) (Paragraph 4-5-8) and Flight Information

Service – Broadcast (FIS-B) (Paragraph 4-5-9).

**FIG 4-5-7**  
**ADS-B, TIS-B, and FIS-B:**  
**Broadcast Services Architecture**



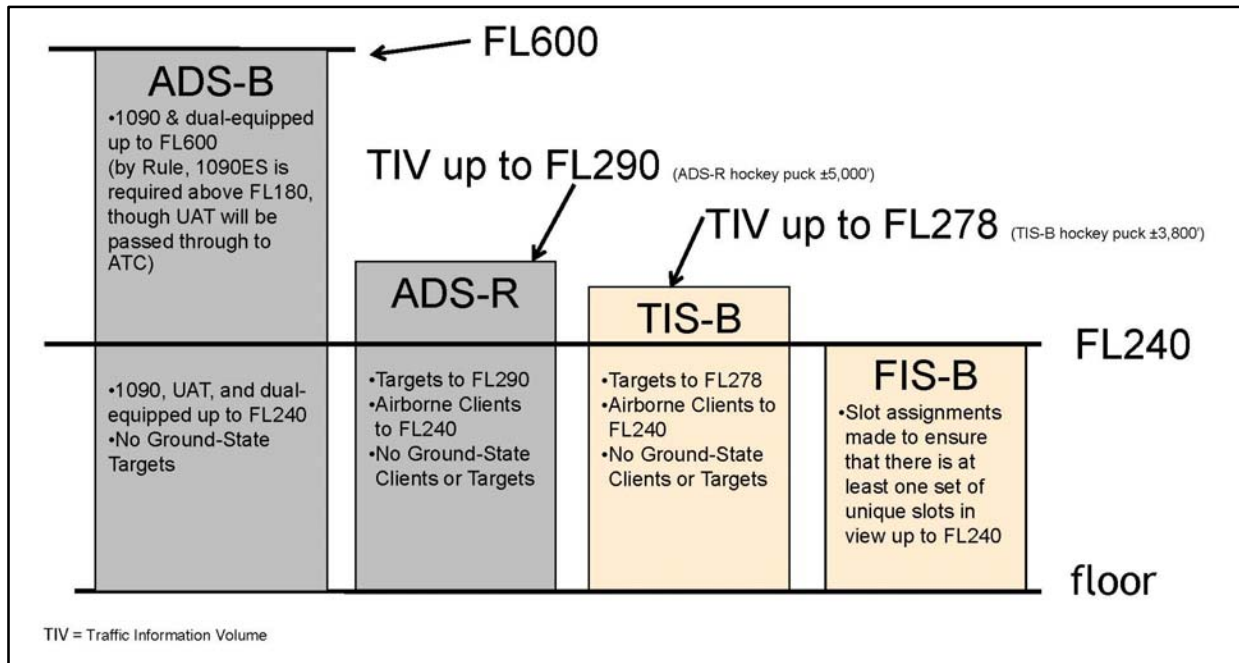
#### **b. ADS-B Certification and Performance Requirements.**

ADS-B equipment may be certified as a surveillance source for air traffic separation services using ADS-B Out. ADS-B equipment may also be certified for use with ADS-B In advisory services that enable appropriately equipped aircraft to display traffic and flight information. Refer to the aircraft's flight manual supplement or Pilot Operating Handbook for the capabilities of a specific aircraft installation.

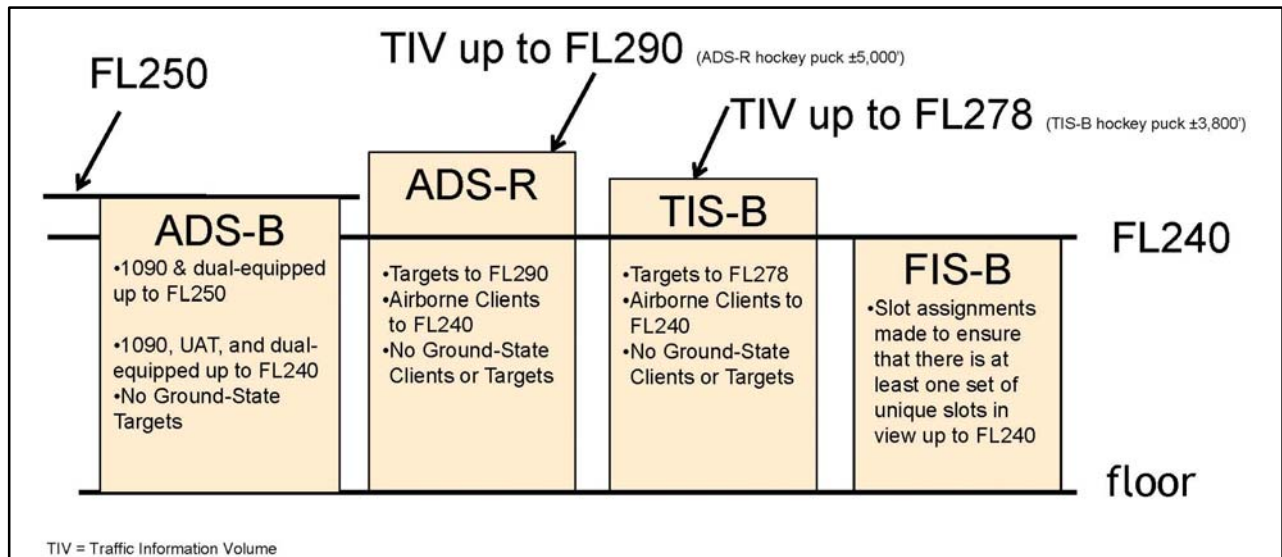
#### **c. ADS-B Capabilities and Procedures.**

1. ADS-B enables improved surveillance services, both air-to-air and air-to-ground, especially in areas where radar is ineffective due to terrain or where it is impractical or cost prohibitive. Initial NAS applications of air-to-air ADS-B are for "advisory" use only, enhancing a pilot's visual acquisition of other nearby equipped aircraft either when airborne or on the airport surface. Additionally, ADS-B will enable ATC and fleet operators to monitor aircraft throughout the available ground station coverage area.

**FIG 4-5-8**  
**En Route – ADS-B/ADS-R/TIS-B/FIS-B Service Ceilings/Floors**



**FIG 4-5-9**  
**Terminal – ADS-B/ADS-R/TIS-B/FIS-B Service Ceilings/Floors**



performance is monitored by maintenance personnel rather than ATC, report malfunctions to the nearest Flight Service Station (FSS) facility by radio or telephone, or by sending an email to the ADS-B help desk at [adsb@faa.gov](mailto:adsb@faa.gov). Reports should include:

1. Condition observed;
2. Date and time of observation;
3. Altitude and location of observation;
4. Type and call sign of the aircraft; and
5. Type and software version of avionics system.

#### **4-5-8. Traffic Information Service-Broadcast (TIS-B)**

##### **a. Introduction**

TIS-B is the broadcast of ATC derived traffic information to ADS-B equipped (1090ES or UAT) aircraft from ground radio stations. The source of this traffic information is derived from ground-based air traffic surveillance sensors. TIS-B service will be available throughout the NAS where there are both adequate surveillance coverage from ground sensors and adequate broadcast coverage from ADS-B ground radio stations. The quality level of traffic information provided by TIS-B is dependent upon the number and type of ground sensors available as TIS-B sources and the timeliness of the reported data. (See FIG 4-5-8 and FIG 4-5-9.)

##### **b. TIS-B Requirements.**

In order to receive TIS-B service, the following conditions must exist:

1. Aircraft must be equipped with an ADS-B transmitter/receiver or transceiver, and a cockpit display of traffic information (CDTI).
2. Aircraft must fly within the coverage volume of a compatible ground radio station that is configured for TIS-B uplinks. (Not all ground radio stations provide TIS-B due to a lack of radar coverage or because a radar feed is not available).
3. Aircraft must be within the coverage of and detected by at least one ATC radar serving the ground radio station in use.

##### **c. TIS-B Capabilities.**

1. TIS-B is intended to provide ADS-B equipped aircraft with a more complete traffic picture in situations where not all nearby aircraft are equipped with ADS-B Out. This advisory-only application is intended to enhance a pilot's visual acquisition of other traffic.

2. Only transponder-equipped targets (i.e., Mode A/C or Mode S transponders) are transmitted through the ATC ground system architecture. Current radar siting may result in limited radar surveillance coverage at lower altitudes near some airports, with subsequently limited TIS-B service volume coverage. If there is no radar coverage in a given area, then there will be no TIS-B coverage in that area.

##### **d. TIS-B Limitations.**

1. TIS-B is NOT intended to be used as a collision avoidance system and does not relieve the pilot's responsibility to "see and avoid" other aircraft, in accordance with 14CFR §91.113b. TIS-B must not be used for avoidance maneuvers during times when there is no visual contact with the intruder aircraft. TIS-B is intended only to assist in the visual acquisition of other aircraft.

##### **NOTE-**

*No aircraft avoidance maneuvers are authorized as a direct result of a TIS-B target being displayed in the cockpit.*

2. While TIS-B is a useful aid to visual traffic avoidance, its inherent system limitations must be understood to ensure proper use.

(a) A pilot may receive an intermittent TIS-B target of themselves, typically when maneuvering (e.g., climbing turns) due to the radar not tracking the aircraft as quickly as ADS-B.

(b) The ADS-B-to-radar association process within the ground system may at times have difficulty correlating an ADS-B report with corresponding radar returns from the same aircraft. When this happens the pilot may see duplicate traffic symbols (i.e., "TIS-B shadows") on the cockpit display.

(c) Updates of TIS-B traffic reports will occur less often than ADS-B traffic updates. TIS-B position updates will occur approximately once every 3-13 seconds depending on the type of radar system in use within the coverage area. In comparison, the update rate for ADS-B is nominally once per second.

(d) The TIS-B system only uplinks data pertaining to transponder-equipped aircraft. Aircraft without a transponder will not be displayed as TIS-B traffic.

(e) There is no indication provided when any aircraft is operating inside or outside the TIS-B service volume, therefore it is difficult to know if one is receiving uplinked TIS-B traffic information.

3. Pilots and operators are reminded that the airborne equipment that displays TIS-B targets is for pilot situational awareness only and is not approved as a collision avoidance tool. Unless there is an imminent emergency requiring immediate action, any deviation from an air traffic control clearance in response to perceived converging traffic appearing on a TIS-B display must be approved by the controlling ATC facility before commencing the maneuver, except as permitted under certain conditions in 14CFR §91.123. Uncoordinated deviations may place an aircraft in close proximity to other aircraft under ATC control not seen on the airborne equipment and may result in a pilot deviation or other incident.

#### **e. Reports of TIS-B Malfunctions.**

Users of TIS-B can provide valuable assistance in the correction of malfunctions by reporting instances of undesirable system performance. Since TIS-B performance is monitored by maintenance personnel rather than ATC, report malfunctions to the nearest Flight Service Station (FSS) facility by radio or telephone, or by sending an email to the ADS-B help desk at [adsb@faa.gov](mailto:adsb@faa.gov). Reports should include:

1. Condition observed;
2. Date and time of observation;
3. Altitude and location of observation;
4. Type and call sign of the aircraft; and
5. Type and software version of avionics system.

### **4-5-9. Flight Information Service–Broadcast (FIS-B)**

#### **a. Introduction.**

FIS-B is a ground broadcast service provided through the ADS-B Services network over the 978 MHz UAT data link. The FAA FIS-B system provides pilots and flight crews of properly equipped aircraft with a cockpit display of certain aviation weather and aeronautical information. FIS-B reception is line-of-sight within the service volume of the ground infrastructure. (See FIG 4-5-8 and FIG 4-5-9.)

#### **b. Weather Products.**

FIS-B does not replace a preflight weather briefing from a source listed in Paragraph 7-1-2, FAA Weather Services, or inflight updates from an FSS or ATC. FIS-B information may be used by the pilot for the safe conduct of flight and aircraft movement; however, the information should not be the only source of weather or aeronautical information. A pilot should be particularly alert and understand the limitations and quality assurance issues associated with individual products. This includes graphical representation of next generation weather radar (NEXRAD) imagery and Notices to Airmen (NOTAM)/temporary flight restrictions (TFR).

#### **REFERENCE–**

AIM, Paragraph 7-1-11, *Flight Information Services*  
Advisory Circular (AC) 00-63, *“Use of Cockpit Displays of Digital Weather and Aeronautical Information”*

#### **c. Reports of FIS-B Malfunctions.**

Users of FIS-B can provide valuable assistance in the correction of malfunctions by reporting instances of undesirable system performance. Since FIS-B performance is monitored by maintenance personnel rather than ATC, report malfunctions to the nearest Flight Service Station (FSS) facility by radio or telephone, or by sending an email to the ADS-B help desk at [adsb@faa.gov](mailto:adsb@faa.gov). Reports should include:

1. Condition observed;
2. Date and time of observation;
3. Altitude and location of observation;
4. Type and call sign of the aircraft; and
5. Type and software version of avionics system.

*TBL 4-5-3*  
**FIS-B Over UAT Product Update and Transmission Intervals**

<b>Product</b>	<b>Update Interval<sup>1</sup></b>	<b>Transmission Interval (95%)<sup>2</sup></b>	<b>Basic Product</b>
AIRMET	As Available	5 minutes	Yes
AWW/WW	As Available, then at 15 minute intervals for 1 hour	5 minutes	No
Ceiling	As Available	10 minutes	No
Convective SIGMET	As Available, then at 15 minute intervals for 1 hour	5 minutes	Yes
D-ATIS	As Available	1 minute	No
Echo Top	5 minutes	5 minutes	No
METAR/SPECI	1 minute (where available), As Available otherwise	5 minutes	Yes
MRMS NEXRAD (CONUS)	2 minutes	15 minutes	Yes
MRMS NEXRAD (Regional)	2 minutes	2.5 minutes	Yes
NOTAMs-D/FDC	As Available	10 minutes	Yes
NOTAMs-TFR	As Available	10 minutes	Yes
PIREP	As Available	10 minutes	Yes
SIGMET	As Available, then at 15 minute intervals for 1 hour	5 minutes	Yes
SUA Status	As Available	10 minutes	Yes
TAF/AMEND	6 Hours (±15 minutes)	10 minutes	Yes
Temperature Aloft	12 Hours (±15 minutes)	10 minutes	Yes
TWIP	As Available	1 minute	No
Winds aloft	12 Hours (±15 minutes)	10 minutes	Yes
Lightning strikes <sup>3</sup>	5 minutes	5 minutes	Yes
Turbulence <sup>3</sup>	1 minute	15 minutes	Yes
Icing, Forecast Potential (FIP) <sup>3</sup>	60 minutes	15 minutes	Yes
Cloud tops <sup>3</sup>	30 minutes	15 minutes	Yes
1 Minute AWOS <sup>3</sup>	1 minute	10 minutes	No
Graphical-AIRMET <sup>3</sup>	As Available	5 minutes	Yes
Center Weather Advisory (CWA) <sup>3</sup>	As Available	10 minutes	Yes
Temporary Restricted Areas (TRA)	As Available	10 minutes	Yes
Temporary Military Operations Areas (TMOA)	As Available	10 minutes	Yes

<sup>1</sup> The Update Interval is the rate at which the product data is available from the source.

<sup>2</sup> The Transmission Interval is the amount of time within which a new or updated product transmission must be completed (95%) and the rate or repetition interval at which the product is rebroadcast (95%).

<sup>3</sup> The transmission and update intervals for the expanded set of basic meteorological products may be adjusted based on FAA and vendor agreement on the final product formats and performance requirements.

**NOTE—**

1. Details concerning the content, format, and symbols of the various data link products provided should be obtained from the specific avionics manufacturer.
2. NOTAM-D and NOTAM-FDC products broadcast via FIS-B are limited to those issued or effective within the past 30 days.

**4-5-10. Automatic Dependent Surveillance-Rebroadcast (ADS-R)****a. Introduction.**

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. (See FIG 4-5-8 and FIG 4-5-9.)

**b. Reports of ADS-R Malfunctions.**

Users of ADS-R can provide valuable assistance in the correction of malfunctions by reporting instances of undesirable system performance. Since ADS-R performance is monitored by maintenance personnel rather than ATC, report malfunctions to the nearest Flight Service Station (FSS) facility by radio or telephone, or by sending an email to the ADS-B help desk at [adsb@faa.gov](mailto:adsb@faa.gov). Reports should include:

1. Condition observed;
2. Date and time of observation;
3. Altitude and location of observation;
4. Type and call sign of the aircraft and;
5. Type and software version of avionics system.



# 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 or radio when airborne. Pilots within the contiguous U.S. may access Flight Service through **www.1800wxbrief.com** or by contacting them at 1-800-WX-Brief to obtain preflight weather data and to file IFR and VFR flight plans.

#### 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 for preflight weather briefing.

d. FSSs are required to advise of pertinent NOTAMs if a *standard* briefing is requested, but if they are overlooked, do not hesitate to remind the specialist that you have not received NOTAM information.

#### NOTE-

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

#### REFERENCE-

*AIM, 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 7–1–5, 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 (HDTA) 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 without having an FAA assigned 3-letter designator, must prefix the normal registration (N) number with the letter "T" on flight plan filing; for example, TN1234B.

**REFERENCE–**

*AIM, Paragraph 4–2–4, Aircraft Call Signs*

*FAA Order JO 7110.65, Paragraph 2–3–5a, Aircraft Identity*

*FAA Order JO 7110.10, Paragraph 6–2–1b1, Flight Plan Recording*

## 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 that 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 NOTAM System. When data appearing in a NOTAM is printed correctly in a publication or on a chart, or when a temporary condition is returned to normal status, the corresponding NOTAM is canceled. NOTAMs are eligible to be disseminated up to 7 days before the start of activity. Pilots can access NOTAM information via FSS or online via NOTAM Search at: <https://notams.aim.faa.gov/notamSearch/>.

**b.** In accordance with 14 CFR § 91.103, Preflight Action, prior to departure, pilots must become familiar with all available information concerning that flight, including NOTAMs. NOTAM information is aeronautical information that could affect a pilot's decision to make a flight and includes changes to:

1. Aerodromes.
2. Runways, taxiways, and ramp restrictions.
3. Obstructions.
4. Communications.
5. Airspace.

6. Status of navigational aids, ILSs, or radar service availability.

7. Other information essential to planned en route, terminal, or landing operations.

c. Pilots should ensure they review those NOTAMs contained under the ARTCC location (for example, ZDC, ZOB, etc.) that the flight is operating within as they can include NOTAMs relevant to all operations, including Central Altitude Reservation Function (CARF), Special Use Airspace (SUA), Temporary Flight Restrictions (TFR), Global Positioning System (GPS), Flight Data Center (FDC) changes to routes, wind turbine, and Unmanned Aircraft System (UAS).

**NOTE—**

*NOTAM information is transmitted using ICAO contractions to reduce transmission time. See TBL 5-1-2 for a listing of the most commonly used contractions, or go online to the following URL: <https://www.notams.faa.gov/downloads/contractions.pdf>. For a complete listing of approved NOTAM Contractions, see FAA JO Order 7340.2, Contractions.*

d. Due to the changeable nature of the NAS components, and frequent processing of NOTAM information, it is recommended, that while en route, pilots contact ATC or FSS and obtain updated information for their route of flight and destination. Pilots should be particularly vigilant when operating at locations without an operating control tower. Dynamic situations, such as snow removal, fire and rescue activities, construction, and wildlife encroachment, may pose hazards that may not reach the pilot prior to arrival/departure.

e. If a NAVAID fails or is removed from service prior to all airspace and procedural dependencies being removed, a NOTAM is published to inform pilots of the NAVAID being Unserviceable (U/S). Pilots must check NOTAMs to ensure any NAVAID required for the flight is in service. There can be considerable time between the NAVAID being U/S and ultimately its removal from the charts, which, during the transition period, means a NOTAM is the primary method of alerting pilots to its unavailability. It is recommended that pilots using VFR charts should regularly consult the Aeronautical Chart Bulletin found in the back matter of the appropriate Chart Supplement U.S. This bulletin identifies any updates to the chart that have not yet been accounted

for because of the extended six-month chart cycle for most VFR charts.

**NOTE—**

1. *Pilots should be alert for NAVAIDs having a dissimilar identifier from the airport(s) they serve and to use the Chart Supplement U.S. to identify the correct NAVAID NOTAM file. Flight planning should include review of NAVAIDs that aren't included for the departure/destination airport but may be part of the route of flight.*

2. *Charts may indicate a NAVAID's unavailability by depicting a crosshatch pattern through the frequency, which indicates its shutdown status.*

f. NOTAM information is classified as Domestic NOTAMs (NOTAM D), Flight Data Center (FDC) NOTAMs, International NOTAMs, or Military NOTAMs.

1. **NOTAM (D)** information is disseminated for all navigational facilities that are part of the National Airspace System (NAS), all public use aerodromes, seaplane bases, and heliports listed in the Chart Supplement U.S. 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. These keywords categorize NOTAM Ds by subject; for example, APRON (ramp), RWY (runway), SVC (Services), etc. There are several types of NOTAM Ds:

(a) Aerodrome activity and conditions, to include field conditions.

(b) Airspace to include CARF, SUA, and general airspace activity like UAS or pyrotechnics.

(c) Visual and radio navigational aids.

(d) Communication and services.

(e) Pointer NOTAMs. NOTAMs issued to point to additional aeronautical information. When pointing to another NOTAM, the keyword in the pointer NOTAM must match the keyword in the original NOTAM. Pointer NOTAMs should be issued for, but are not limited to, TFRs, Airshows, Temporary SUA, major NAS system interruptions, etc.

2. **FDC NOTAMs.** On those occasions when it becomes necessary to disseminate information that is regulatory in nature, an FDC NOTAM is issued. FDC NOTAMs include NOTAMs such as:

(a) Amendments to published IAPs and other current aeronautical charts.

(b) Temporary Flight Restrictions (TFR). Pilots should read NOTAMs in their entirety as some TFRs may allow pilots to fly through the flight restriction should they request permission to do so and subsequently receive it. Pilots are encouraged to use online preflight resources as they provide graphics and plain language interpretations for TFRs.

(c) High barometric pressure warning.

(d) Laser light activity.

(e) ADS-B, TIS-B, and FIS-B service availability.

(f) Satellite-based systems such as WAAS or GPS.

(g) Special Notices.

### 3. International NOTAMs.

(a) Distributed to more than one country, they are published in ICAO format under guidelines established in Annex 15. International NOTAMs issued by the U.S. NOTAM Office use Series A followed by 4 sequential numbers, a slant “/” and a 2-digit number representing the year the NOTAM was issued. For the most part, International NOTAMs duplicate data found in a U.S. Domestic NOTAM.

(b) Not every topic of a U.S. Domestic NOTAM is issued as an International NOTAM by the U.S. When possible, the U.S. International NOTAM will be linked to the appropriate U.S. Domestic NOTAM.

(c) International NOTAMs received by the FAA from other countries are stored in the U.S. NOTAM System.

(d) The International NOTAM format includes a “Q” Line that can be easily read/parsed by a

computer and allows the NOTAM to be displayed digitally.

(1) Field A: ICAO location identifier or FIR affected by the NOTAM.

(2) Field B: Start of Validity.

(3) Field C: End of Validity (both in [Year][Month][Day][Hour][Minute] format).

(4) Field D: (when present) Schedule.

(5) Field E: Full NOTAM description.

(6) Field F: (when present) Lowest altitude, or “SFC.”

(7) Field G: (when present) Highest altitude, or “UNL.”

(e) For more on International format, please see Annex 15.

**4. Military NOTAMs.** NOTAMs originated by the U.S. Air Force, Army, Marine, or Navy, and pertaining to military or joint-use navigational aids/airports that are part of the NAS. Military NOTAMs are published in the International NOTAM format and should be reviewed by users of a military or joint-use facility.

#### g. Security NOTAMS:

**1. U.S. Domestic Security NOTAMS** are FDC NOTAMS that inform pilots of certain U.S. security activities or requirements, such as Special Security Instructions for aircraft operations to, from, within, or transitioning U.S. territorial airspace. These NOTAMS are found on the Federal NOTAM System (FNS) NOTAM Search website under the location designator KZZZ.

**2. United States International Flight Prohibitions, Potential Hostile Situations, and Foreign Notices** are issued by the FAA and are found on the Federal NOTAM System (FNS) NOTAM Search website under the location designator KICZ.

**b.** The FAA has identified three possible situations where the failure to plan for an alternate airport when flying IFR to such a destination airport could result in a critical situation if the weather is less than forecast and sufficient fuel is not available to proceed to a suitable airport.

**1.** An IFR flight to an airport where the Minimum Descent Altitudes (MDAs) or landing visibility minimums for *all instrument approaches* are higher than the forecast weather minimums specified in 14 CFR Section 91.167(b). For example, there are 3 high altitude airports in the U.S. with approved instrument approach procedures where all of the MDAs are greater than 2,000 feet and/or the landing visibility minimums are greater than 3 miles (Bishop, California; South Lake Tahoe, California; and Aspen–Pitkin Co./Sardy Field, Colorado). In the case of these airports, it is possible for a pilot to elect, on the basis of forecasts, not to carry sufficient fuel to get to an alternate when the ceiling and/or visibility is actually lower than that necessary to complete the approach.

**2.** A small number of other airports in mountainous terrain have MDAs which are slightly (100 to 300 feet) below 2,000 feet AGL. In situations where there is an option as to whether to plan for an alternate, pilots should bear in mind that just a slight worsening of the weather conditions from those forecast could place the airport below the published IFR landing minimums.

**3.** An IFR flight to an airport which requires special equipment; i.e., DME, glide slope, etc., in order to make the available approaches to the lowest minimums. Pilots should be aware that all other minimums on the approach charts may require weather conditions better than those specified in 14 CFR Section 91.167(b). An inflight equipment malfunction could result in the inability to comply with the published approach procedures or, again, in the position of having the airport below the published IFR landing minimums for all remaining instrument approach alternatives.

## 5–1–11. Flights Outside U.S. Territorial Airspace

**a.** When conducting flights, particularly extended flights, outside the U.S. and its territories, full account should be taken of the amount and quality of air navigation services available in the airspace to be

traversed. Every effort should be made to secure information on the location and range of navigational aids, availability of communications and meteorological services, the provision of air traffic services, including alerting service, and the existence of search and rescue services.

**b.** Pilots should remember that there is a need to continuously guard the VHF emergency frequency 121.5 MHz when on long over-water flights, except when communications on other VHF channels, equipment limitations, or cockpit duties prevent simultaneous guarding of two channels. Guarding of 121.5 MHz is particularly critical when operating in proximity to Flight Information Region (FIR) boundaries, for example, operations on Route R220 between Anchorage and Tokyo, since it serves to facilitate communications with regard to aircraft which may experience in-flight emergencies, communications, or navigational difficulties.

### REFERENCE–

ICAO Annex 10, Vol II, Paras 5.2.2.1.1.1 and 5.2.2.1.1.2.

**c.** The filing of a flight plan, always good practice, takes on added significance for extended flights outside U.S. airspace and is, in fact, usually required by the laws of the countries being visited or overflown. It is also particularly important in the case of such flights that pilots leave a complete itinerary and schedule of the flight 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 appropriate FSS. Round Robin Flight Plans to Canada and Mexico are not accepted.

**d.** All pilots should review the foreign airspace and entry restrictions published in the appropriate Aeronautical Information Publication (AIP) during the flight planning process. Foreign airspace penetration without official authorization can involve both danger to the aircraft and the imposition of severe penalties and inconvenience to both passengers and crew. A flight plan on file with ATC authorities does not necessarily constitute the prior permission required by certain other authorities. The possibility of fatal consequences cannot be ignored in some areas of the world.

**e.** Current NOTAMs for foreign locations must also be reviewed. International Notices regarding specific countries may be obtained through the Federal NOTAM System (FNS) NOTAM Search External Links or the Air Traffic Plans and Publications web-

site. For additional flight information at foreign locations, pilots should also review the FAA's Prohibitions, Restrictions, and Notices website at [https://www.faa.gov/air\\_traffic/publications/us\\_restrictions/](https://www.faa.gov/air_traffic/publications/us_restrictions/).

**f.** When customs notification to foreign locations is required, it is the responsibility of the pilot to arrange for customs notification in a timely manner.

**g.** Aircraft arriving to locations in U.S. territorial airspace must meet the entry requirements as described in AIM Section 6, National Security and Interception Procedures.

### 5-1-12. Change in Flight Plan

**a.** In addition to altitude or flight level, destination and/or route changes, increasing or decreasing the speed of an aircraft constitutes a change in a flight plan. Therefore, at any time the average true airspeed at cruising altitude between reporting points varies or is expected to vary from that given in the flight plan by *plus or minus 5 percent, or 10 knots, whichever is greater*, ATC should be advised.

**b.** All changes to existing flight plans should be completed more than 46 minutes prior to the proposed departure time. Changes must be made with the initial flight plan service provider. If the initial flight plan's service provider is unavailable, filers may contact an ATC facility or FSS to make the necessary revisions. Any revision 46 minutes or less from the proposed departure time must be coordinated through an ATC facility or FSS.

### 5-1-13. Change in Proposed Departure Time

**a.** To prevent computer saturation in the en route environment, parameters have been established to delete proposed departure flight plans which have not been activated. Most centers have this parameter set so as to delete these flight plans a minimum of 2 hours after the proposed departure time or Expect Departure Clearance Time (EDCT). To ensure that a flight plan remains active, pilots whose actual departure time will be delayed 2 hours or more beyond their filed departure time, are requested to notify ATC of their new proposed departure time.

**b.** Due to traffic saturation, ATC personnel frequently will be unable to accept these revisions via

radio. It is recommended that you forward these revisions to a flight plan service provider or FSS.

### 5-1-14. Closing VFR/DVFR Flight Plans

A pilot is responsible for ensuring that his/her VFR or DVFR flight plan is canceled. You should close your flight plan with the nearest FSS, or if one is not available, you may request any ATC facility to relay your cancellation to the FSS. Control towers do not automatically close VFR or DVFR flight plans since they do not know if a particular VFR aircraft is on a flight plan. If you fail to report or cancel your flight plan within  $\frac{1}{2}$  hour after your ETA, search and rescue procedures are started.

#### REFERENCE—

14 CFR Section 91.153.

14 CFR Section 91.169.

### 5-1-15. Canceling IFR Flight Plan

**a.** 14 CFR Sections 91.153 and 91.169 include the statement “When a flight plan has been activated, the pilot-in-command, upon canceling or completing the flight under the flight plan, must notify an FAA Flight Service Station or ATC facility.”

**b.** An IFR flight plan may be canceled at any time the flight is operating in VFR conditions outside Class A airspace by pilots stating “CANCEL MY IFR FLIGHT PLAN” to the controller or air/ground station with which they are communicating. Immediately after canceling an IFR flight plan, a pilot should take the necessary action to change to the appropriate air/ground frequency, VFR radar beacon code and VFR altitude or flight level.

**c.** ATC separation and information services will be discontinued, including radar services (where applicable). Consequently, if the canceling flight desires VFR radar advisory service, the pilot must specifically request it.

#### NOTE—

*Pilots must be aware that other procedures may be applicable to a flight that cancels an IFR flight plan within an area where a special program, such as a designated TRSA, Class C airspace, or Class B airspace, has been established.*

**d.** If a DVFR flight plan requirement exists, the pilot is responsible for filing this flight plan to replace the canceled IFR flight plan. If a subsequent IFR operation becomes necessary, a new IFR flight plan must be filed and an ATC clearance obtained before operating in IFR conditions.

e. If operating on an IFR flight plan to an airport with a functioning control tower, the flight plan is automatically closed upon landing.

f. If operating on an IFR flight plan to an airport where there is no functioning control tower, the pilot must initiate cancellation of the IFR flight plan. This can be done after landing if there is a functioning FSS or other means of direct communications with ATC. In the event there is no FSS and/or air/ground communications with ATC is not possible below a certain altitude, the pilot should, weather conditions permitting, cancel the IFR flight plan while still airborne and able to communicate with ATC by radio. This will not only save the time and expense of canceling the flight plan by telephone but will quickly release the airspace for use by other aircraft.

### 5-1-16. RNAV and RNP Operations

a. During the pre-flight planning phase the availability of the navigation infrastructure required for the intended operation, including any non-RNAV contingencies, must be confirmed for the period of intended operation. Availability of the onboard navigation equipment necessary for the route to be flown must be confirmed.

b. If a pilot determines a specified RNP level cannot be achieved, revise the route or delay the operation until appropriate RNP level can be ensured.

c. The onboard navigation database must be current and appropriate for the region of intended operation and must include the navigation aids, waypoints, and coded terminal airspace procedures for the departure, arrival and alternate airfields.

d. During system initialization, pilots of aircraft equipped with a Flight Management System or other RNAV-certified system, must confirm that the navigation database is current, and verify that the aircraft position has been entered correctly. Flight crews should crosscheck the cleared flight plan against charts or other applicable resources, as well as the navigation system textual display and the aircraft map display. This process includes confirmation of the waypoints sequence, reasonableness of track angles and distances, any altitude or speed constraints, and identification of fly-by or fly-over waypoints. A procedure must not be used if validity of the navigation database is in doubt.

e. Prior to commencing takeoff, the flight crew must verify that the RNAV system is operating correctly and the correct airport and runway data have been loaded.

f. During the pre-flight planning phase RAIM prediction must be performed if TSO-C129() equipment is used to solely satisfy the RNAV and RNP requirement. GPS RAIM availability must be confirmed for the intended route of flight (route and time) using current GPS satellite information. In the event of a predicted, continuous loss of RAIM of more than five (5) minutes for any part of the intended flight, the flight should be delayed, canceled, or re-routed where RAIM requirements can be met. Operators may satisfy the predictive RAIM requirement through any one of the following methods:

1. Operators may monitor the status of each satellite in its plane/slot position, by accounting for the latest GPS constellation status (for example, NOTAMs or NANUs), and compute RAIM availability using model-specific RAIM prediction software;

2. Operators may use the Service Availability Prediction Tool (SAPT) on the FAA en route and terminal RAIM prediction website;

3. Operators may contact a Flight Service Station to obtain non-precision approach RAIM;

4. Operators may use a third party interface, incorporating FAA/VOLPE RAIM prediction data without altering performance values, to predict RAIM outages for the aircraft's predicted flight path and times;

5. Operators may use the receiver's installed RAIM prediction capability (for TSO-C129a/Class A1/B1/C1 equipment) to provide non-precision approach RAIM, accounting for the latest GPS constellation status (for example, NOTAMs or NANUs). Receiver non-precision approach RAIM should be checked at airports spaced at intervals not to exceed 60 NM along the RNAV 1 procedure's flight track. "Terminal" or "Approach" RAIM must be available at the ETA over each airport checked; or,

6. Operators not using model-specific software or FAA/VOLPE RAIM data will need FAA operational approval.

#### **NOTE-**

*If TSO-C145/C146 equipment is used to satisfy the RNAV and RNP requirement, the pilot/operator need not perform the prediction if WAAS coverage is confirmed to be*



*available along the entire route of flight. Outside the U.S. or in areas where WAAS coverage is not available, operators using TSO-C145/C146 receivers are required to check GPS RAIM availability.*

### **5-1-17. Cold Temperature Operations**

Pilots should begin planning for operating into airports with cold temperatures during the preflight planning phase. Instrument approach charts will contain a snowflake symbol and a temperature when cold temperature correction must be applied. Pilots operating into airports requiring cold temperature corrections should request the lowest forecast temperature at the airport for departure and arrival times. If the temperature is forecast to be at or below any published cold temperature restriction, calculate an altitude correction for the appropriate segment(s) and/or review procedures for operating automatic

cold temperature compensating systems, as applicable. The pilot is responsible to calculate and apply the corrections to the affected segment(s) when the actual reported temperature is at or below any published cold temperature restriction, or pilots with automatic cold temperature compensating systems must ensure the system is on and operating on each designated segment. Advise ATC when intending to apply cold temperature correction and of the amount of correction required on initial contact (or as soon as possible) for the intermediate segment and/or the published missed approach. This information is required for ATC to provide aircraft appropriate vertical separation between known traffic.

#### **REFERENCE-**

*AIM, Chapter 7, Section 3, Cold Temperature Barometric Altimeter Errors, Setting Procedures, and Cold Temperature Airports (CTA)  
AIM, TBL 7-3-1, ICAO Cold Temperature Error Table*



## Section 5. Pilot/Controller Roles and Responsibilities

### 5-5-1. General

a. The roles and responsibilities of the pilot and controller for effective participation in the ATC system are contained in several documents. Pilot responsibilities are in the CFRs and the air traffic controllers' are in the FAA Order JO 7110.65, Air Traffic Control, and supplemental FAA directives. Additional and supplemental information for pilots can be found in the current Aeronautical Information Manual (AIM), Notices to Airmen, Advisory Circulars and aeronautical charts. Since there are many other excellent publications produced by nongovernment organizations, as well as other government organizations, with various updating cycles, questions concerning the latest or most current material can be resolved by cross-checking with the above mentioned documents.

b. The pilot-in-command of an aircraft is directly responsible for, and is the final authority as to the safe operation of that aircraft. In an emergency requiring immediate action, the pilot-in-command may deviate from any rule in the General Subpart A and Flight Rules Subpart B in accordance with 14 CFR Section 91.3.

c. The air traffic controller is responsible to give first priority to the separation of aircraft and to the issuance of radar safety alerts, second priority to other services that are required, but do not involve separation of aircraft and third priority to additional services to the extent possible.

d. In order to maintain a safe and efficient air traffic system, it is necessary that each party fulfill their responsibilities to the fullest.

e. The responsibilities of the pilot and the controller intentionally overlap in many areas providing a degree of redundancy. Should one or the other fail in any manner, this overlapping responsibility is expected to compensate, in many cases, for failures that may affect safety.

f. The following, while not intended to be all inclusive, is a brief listing of pilot and controller responsibilities for some commonly used procedures

or phases of flight. More detailed explanations are contained in other portions of this publication, the appropriate CFRs, ACs and similar publications. The information provided is an overview of the principles involved and is not meant as an interpretation of the rules nor is it intended to extend or diminish responsibilities.

### 5-5-2. Air Traffic Clearance

#### a. Pilot.

1. Acknowledges receipt and understanding of an ATC clearance.

2. Reads back any hold short of runway instructions issued by ATC.

3. Requests clarification or amendment, as appropriate, any time a clearance is not fully understood or considered unacceptable from a safety standpoint.

4. Promptly complies with an air traffic clearance upon receipt except as necessary to cope with an emergency. Advises ATC as soon as possible and obtains an amended clearance, if deviation is necessary.

#### **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 altitude crossing restriction.*

#### b. Controller.

1. Issues appropriate clearances for the operation to be conducted, or being conducted, in accordance with established criteria.

2. Assigns altitudes in IFR clearances that are at or above the minimum IFR altitudes in controlled airspace.

3. Ensures acknowledgement by the pilot for issued information, clearances, or instructions.

4. Ensures that readbacks by the pilot of altitude, heading, or other items are correct. If incorrect, distorted, or incomplete, makes corrections as appropriate.

### 5-5-3. Contact Approach

#### a. Pilot.

1. Must request a contact approach and makes it in lieu of a standard or special instrument approach.

2. By requesting the contact approach, indicates that the flight is operating clear of clouds, has at least one mile flight visibility, and reasonably expects to continue to the destination airport in those conditions.

3. Assumes responsibility for obstruction clearance while conducting a contact approach.

4. Advises ATC immediately if unable to continue the contact approach or if encounters less than 1 mile flight visibility.

5. Is aware that if radar service is being received, it may be automatically terminated when told to contact the tower.

#### REFERENCE-

*Pilot/Controller Glossary Term- Radar Service Terminated.*

#### b. Controller.

1. Issues clearance for a contact approach only when requested by the pilot. Does not solicit the use of this procedure.

2. Before issuing the clearance, ascertains that reported ground visibility at destination airport is at least 1 mile.

3. Provides approved separation between the aircraft cleared for a contact approach and other IFR or special VFR aircraft. When using vertical separation, does not assign a fixed altitude, but clears the aircraft at or below an altitude which is at least 1,000 feet below any IFR traffic but not below Minimum Safe Altitudes prescribed in 14 CFR Section 91.119.

4. Issues alternative instructions if, in their judgment, weather conditions may make completion of the approach impracticable.

### 5-5-4. Instrument Approach

#### a. Pilot.

1. Be aware that the controller issues clearance for approach based only on known traffic.

2. Follows the procedure as shown on the IAP, including all restrictive notations, such as:

(a) Procedure not authorized at night;

(b) Approach not authorized when local area altimeter not available;

(c) Procedure not authorized when control tower not in operation;

(d) Procedure not authorized when glide slope not used;

(e) Straight-in minimums not authorized at night; etc.

(f) Radar required; or

(g) The circling minimums published on the instrument approach chart provide adequate obstruction clearance and pilots should not descend below the circling altitude until the aircraft is in a position to make final descent for landing. Sound judgment and knowledge of the pilot's and the aircraft's capabilities are the criteria for determining the exact maneuver in each instance since airport design and the aircraft position, altitude and airspeed must all be considered.

#### REFERENCE-

*AIM, Paragraph 5-4-20, Approach and Landing Minimums*

3. Upon receipt of an approach clearance while on an unpublished route or being radar vectored:

(a) Complies with the minimum altitude for IFR; and

(b) Maintains the last assigned altitude until established on a segment of a published route or IAP, at which time published altitudes apply.

4. When applicable, apply cold temperature correction to instrument approach segments. Advise ATC when intending to apply cold temperature correction and of the amount of correction required for each affected segment on initial contact (or as soon as possible). This information is required for ATC to provide aircraft appropriate vertical separation between known traffic.

#### REFERENCE-

*AIM, Chapter 7, Section 3, Cold Temperature Barometric Altimeter Errors, Setting Procedures, and Cold Temperature Airports (CTA)  
AIM, TBL 7-3-1, ICAO Cold Temperature Error Table*

#### b. Controller.

1. Issues an approach clearance based on known traffic.

2. Issues an IFR approach clearance only after the aircraft is established on a segment of published

route or IAP, or assigns an appropriate altitude for the aircraft to maintain until so established.

### 5-5-5. Missed Approach

#### a. Pilot.

1. Executes a missed approach when one of the following conditions exist:

(a) Arrival at the Missed Approach Point (MAP) or the Decision Height (DH) and visual reference to the runway environment is insufficient to complete the landing.

(b) Determines that a safe approach or landing is not possible (see subparagraph 5-4-21h).

(c) Instructed to do so by ATC.

2. Advises ATC that a missed approach will be made. Include the reason for the missed approach unless the missed approach is initiated by ATC.

3. Complies with the missed approach instructions for the IAP being executed from the MAP, unless other missed approach instructions are specified by ATC.

4. If executing a missed approach prior to reaching the MAP, fly the lateral navigation path of the instrument procedure to the MAP. Climb to the altitude specified in the missed approach procedure, except when a maximum altitude is specified between the final approach fix (FAF) and the MAP. In that case, comply with the maximum altitude restriction. Note, this may require a continued descent on the final approach.

5. When applicable, apply cold temperature correction to the published missed approach segment. Advise ATC when intending to apply cold temperature correction and of the amount of correction required on initial contact (or as soon as possible). This information is required for ATC to provide aircraft appropriate vertical separation between known traffic. The pilot must not apply an altitude correction to an assigned altitude when provided an initial heading to fly or radar vector in lieu of published missed approach procedures, unless approved by ATC.

#### REFERENCE-

AIM, Chapter 7, Section 3, Cold Temperature Barometric Altimeter Errors, Setting Procedures, and Cold Temperature Airports (CTA)  
AIM, TBL 7-3-1, ICAO Cold Temperature Error Table

6. Following a missed approach, requests clearance for specific action; i.e., another approach, hold for improved conditions, proceed to an alternate airport, etc.

#### b. Controller.

1. Issues an approved alternate missed approach procedure if it is desired that the pilot execute a procedure other than as depicted on the instrument approach chart.

2. May vector a radar identified aircraft executing a missed approach when operationally advantageous to the pilot or the controller.

3. In response to the pilot's stated intentions, issues a clearance to an alternate airport, to a holding fix, or for reentry into the approach sequence, as traffic conditions permit.

### 5-5-6. Radar Vectors

#### a. Pilot.

1. Promptly complies with headings and altitudes assigned to you by the controller.

2. Questions any assigned heading or altitude believed to be incorrect.

3. If operating VFR and compliance with any radar vector or altitude would cause a violation of any CFR, advises ATC and obtains a revised clearance or instructions.

#### b. Controller.

1. Vectors aircraft in Class A, Class B, Class C, Class D, and Class E airspace:

(a) For separation.

(b) For noise abatement.

(c) To obtain an operational advantage for the pilot or controller.

2. Vectors aircraft in Class A, Class B, Class C, Class D, Class E, and Class G airspace when requested by the pilot.

3. Vectors IFR aircraft at or above minimum vectoring altitudes.

4. May vector aircraft off assigned procedures. When published altitude or speed restrictions are included, controllers must assign an altitude, or if necessary, a speed.

5. May vector VFR aircraft, not at an ATC assigned altitude, at any altitude. In these cases, terrain separation is the pilot's responsibility.

### 5-5-7. Safety Alert

#### a. Pilot.

1. Initiates appropriate action if a safety alert is received from ATC.

2. Be aware that this service is not always available and that many factors affect the ability of the controller to be aware of a situation in which unsafe proximity to terrain, obstructions, or another aircraft may be developing.

#### b. Controller.

1. Issues a safety alert if aware an aircraft under their control is at an altitude which, in the controller's judgment, places the aircraft in unsafe proximity to terrain, obstructions or another aircraft. Types of safety alerts are:

(a) **Terrain or Obstruction Alert.** Immediately issued to an aircraft under their control if aware the aircraft is at an altitude believed to place the aircraft in unsafe proximity to terrain or obstructions.

(b) **Aircraft Conflict Alert.** Immediately issued to an aircraft under their control if aware of an aircraft not under their control at an altitude believed to place the aircraft in unsafe proximity to each other. With the alert, they offer the pilot an alternative, if feasible.

2. Discontinue further alerts if informed by the pilot action is being taken to correct the situation or that the other aircraft is in sight.

### 5-5-8. See and Avoid

a. **Pilot.** When meteorological conditions permit, regardless of type of flight plan or whether or not under control of a radar facility, the pilot is responsible to see and avoid other traffic, terrain, or obstacles.

#### b. Controller.

1. Provides radar traffic information to radar identified aircraft operating outside positive control airspace on a workload permitting basis.

2. Issues safety alerts to aircraft under their control if aware the aircraft is at an altitude believed to place the aircraft in unsafe proximity to terrain, obstructions, or other aircraft.

### 5-5-9. Speed Adjustments

#### a. Pilot.

1. Advises ATC any time cruising airspeed varies plus or minus 5 percent or 10 knots, whichever is greater, from that given in the flight plan.

2. Complies with speed adjustments from ATC unless:

(a) The minimum or maximum safe airspeed for any particular operation is greater or less than the requested airspeed. In such cases, advises ATC.

#### NOTE-

*It is the pilot's responsibility and prerogative to refuse speed adjustments considered excessive or contrary to the aircraft's operating specifications.*

(b) Operating at or above 10,000 feet MSL on an ATC assigned SPEED ADJUSTMENT of more than 250 knots IAS and subsequent clearance is received for descent below 10,000 feet MSL. In such cases, pilots are expected to comply with 14 CFR Section 91.117(a).

3. When complying with speed adjustment assignments, maintains an indicated airspeed within plus or minus 10 knots or 0.02 Mach number of the specified speed.

#### b. Controller.

1. Assigns speed adjustments to aircraft when necessary but not as a substitute for good vectoring technique.

2. Adheres to the restrictions published in FAA Order JO 7110.65, Air Traffic Control, as to when speed adjustment procedures may be applied.

3. Avoids speed adjustments requiring alternate decreases and increases.

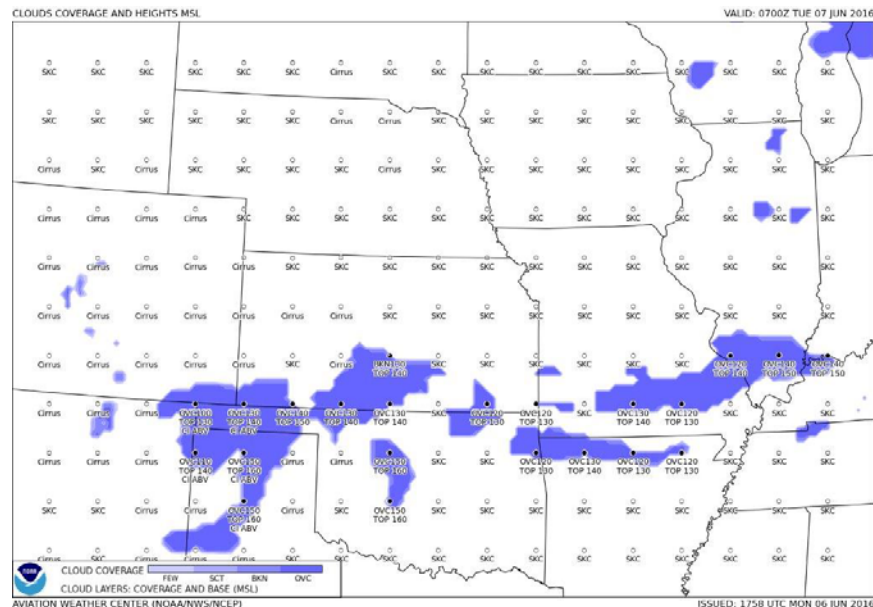
4. Assigns speed adjustments to a specified IAS (KNOTS)/Mach number or to increase or decrease speed using increments of 5 knots or multiples thereof.

5. Terminates ATC-assigned speed adjustments when no longer required by issuing further instructions to pilots in the following manner:

(a) Advises pilots to "resume normal speed" when the aircraft is on a heading, random routing, charted procedure, or route without published speed restrictions.

(b) Instructs pilots to "comply with speed restrictions" when the aircraft is joining or resuming

FIG 7-1-3  
Aviation Cloud Forecast



### 7-1-5. Preflight Briefing

a. Flight Service Stations (FSS) are the primary sources for obtaining preflight briefings and to file flight plans by phone or the Internet. Flight Service Specialists are qualified and certified as Pilot Weather Briefers by the FAA. 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 can be expected along the flight route and at the destination. Three basic types of preflight briefings (Standard, Abbreviated, and Outlook) are available to serve the pilot's specific needs. Pilots should specify to the briefer the type of briefing they want, along with their appropriate background information. This will enable the briefer to tailor the information to the pilot's 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; for example, in Alaska only, TIBS and TWEB. 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.** Airway NOTAMs, procedural NOTAMs, and NOTAMs that are general in nature and not tied to a specific airport/facility (for example, flight advisories and restrictions, open duration special security instructions, and special flight rules areas) are briefed solely by pilot request. For complete flight information, pilots are urged to review the Domestic Notices and International Notices found in the External Links section of the Federal NOTAM System (FNS) NOTAM Search System 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 airway NOTAMs, procedural NOTAMs, and NOTAMs that are general in nature and not tied to a specific airport/facility (for example, flight advisories and restrictions, open duration special security instructions, and special flight rules areas), Domestic Notices and International Notices. Domestic Notices and International Notices are found in the External Links section of the Federal NOTAM System (FNS) NOTAM Search System.

(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.

## 7-1-6. 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 7-1-4 and FIG 7-1-5. 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 7-1-4. 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.



## 7-1-11. Flight Information Services (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.

**a. Data link Service Providers (DSPs).** DSPs 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. A DSP may provide a free of charge or a for-fee service that permits end users to uplink and downlink AI/MET and other information. The following are examples of DSPs:

**1. 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.

**2. 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.

**b. 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.

**1. 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.

**2. 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.

**3. 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.

**c. 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.

**d. Operational Use of FIS.** Regardless of the type of FIS system being used, several factors must be considered when using FIS:

**1. 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.

2. 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.

3. 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.

4. 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 decision-making 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.

5. DSPs 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.

6. 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.

7. FIS supports better pilot decision-making 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.

e. 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. TBL 7–1–1 lists the 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.

3. Users of FIS–B should familiarize themselves with the operational characteristics and limitations of the system, including: system architec-

ture; service environment; product lifecycles; modes of operation; and indications of system failure.

**NOTE—**

*The NOTAM–D and NOTAM–FDC products broadcast via FIS–B are limited to those issued or effective within the past 30 days. Except for TFRs, NOTAMs older than 30 days are not provided. The pilot in command is responsible for reviewing all necessary information prior to flight.*

**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 En Route/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, or by sending an email to the ADS–B help desk at [adsb@faa.gov](mailto:adsb@faa.gov). Reports should include:

- (a) Condition observed;
- (b) Date and time of observation;

- (c) Altitude and location of observation;
- (d) Type and call sign of the aircraft; and
- (e) Type and software version of avionics system.

**f. 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. 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**

<b>Product</b>	<b>Update Interval<sup>1</sup></b>	<b>Transmission Interval (95%)<sup>2</sup></b>	<b>Basic Product</b>
AIRMET	As Available	5 minutes	Yes
AWW/WW	As Available, then at 15 minute intervals for 1 hour	5 minutes	No
Ceiling	As Available	10 minutes	No
Convective SIGMET	As Available, then at 15 minute intervals for 1 hour	5 minutes	Yes
D-ATIS	As Available	1 minute	No
Echo Top	5 minutes	5 minutes	No
METAR/SPECI	1 minute (where available), As Available otherwise	5 minutes	Yes
MRMS NEXRAD (CONUS)	2 minutes	15 minutes	Yes
MRMS NEXRAD (Regional)	2 minutes	2.5 minutes	Yes
NOTAMs-D/FDC	As Available	10 minutes	Yes
NOTAMs-TFR	As Available	10 minutes	Yes
PIREP	As Available	10 minutes	Yes
SIGMET	As Available, then at 15 minute intervals for 1 hour	5 minutes	Yes
SUA Status	As Available	10 minutes	Yes
TAF/AMEND	6 Hours (±15 minutes)	10 minutes	Yes
Temperature Aloft	12 Hours (±15 minutes)	10 minutes	Yes
TWIP	As Available	1 minute	No
Winds aloft	12 Hours (±15 minutes)	10 minutes	Yes
Lightning strikes <sup>3</sup>	5 minutes	5 minutes	Yes
Turbulence <sup>3</sup>	1 minute	15 minutes	Yes
Icing, Forecast Potential (FIP) <sup>3</sup>	60 minutes	15 minutes	Yes
Cloud tops <sup>3</sup>	30 minutes	15 minutes	Yes
1 Minute AWOS <sup>3</sup>	1 minute	10 minutes	No
Graphical-AIRMET <sup>3</sup>	As Available	5 minutes	Yes
Center Weather Advisory (CWA) <sup>3</sup>	As Available	10 minutes	Yes
Temporary Restricted Areas (TRA)	As Available	10 minutes	Yes
Temporary Military Operations Areas (TMOA)	As Available	10 minutes	Yes

<sup>1</sup> The Update Interval is the rate at which the product data is available from the source.

<sup>2</sup> The Transmission Interval is the amount of time within which a new or updated product transmission must be completed (95%) and the rate or repetition interval at which the product is rebroadcast (95%).

<sup>3</sup> The transmission and update intervals for the expanded set of basic meteorological products may be adjusted based on FAA and vendor agreement on the final product formats and performance requirements.

**NOTE–**

**1.** Details concerning the content, format, and symbols of the various data link products provided should be obtained from the specific avionics manufacturer.

**2.** NOTAM–D and NOTAM–FDC products broadcast via FIS–B are limited to those issued or effective within the past 30 days.

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

**7–1–12. 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 7–1–30, 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 AIM, Paragraph 7–2–3, Altimeter Errors.

**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-I** usually reports altimeter setting, wind data, temperature, dew point, and density altitude;

(d) **AWOS-2** provides the information provided by AWOS-I 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  $\frac{1}{4}$ .” 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 Observing System (AWOS)** The ASOS/AWOS is the primary surface weather observing system of the U.S. (See Key to Decode an ASOS/AWOS (METAR) Observation, FIG 7-1-7 and FIG 7-1-8.) 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. ASOS/AWOS is designed to support aviation operations and weather forecast activities. The ASOS/AWOS 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/AWOS transmissions on a discrete VHF radio frequency are engineered to be receivable to a maximum of 25 NM

from the ASOS/AWOS site and a maximum altitude of 10,000 feet AGL. At many locations, ASOS/AWOS 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/AWOS 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/AWOS 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/AWOS 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.

(i) Automated Lightning Detection and Reporting System (ALDARS) (excluding Alaska and Pacific Island sites).

**3. The ASOS/AWOS 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 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 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/AWOS report, refer to FIG 7-1-7 and FIG 7-1-8.*

**REFERENCE—**

*A complete explanation of METAR terminology is located in AIM, Paragraph 7-1-30, Key to Aerodrome Forecast (TAF) and Aviation Routine Weather Report (METAR).*

FIG 7-1-7

## Key to Decode an ASOS/AWOS (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 <u>Z</u> 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 <u>G</u> usts (character) followed by maximum observed speed; always appended with <u>K</u> T to indicate knots; 00000KT for calm; if direction varies by 60° or more a <u>V</u> ariable wind direction group is reported.	21016G24KT 108V240
VISIBILITY	Prevailing visibility in statute miles and fractions (space between whole miles and fractions); always appended with <u>SM</u> 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 <u>FT</u> to indicate feet; value prefixed with <u>M</u> or <u>P</u> 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 ( <u>VV</u> ) 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 <u>M</u> (minus).	06/04
ALTIMETER	Altimeter always prefixed with an <u>A</u> indicating inches of mercury; reported using four digits: tens, units, tenths, and hundredths.	A2990

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  $\frac{3}{4}$  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.

## 7-1-29. 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 depicted may be 15 to 20 minutes older than 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 -15°C.

**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.

## Section 2. Barometric Altimeter Errors and Setting Procedures

### 7-2-1. General

a. Aircraft altimeters are subject to the following errors and weather factors:

1. Instrument error.
2. Position error from aircraft static pressure systems.
3. Nonstandard atmospheric pressure.
4. Nonstandard temperatures.

b. The standard altimeter 29.92 inches Mercury (“Hg.”) setting at the higher altitudes eliminates station barometer errors, some altimeter instrument errors, and errors caused by altimeter settings derived from different geographical sources.

### 7-2-2. Barometric Pressure Altimeter Errors

a. High Barometric Pressure: Cold, dry air masses may produce barometric pressures in excess of 31.00 “Hg. Many aircraft altimeters cannot be adjusted above 31.00 “Hg. When an aircraft’s altimeter cannot be set to pressure settings above 31.00 “Hg, the aircraft’s true altitude will be higher than the indicated altitude on the barometric altimeter.

b. Low Barometric Pressure: An abnormal low-pressure condition exists when the barometric pressure is less than 28.00 “Hg. Flight operations are not recommended when an aircraft’s altimeter is unable to be set below 28.00 “Hg. In this situation, the aircraft’s true altitude is lower than the indicated altitude. This situation may be exacerbated when operating in extremely cold temperatures, which may result in the aircraft’s true altitude being significantly lower than the indicated altitude.

#### NOTE—

*EXTREME CAUTION SHOULD BE EXERCISED WHEN FLYING IN PROXIMITY TO OBSTRUCTIONS OR TERRAIN IN LOW PRESSURES AND/OR LOW TEMPERATURES.*

### 7-2-3. Altimeter Errors

a. Manufacturing and installation specifications, along with 14 CFR Part 43, Appendix E requirement

for periodic tests and inspections, helps reduce mechanical, elastic, temperature, and installation errors. (See Instrument Flying Handbook.) Scale error may be observed while performing a ground altimeter check using the following procedure:

1. Set the current reported airfield altimeter setting on the altimeter setting scale.

2. Read the altitude on the altimeter. The altitude should read the known field elevation if you are located on the same reference level used to establish the altimeter setting.

3. If the difference from the known field elevation and the altitude read from the altimeter is plus or minus 75 feet or greater, the accuracy of the altimeter is questionable and the problem should be referred to an appropriately rated repair station for evaluation and possible correction.

b. It is important to set the current altimeter settings for the area of operation when flying at an enroute altitude that does not require a standard altimeter setting of 29.92 “Hg. If the altimeter is not set to the current altimeter setting when flying from an area of high pressure into an area of low pressure, the aircraft will be closer to the surface than the altimeter indicates. An inch Hg. error in the altimeter setting equals 1,000 feet of altitude. For example, setting 29.90 “Hg instead of 30.90 “Hg. To quote an old saying: “GOING FROM A HIGH TO A LOW, LOOK OUT BELOW.”

c. The aircraft cruising altitude or flight level is maintained by referencing the barometric altimeter. Procedures for setting altimeters during high and low barometric pressure events must be set using the following procedures:

1. Below 18,000 feet mean sea level (MSL).

- (a) Barometric pressure is 31.00 “Hg or less.

- (1) Set the altimeter to a current reported altimeter setting from a station along the route and within 100 NM of the aircraft, or;

- (2) If there is no station within this area, use the current reported altimeter setting of an appropriate available station, or;

#### NOTE—

*Air traffic controllers will furnish this information at least*

once when en route or on an instrument flight plan within their controlled airspace:

(3) If the aircraft is not equipped with a radio, set the altimeter to the elevation of the departure airport or use an available appropriate altimeter setting prior to departure.

(b) When the barometric pressure exceeds 31.00 “Hg., a NOTAM will be published to define the affected geographic area. The NOTAM will also institute the following procedures:

(1) All aircraft: All aircraft will set 31.00 “Hg. for en route operations below 18,000 feet MSL. Maintain this setting until out of the affected area or until reaching the beginning of the final approach segment on an instrument approach. Set the current altimeter setting (above 31.00 “Hg.) approaching the final segment, if possible. If no current altimeter setting is available, or if a setting above 31.00 “Hg. cannot be made on the aircraft’s altimeter, leave 31.00 “Hg. set in the altimeter and continue the approach.

(2) Set 31.00 “Hg. in the altimeter prior to reaching the lowest of any mandatory/crossing altitudes or 1,500 feet above ground level (AGL) when on a departure or missed approach.

**NOTE—**

*Air traffic control will issue actual altimeter settings and advise pilots to set 31.00 “Hg. in their altimeters for en route operations below 18,000 feet MSL in affected areas.*

(3) No additional restrictions apply for aircraft operating into an airport that are able to set and measure altimeter settings above 31.00 “Hg.

(4) Flight operations are restricted to VFR weather conditions to and from an airport that is unable to accurately measure barometric pressures above 31.00 “Hg. These airports will report the barometric pressure as “missing” or “in excess of 31.00 “Hg.”.

(5) VFR aircraft. VFR operating aircraft have no additional restrictions. Pilots must use caution when flight planning and operating in these conditions.

(6) IFR aircraft: IFR aircraft unable to set an altimeter setting above 31.00 “Hg. should apply the following:

[a] The suitability of departure alternate airports, destination airports, and destination alternate airports will be determined by increasing the published ceiling and visibility requirements when unable to set the aircraft altimeter above 31.00 “Hg. Any reported or forecast altimeter setting over 31.00 “Hg. will be rounded up to the next tenth to calculate the required increases. The ceiling will be increased by 100 feet and the visibility by 1/4 statute mile for each 1/10 “Hg. over 31.00 “Hg. Use these adjusted values in accordance with operating regulations and operations specifications.

**EXAMPLE—**

*Destination airport altimeter is 31.21 “Hg. The planned approach is an instrument landing system (ILS) with a decision altitude (DA) 200 feet and visibility 1/2 mile (200–1/2). Subtract 31.00 “Hg. from 31.21 “Hg. to get .21 “Hg. .21 “Hg rounds up to .30 “Hg. Calculate the increased requirement: 100 feet per 1/10 equates to a 300 feet increase for .30 “Hg. 1/4 statute mile per 1/10 equates to a 3/4 statute mile increase for .30 “Hg. The destination weather requirement is determined by adding the 300–3/4 increase to 200–1/2. The destination weather requirement is now 500–1 1/4.*

[b] 31.00 “Hg. will remain set during the complete instrument approach. The aircraft has arrived at the DA or minimum descent altitude (MDA) when the published DA or MDA is displayed on the barometric altimeter.

**NOTE—**

*The aircraft will be approximately 300 feet higher than the indicated barometric altitude using this method.*

[c] These restrictions do not apply to authorized Category II/III ILS operations and certificate holders using approved atmospheric pressure at aerodrome elevation (QFE) altimetry systems.

(7) The FAA Flight Procedures & Airspace Group, Flight Technologies and Procedures Division may authorize temporary waivers to permit emergency resupply or emergency medical service operation.

2. At or above 18,000 feet MSL. All operators will set 29.92 “Hg. (standard setting) in the barometric altimeter. The lowest usable flight level is determined by the atmospheric pressure in the area of operation as shown in TBL 7–2–1. Air Traffic Control (ATC) will assign this flight level.

**TBL 7-2-1**  
**Lowest Usable Flight Level**

Altimeter Setting (Current Reported)	Lowest Usable Flight Level
29.92 or higher	180
29.91 to 28.92	190
28.91 to 27.92	200

3. When the minimum altitude per 14 CFR Section 91.159 and 14 CFR Section 91.177 is above 18,000 feet MSL, the lowest usable flight level must be the flight level equivalent of the minimum altitude plus the number of feet specified in TBL 7-2-2. ATC will accomplish this calculation.

**TBL 7-2-2**  
**Lowest Flight Level Correction Factor**

Altimeter Factor	Correction Factor
29.92 or higher	None
29.91 to 29.42	500 feet
29.41 to 28.92	1000 feet
28.91 to 28.42	1500 feet
28.41 to 27.92	2000 feet
27.91 to 27.42	2500 feet

**EXAMPLE-**

*The minimum safe altitude of a route is 19,000 feet MSL and the altimeter setting is reported between 29.92 and 29.43 "Hg, the lowest usable flight level will be 195, which is the flight level equivalent of 19,500 feet MSL (minimum altitude (TBL 7-2-1) plus 500 feet).*





## Section 3. Cold Temperature Barometric Altimeter Errors, Setting Procedures and Cold Temperature Airports (CTA)

### 7-3-1. Effect of Cold Temperature on Barometric Altimeters

a. Temperature has an effect on the accuracy of barometric altimeters, indicated altitude, and true altitude. The standard temperature at sea level is 15 degrees Celsius (59 degrees Fahrenheit). The temperature gradient from sea level is minus 2 degrees Celsius (3.6 degrees Fahrenheit) per 1,000 feet. For example, at 5000 feet above sea level, the ambient temperature on a standard day would be 5 degrees Celsius. When the ambient (at altitude) temperature is colder than standard, the aircraft's true altitude is lower than the indicated barometric

altitude. When the ambient temperature is warmer than the standard day, the aircraft's true altitude is higher than the indicated barometric altitude.

b. TBL 7-3-1 indicates how much error may exist when operating in non-standard cold temperatures. To use the table, find the reported temperature in the left column, and read across the top row to locate the height above the airport (subtract the airport elevation from the flight altitude). Find the intersection of the temperature row and height above airport column. This number represents how far the aircraft may be below the indicated altitude due to possible cold temperature induced error.

TBL 7-3-1

ICAO Cold Temperature Error Table

HEIGHT ABOVE AIRPORT IN FEET

REPORTED TEMP °C	200	300	400	500	600	700	800	900	1000	1500	2000	3000	4000	5000
	+10	10	10	10	10	20	20	20	20	30	40	60	80	90
	0	20	20	30	30	40	40	50	50	60	90	120	170	280
	-10	20	30	40	50	60	70	80	90	100	150	200	290	490
	-20	30	50	60	70	90	100	120	130	140	210	280	420	570
	-30	40	60	80	100	120	140	150	170	190	280	380	570	760
	-40	50	80	100	120	150	170	190	220	240	360	480	720	970
	-50	60	90	120	150	180	210	240	270	300	450	590	890	1190

### 7-3-2. Pre-Flight Planning for Cold Temperature Altimeter Errors

Flight planning into a CTA may be accomplished prior to flight. Use the predicted coldest temperature for plus or minus 1 hour of the estimated time of arrival and compare against the CTA published temperature. If the predicted temperature is at or below CTA temperature, calculate an altitude correction using TBL 7-3-1. This correction may be used at the CTA if the actual arrival temperature is the same as the temperature used to calculate the altitude correction during preflight planning.

### 7-3-3. Effects of Cold Temperature on Baro-Vertical Navigation (VNAV) Vertical Guidance

Non-standard temperatures can result in a change to effective vertical paths and actual descent rates when using aircraft baro-VNAV equipment for vertical guidance on final approach segments. A lower than standard temperature will result in a shallower descent angle and reduced descent rate. Conversely, a higher than standard temperature will result in a steeper angle and increased descent rate. Pilots should consider potential consequences of these effects on approach minima, power settings, sight

picture, visual cues, etc., especially for high-altitude or terrain-challenged locations and during low-visibility conditions.

#### REFERENCE-

AIM Paragraph 5-4-5. Instrument Approach Procedure (IAP) Charts.

**a.** Uncompensated Baro-VNAV note on 14 CFR Part 97 IAPs. The area navigation (RNAV) global positioning system (GPS) and RNAV required navigation performance (RNP) notes, “For uncompensated Baro-VNAV systems, lateral navigation (LNAV)/VNAV NA below  $-XX^{\circ}\text{C}$  ( $-XX^{\circ}\text{F}$ ) or above  $XX^{\circ}\text{C}$  ( $XXX^{\circ}\text{F}$ )” and “For uncompensated Baro-VNAV systems, procedure NA below  $-XX^{\circ}\text{C}$  ( $-XX^{\circ}\text{F}$ ) or above  $XX^{\circ}\text{C}$  ( $XXX^{\circ}\text{F}$ )” apply to baro-VNAV equipped aircraft. These temperatures and how they are used are independent of the temperature and procedures applied for a Cold Temperature Airport.

**1.** The uncompensated baro-VNAV chart note and temperature range on an RNAV (GPS) approach is applicable to the LNAV/VNAV line of minima. Baro-VNAV equipped aircraft without a temperature compensating system may not use the RNAV (GPS) approach LNAV/VNAV line of minima when the actual temperature is above or below the charted temperature range.

**2.** The uncompensated baro-VNAV chart note and temperature range on an RNAV (RNP) approach applies to the entire procedure. For aircraft without a baro-VNAV and temperature compensating system, the RNAV (RNP) approach is not authorized when the actual temperature is above or below the charted uncompensated baro-VNAV temperature range.

**b.** Baro-VNAV temperature range versus CTA temperature: The baro-VNAV and CTA temperatures are independent and do not follow the same correction or reporting procedures. However, there are times when both procedures, each according to its associated temperature, should be accomplished on the approach.

**c.** Operating and ATC reporting procedures.

**1.** Do not use the CTA operating or reporting procedure found in this section, 7-3-4 a. thru 7-3-5 e. when complying with the baro-VNAV temperature note on an RNAV (GPS) approach. Correction is not required nor expected to be applied to procedure

altitudes or VNAV paths outside of the final approach segment.

**2.** Operators must advise ATC when making temperature corrections on RNP authorization required (AR) approaches while adhering to baro-VNAV temperature note.


**3.** Reporting altitude corrections is required when complying with CTAs in conjunction with the baro-VNAV temperature note. The CTA altitude corrections will be reported in this situation. No altitude correction reporting is required in the final segment.

#### NOTE-

*When executing an approach with vertical guidance at a CTA (i.e., ILS, localizer performance with vertical guidance (LPV), LNAV/VNAV), pilots are reminded to intersect the glideslope/glidepath at the corrected intermediate altitude (if applicable) and follow the published glideslope/glidepath to the corrected minima. The ILS glideslope and WAAS generated glidepath are unaffected by cold temperatures and provide vertical guidance to the corrected DA. Begin descent on the ILS glideslope or WAAS generated glidepath when directed by aircraft instrumentation. Temperature affects the precise final approach fix (PFAF) true altitude where a baro-VNAV generated glidepath begins. The PFAF altitude must be corrected when below the CTA temperature restriction for the intermediate segment or outside of the baro-VNAV temperature restriction when using the LNAV/VNAV line of minima to the corrected DA.*

### 7-3-4. Cold Temperature Airports (CTA)

**a.** General: The FAA has determined that operating in cold temperatures has placed some 14 CFR Part 97 instrument approach procedures in the United States National Airspace System at risk for loss of required obstacle clearance (ROC). An airport that is determined to be at risk will have an ICON and temperature published on the instrument approach procedure (IAP) in the terminal procedures publication (TPP).

**b.** CTA identification in TPP: A CTA is identified by a “snowflake” icon () and temperature limit, in Celsius, on U.S. Government approach charts.

**c.** A current list of CTAs is located at: [https://www.faa.gov/air\\_traffic/flight\\_info/aeronav/digital\\_products/dtpp/search/](https://www.faa.gov/air_traffic/flight_info/aeronav/digital_products/dtpp/search/). Airports are listed by ICAO code, Airport Name, Temperature in Celsius, and affected segment(s).

**d.** Airport Criteria. The CTA risk analysis is performed on airports that have at least one runway

of 2500 ft. Pilots operating into an airport with a runway length less than 2500 ft. may make a cold temperature altitude correction in cold temperature conditions, if desired. Comply with operating and reporting procedures for CTAs.

**e. ATC Reporting Requirements.** Pilots must advise ATC with the corrected altitude when applying an altitude correction on any approach segment with the exception of the final segment.

**f. Methods to apply correction:** The FAA recommends operators/pilots use either the All Segments Method or the Individual Segments Method when making corrections at CTAs.

### 7-3-5. Cold Temperature Airport Procedures

**a. PILOTS MUST NOT MAKE AN ALTIME-TER CHANGE** to accomplish an altitude correction. Pilots must ensure that the altimeter is set to the current altimeter setting provided by ATC in accordance with 14 CFR §91.121.

**b. Actions on when and where to make corrections:** Pilots will make an altitude correction to the published, “at”, “at or above”, and “at or below” altitudes on all designated segment(s) to all runways for all published instrument approach procedures when the reported airport temperature is at or below the published CTA temperature on the approach plate. A pilot may request an altitude correction (if desired) on any approach at any United States airport when extreme cold temperature is encountered. Pilots making a correction must comply with ATC reporting requirements.

**c. Correctable altitudes:** ATC does not apply a cold temperature correction to their Minimum Vectoring Altitude (MVA) or Minimum IFR Altitude (MIA) charts. Pilots must request approval from ATC to apply a cold temperature correction to any ATC assigned altitude. Pilots must not correct altitudes published on Standard Instrument Departures (SIDs), Obstacle Departure Procedures (ODPs), and Standard Terminal Arrivals (STARs).

**d. Use of corrected MDA/DA:** Pilots will use the corrected MDA or DA as the minimum altitude for an approach. Pilots must meet the requirements in 14 CFR Part 91.175 in order to operate below the corrected MDA or DA. Pilots must see and avoid

obstacles when descending below the minimum altitude on the approach.

#### **NOTE–**

*The corrected DA or MDA does not affect the visibility minima published for the approach. With the application of a cold temperature correction to the DA or MDA, the airplane should be in a position on the glideslope/glide-path or at the published missed approach point to identify the runway environment.*

**e. How to apply Cold Temperature Altitude Corrections on an Approach.**

**1. All Segments Method:** Pilots may correct all segment altitudes from the initial approach fix (IAF) altitude to the missed approach (MA) final holding altitude. Pilots familiar with the information in this section and the procedures for accomplishing the all segments method, only need to use the published “snowflake” icon, /CTA temperature limit on the approach chart for making corrections. Pilots are not required to reference the CTA list. The altitude correction is calculated as follows:

**(a) Manual correction:** Pilots will make a manual correction when the aircraft is not equipped with a temperature compensating system or when a compensating system is not used to make the correction. Use TBL 7-3-1, ICAO Cold Temperature Error Table to calculate the correction needed for the approach segment(s).

**(1) Correct all altitudes from the final approach fix (FAF)/PFAF up to and including the IAF altitude:** Calculate the correction by taking the FAF/PFAF altitude and subtracting the airport elevation. Use this number to enter the height above airport column in TBL 7-3-1 until reaching the reported temperature from the “Reported Temperature” row. Round this number as applicable and then add to all altitudes from the FAF altitude through the IAF altitude.

**(2) Correct all altitudes in the final segment:** Calculate the correction by taking the MDA or DA for the approach being flown and subtract the airport elevation. Use this number to enter the height above airport column in TBL 7-3-1 until reaching the reported temperature from the “Reported Temperature” row. Use this number or round up to next nearest 100. Add this number to MDA or DA, as applicable, and any applicable step-down fixes in the final segment.

(3) Correct final holding altitude in the MA Segment: Calculate the correction by taking the final missed approach (MA) holding altitude and subtract the airport elevation. Use this number to enter the height above airport column in TBL 7-3-1 until reaching the reported temperature from the “Reported Temperature” row. Round this number as applicable and then add to the final MA altitude only.

(b) Aircraft with temperature compensating systems: If flying an aircraft equipped with a system capable of temperature compensation, follow the instructions for applying temperature compensation provided in the airplane flight manual (AFM), AFM supplement, or system operating manual. Ensure that temperature compensation system is on and active prior to the IAF and remains active throughout the entire approach and missed approach.

(1) Pilots that have a system that is able to calculate a temperature-corrected DA or MDA may use the system for this purpose.

(2) Pilots that have a system unable to calculate a temperature corrected DA or MDA will manually calculate an altitude correction for the MDA or DA.

**NOTE-**

*Some systems apply temperature compensation only to those altitudes associated with an instrument approach procedure loaded into the active flight plan while other systems apply temperature compensation to all procedure altitudes or user entered altitudes in the active flight plan, including altitudes associated with a STAR. For those systems that apply temperature compensation to all altitudes in the active flight plan, delay activating temperature compensation until the aircraft has passed the last altitude constraint associated with the active STAR.*

2. Individual Segment(s) Method: Pilots are allowed to correct only the marked segment(s) indicated in the CTA list. [https://www.faa.gov/air\\_traffic/flight\\_info/aeronav/digital\\_products/dtpp/search/](https://www.faa.gov/air_traffic/flight_info/aeronav/digital_products/dtpp/search/). Pilots using the Individual Segment(s) Method will reference the CTA list to determine which segment(s) need a correction. See FIG 6-3-1.

FIG 6-3-1

**Example Cold Temperature Restricted Airport List – Required Segments**

Identifier	Airport Name	Temperature	Intermediate	Final	Missed Appr
3U3	Bowman Field	-33C	X		
6S5	Ravalli County	-23C			X
6S8	Laurel Municipal	-30C	X		
7S0	Ronan	-27C	X		
8S1	Polson	-20C	X	X	
32S	Stevensville	-20C	X		

(a) Manual Correction: Pilots will make a manual correction when the aircraft is not equipped with a temperature compensating system or when a compensating system is not used to make the correction. Use TBL 7-3-1, ICAO Cold Temperature Error Table, to calculate the correction needed for the approach segment(s).

(1) Intermediate Segment: All altitudes from the FAF/PFAF up to but not including the intermediate fix (IF) altitude. Calculate the correction by taking FAF/PFAF altitude and subtracting the airport elevation. Use this number to enter the height above airport column in TBL 7-3-1 until reaching the reported temperature from the “Reported Temperature” row. Round this number as applicable and then add to FAF altitude and all step-down

altitudes within the intermediate segment (inside of the waypoint labeled “(IF)”).

(2) Final segment: Calculate correction by taking the MDA or DA for the approach flown and subtract the airport elevation. Use this number to enter the height above airport column in TBL 7-3-1 until reaching the reported temperature from the “Reported Temperature” row. Use this number or round up to next nearest 100. Add this number to MDA or DA, as applicable, and any applicable step-down fixes in the final segment.

(3) Missed Approach Segment: Calculate the correction by taking the final MA holding altitude and subtract the airport elevation. Use this number to enter the height above airport column in TBL 7-3-1 until reaching the reported temperature from the

“Reported Temperature” row. Round this number as applicable and then add to the final MA altitude only.

**(b) Aircraft with temperature compensating system:** If flying an aircraft equipped with a system capable of temperature compensation, follow the instructions for applying temperature compensation provided in the AFM, AFM supplement, or system operating manual. Ensure the temperature compensation system is on and active prior to the segment(s) being corrected. Manually calculate an altimetry correction for the MDA or DA. Determine an altimetry correction from the ICAO table based on the reported airport temperature and the height difference between the MDA or DA, as applicable, and the airport elevation, or use the compensating system to calculate a temperature corrected altitude for the published MDA or DA if able.

**f. Acceptable Use of Table for manual CTA altitude correction:** (See TBL 7-3-1.) Pilots may calculate a correction with a visual interpolation of the chart when using reported temperature and height above airport. This calculated altitude correction may then be rounded to the nearest whole hundred or rounded up. For example, a correction of 130 ft. from the chart may be rounded to 100 ft. or 200 ft. A correction of 280 ft. will be rounded up to 300 ft. This rounded correction will be added to the appropriate altitudes for the “Individual” or “All” segment method. The correction calculated from the table for the MDA or DA may be used as is or rounded up, but never rounded down. This number will be added to the MDA, DA, and all step-down fixes inside of the FAF as applicable.

**1.** No extrapolation above the 5000 ft. column is required. Pilots may use the 5000 ft. “height above airport in feet” column for calculating corrections when the calculated altitude is greater than 5000 ft. above reporting station elevation. Pilots must add the correction(s) from the table to the affected segment altitude(s) and fly at the new corrected altitude. Do not round down when using the 5000 ft. column for calculated height above airport values greater than 5000 ft. Pilots may extrapolate above the 5000 ft. column to apply a correction if desired.

**2.** These techniques have been adopted to minimize pilot distraction by limiting the number of entries into the table when making corrections.

Although not all altitudes on the approach will be corrected back to standard day values, a safe distance above the terrain/obstacle will be maintained on the corrected approach segment(s). Pilots may calculate a correction for each fix based on the fix altitude if desired.

**NOTE—**

*Pilots may use Real Time Mesoscale Analysis (RTMA): Alternate Report of Surface Temperature, for computing altitude corrections, when airport temperatures are not available via normal reporting. The RTMA website is [http://nomads.ncep.noaa.gov/pub/data/nccf/com/rtma/prod/airport\\_temps/](http://nomads.ncep.noaa.gov/pub/data/nccf/com/rtma/prod/airport_temps/).*

**g. Communication:** Pilots must request approval from ATC whenever applying a cold temperature altitude correction. Pilots do not need to inform ATC of the final approach segment correction (i.e., new MDA or DA). This request should be made on initial radio contact with the ATC facility issuing the approach clearance. ATC requires this information in order to ensure appropriate vertical separation between known traffic. Pilots should query ATC when vectored altitudes to a segment are lower than the requested corrected altitude. Pilots are encouraged to self-announce corrected altitude when flying into a non-towered airfield.

**1.** The following are examples of appropriate pilot-to-ATC communication when applying cold-temperature altitude corrections.

**(a)** On initial check-in with ATC providing approach clearance: Missoula, MT (example below).

- Vectors to final approach course: Outside of IAFs: “Request 9700 ft. for cold temperature operations.”

- Vectors to final approach course: Inside of ODIRE: “Request 7300 ft. for cold temperature operations.”

- Missed Approach segment: “Require final holding altitude, 12500 ft. on missed approach for cold temperature operations.”

**(b)** Pilots cleared by ATC for an instrument approach procedure; “Cleared the RNAV (GPS) Y RWY 12 approach (from any IAF)”. Missoula, MT (example below).

- IAF: “Request 9700 ft. for cold temperature operations at LANNY, CHARL, or ODIRE.”

### 7-3-6. Examples for Calculating Altitude Corrections on CTAs

All 14 CFR Part 97 IAPs must be corrected at an airport. The following example provides the steps for correcting the different segments of an approach and will be applied to all 14 CFR Part 97 IAPs:

**a.** Missoula Intl (KMSO). Reported Temperature  $-12^{\circ}\text{C}$ : RNAV (GPS) Y RWY 12.

**1.** All Segments Method: All segments corrected from IAF through MA holding altitude.

**(a)** Manual Calculation:

**(1)** Cold Temperature Restricted Airport Temperature Limit:  $-12^{\circ}\text{C}$ .

**(2)** Altitude at the Final Approach Fix (FAF) (SUPPY) = 6200 ft.

**(3)** Airport elevation = 3206 ft.

**(4)** Difference: 6200 ft.  $-$  3206 ft. = 2994 ft.

**(5)** Use TBL 7-3-1, ICAO Cold Temperature Error Table, a height above airport of 2994 ft. and  $-12^{\circ}\text{C}$ . Visual interpolation is approximately 300 ft. Actual interpolation is 300 ft.

**(6)** Add 300 ft. to the FAF and all procedure altitudes outside of the FAF up to and including IAF altitude(s):

**[a]** LANNY (IAF), CHARL (IAF), and ODIRE (IAF Holding-in-Lieu):  $9400 + 300 = 9700$  ft.

**[b]** CALIP (stepdown fix):  $7000 + 300 = 7300$  ft.

**[c]** SUPPY (FAF):  $6200 + 300 = 6500$  ft.

**(7)** Correct altitudes within the final segment altitude based on the minima used. LP MDA = 4520 ft.

**(8)** Difference: 4520 ft.  $-$  3206 ft. = 1314 ft.

**(9)** AIM 7-3-1 Table: 1314 ft. at  $-12^{\circ}\text{C}$  is approximately 150ft. Use 150 ft. or round up to 200 ft.

**(10)** Add corrections to altitudes up to but not including the FAF:

**[a]** BEGPE (stepdown fix):  $4840 + 150 = 4990$  ft.

**[b]** LNAV MDA:  $4520 + 180 = 4670$  ft.

**(11)** Correct JENKI/Missed Approach Holding Altitude: MA altitude is 12000:

**[a]** JENKI:  $12000 - 3206 = 8794$  ft.

**(12)** Table 7-3-1: 8794 ft. at  $-12^{\circ}\text{C}$ . Enter table at  $-12^{\circ}\text{C}$  and intersect the 5000 ft. height above airport column. The approximate value is 500 ft.

**(13)** Add correction to holding fix final altitude:

**[a]** JENKI:  $12000 + 500 = 12500$  ft.

**b.** Temperature Compensating System: Operators using a temperature compensating RNAV system to make altitude corrections will be set to the current airport temperature ( $-12^{\circ}\text{C}$ ) and activated prior to passing the IAF. A manual calculation of the cold temperature altitude correction is required for the MDA/DA.

**1.** Individual Segments Method: Missoula requires correction in the intermediate and final segments. However, in this example, the missed approach is also shown.

**(a)** Manual Calculation: Use the appropriate steps in the All Segments Method above to apply a correction to the required segment.

**(1)** Intermediate. Use steps 7-3-6 a. 1. (a) (1) thru (6). Do not correct the IAF or IF when using individual segments method.

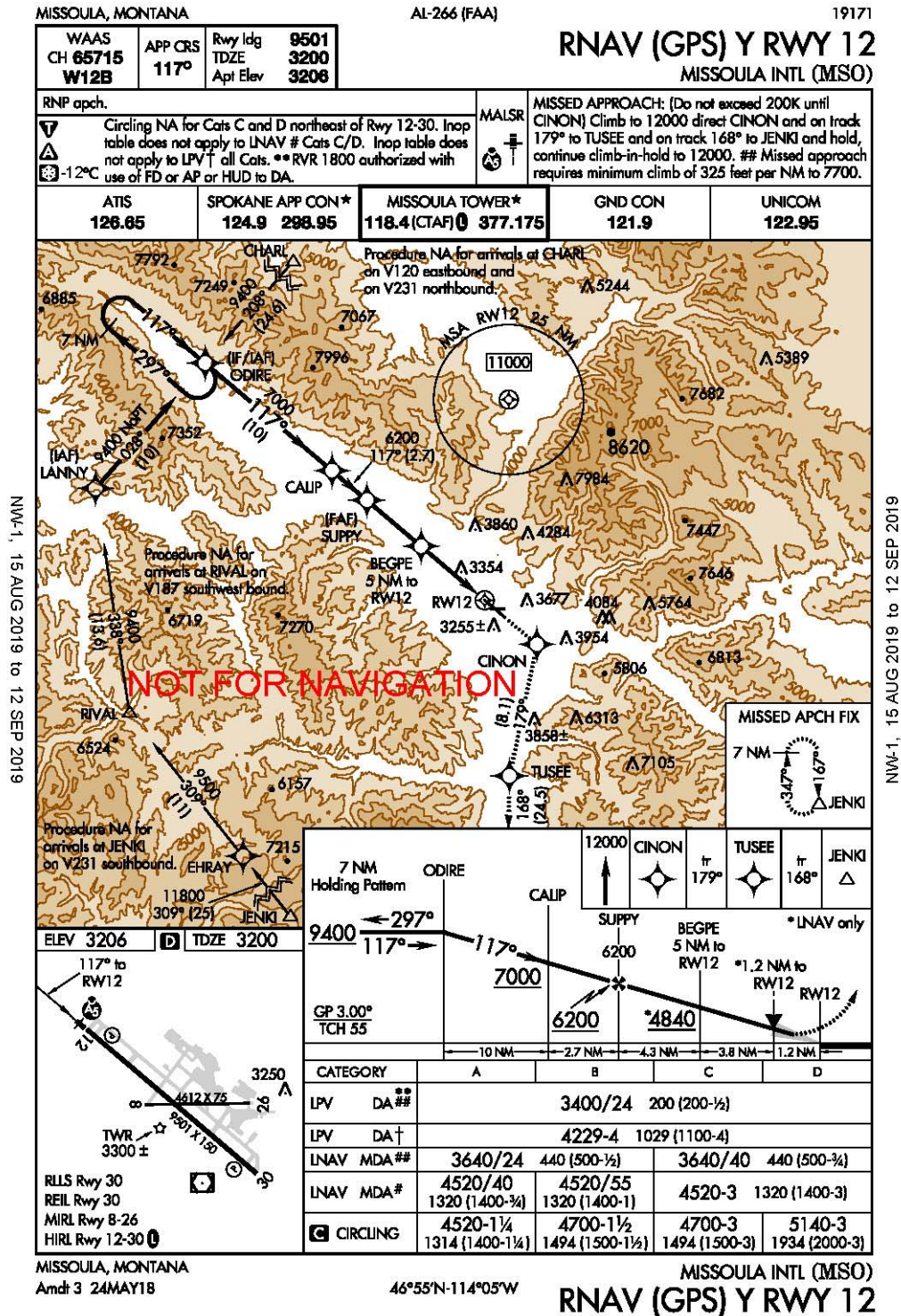
**(2)** Final. Use steps 7-3-6 a. 1. (a) (7) thru (10).

**(3)** Missed Approach. Use steps 7-3-6 a. 1. (a) (11) thru (13).

**(b)** Temperature Compensating System: Operators using a temperature compensating RNAV system to make altitude corrections will be set to the current airport temperature ( $-12^{\circ}\text{C}$ ) and activated at a point needed to correct the altitude for the segment. A manual calculation of the cold temperature altitude correction is required for the MDA/DA.



FIG 6-3-2  
Missoula Intl RNAV (GPS) Y RWY 12







## Section 4. Wake Turbulence

### 7-4-1. General

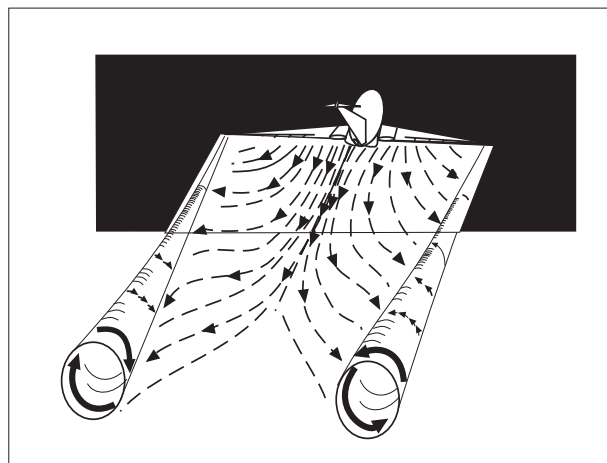
a. Every aircraft generates wake turbulence while in flight. Wake turbulence is a function of an aircraft producing lift, resulting in the formation of two counter-rotating vortices trailing behind the aircraft.

b. Wake turbulence from the generating aircraft can affect encountering aircraft due to the strength, duration, and direction of the vortices. Wake turbulence can impose rolling moments exceeding the roll-control authority of encountering aircraft, causing possible injury to occupants and damage to aircraft. Pilots should always be aware of the possibility of a wake turbulence encounter when flying through the wake of another aircraft, and adjust the flight path accordingly.

### 7-4-2. Vortex Generation

a. The creation of a pressure differential over the wing surface generates lift. The lowest pressure occurs over the upper wing surface and the highest pressure under the wing. This pressure differential triggers the roll up of the airflow at the rear of the wing resulting in swirling air masses trailing downstream of the wing tips. After the roll up is completed, the wake consists of two counter-rotating cylindrical vortices. (See FIG 7-4-1.) The wake vortex is formed with most of the energy concentrated within a few feet of the vortex core.

FIG 7-4-1  
Wake Vortex Generation



b. More aircraft are being manufactured or retrofitted with winglets. There are several types of winglets, but their primary function is to increase fuel efficiency by improving the lift-to-drag ratio. Studies have shown that winglets have a negligible effect on wake turbulence generation, particularly with the slower speeds involved during departures and arrivals.

### 7-4-3. Vortex Strength

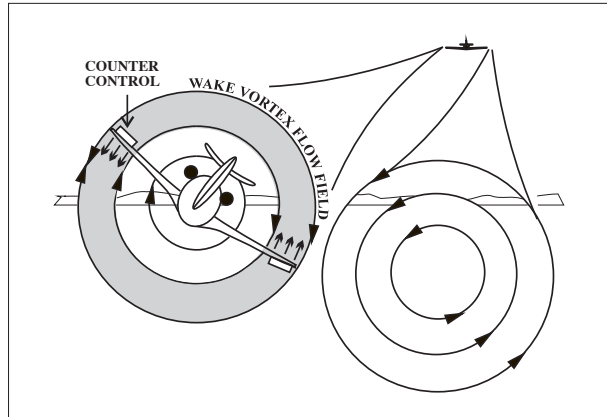
a. Weight, speed, wingspan, and shape of the generating aircraft's wing all govern the strength of the vortex. The vortex characteristics of any given aircraft can also be changed by extension of flaps or other wing configuring devices. However, the vortex strength from an aircraft increases proportionately to an increase in operating weight or a decrease in aircraft speed. Since the turbulence from a "dirty" aircraft configuration hastens wake decay, the greatest vortex strength occurs when the generating aircraft is HEAVY, CLEAN, and SLOW.

#### b. Induced Roll

1. In rare instances, a wake encounter could cause catastrophic inflight structural damage to an aircraft. However, the usual hazard is associated with induced rolling moments that can exceed the roll-control authority of the encountering aircraft. During inflight testing, aircraft intentionally flew directly up trailing vortex cores of larger aircraft. These tests demonstrated that the ability of aircraft to counteract the roll imposed by wake vortex depends primarily on the wingspan and counter-control responsiveness of the encountering aircraft. These tests also demonstrated the difficulty of an aircraft to remain within a wake vortex. The natural tendency is for the circulation to eject aircraft from the vortex.

2. Counter control is usually effective and induced roll minimal in cases where the wingspan and ailerons of the encountering aircraft extend beyond the rotational flow field of the vortex. It is more difficult for aircraft with short wingspan (relative to the generating aircraft) to counter the imposed roll induced by vortex flow. Pilots of short span aircraft, even of the high performance type, must be especially alert to vortex encounters. (See FIG 7-4-2.)

FIG 7-4-2

**Wake Encounter Counter Control****7-4-4. Vortex Behavior**

a. Trailing vortices have certain behavioral characteristics which can help a pilot visualize the wake location and thereby take avoidance precautions.

1. An aircraft generates vortices from the moment it rotates on takeoff to touchdown, since trailing vortices are a by-product of wing lift. Prior to takeoff or touchdown pilots should note the rotation or touchdown point of the preceding aircraft. (See FIG 7-4-3.)

2. The vortex circulation is outward, upward and around the wing tips when viewed from either ahead or behind the aircraft. Tests with larger aircraft have shown that the vortices remain spaced a bit less than a wingspan apart, drifting with the wind, at altitudes greater than a wingspan from the ground. In view of this, if persistent vortex turbulence is encountered, a slight change of altitude (upward) and lateral position (upwind) should provide a flight path clear of the turbulence.

3. Flight tests have shown that the vortices from larger aircraft sink at a rate of several hundred feet per minute, slowing their descent and diminishing in strength with time and distance behind the generating aircraft. Pilots should fly at or above the preceding aircraft's flight path, altering course as necessary to avoid the area directly behind and below the generating aircraft. (See FIG 7-4-4.) Pilots, in all phases of flight, must remain vigilant of possible wake effects created by other aircraft. Studies have shown that atmospheric turbulence hastens wake breakup, while other atmospheric conditions can transport wake horizontally and vertically.

4. When the vortices of larger aircraft sink close to the ground (within 100 to 200 feet), they tend to move laterally over the ground at a speed of 2 or 3 knots. (See FIG 7-4-5)

FIG 7-4-3

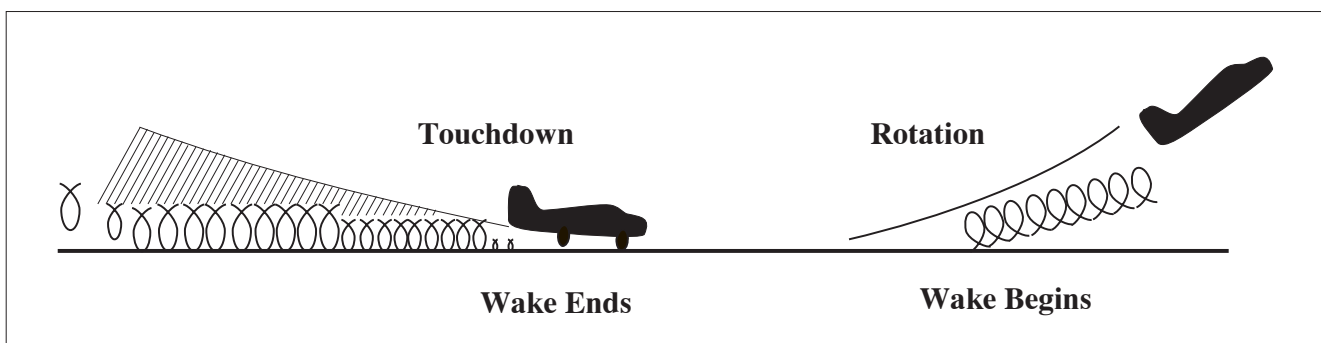
**Wake Ends/Wake Begins**

FIG 7-4-4  
Vortex Flow Field

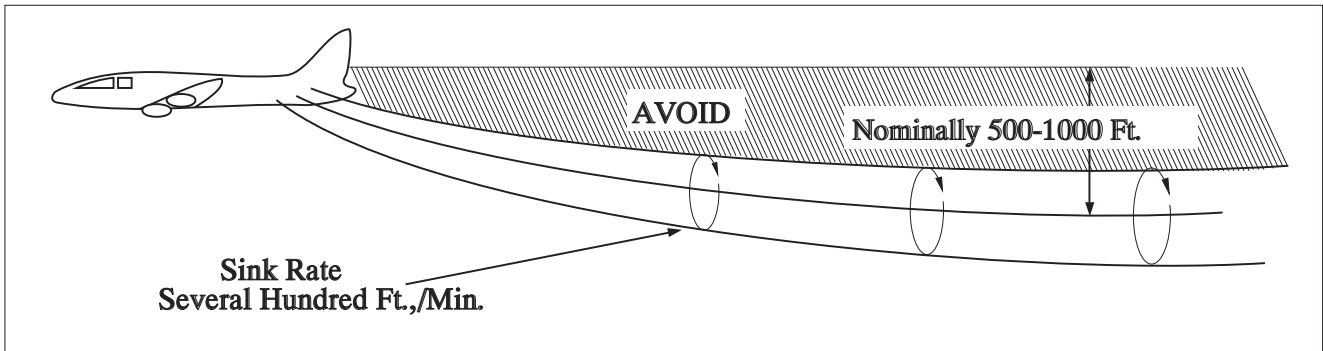


FIG 7-4-5  
Vortex Movement Near Ground - No Wind

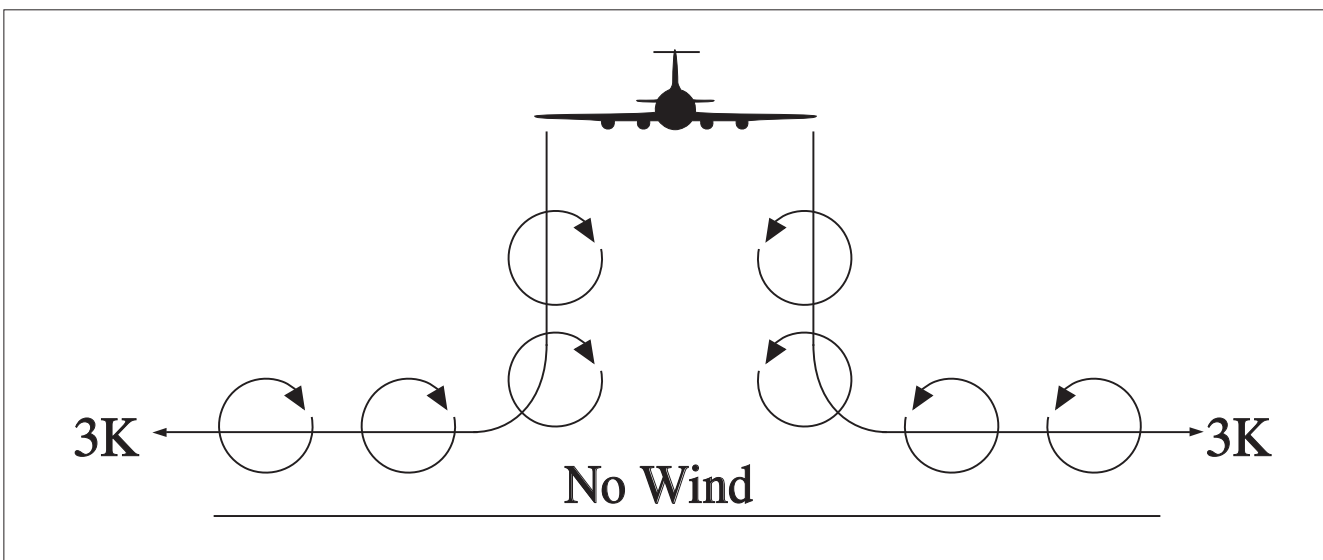
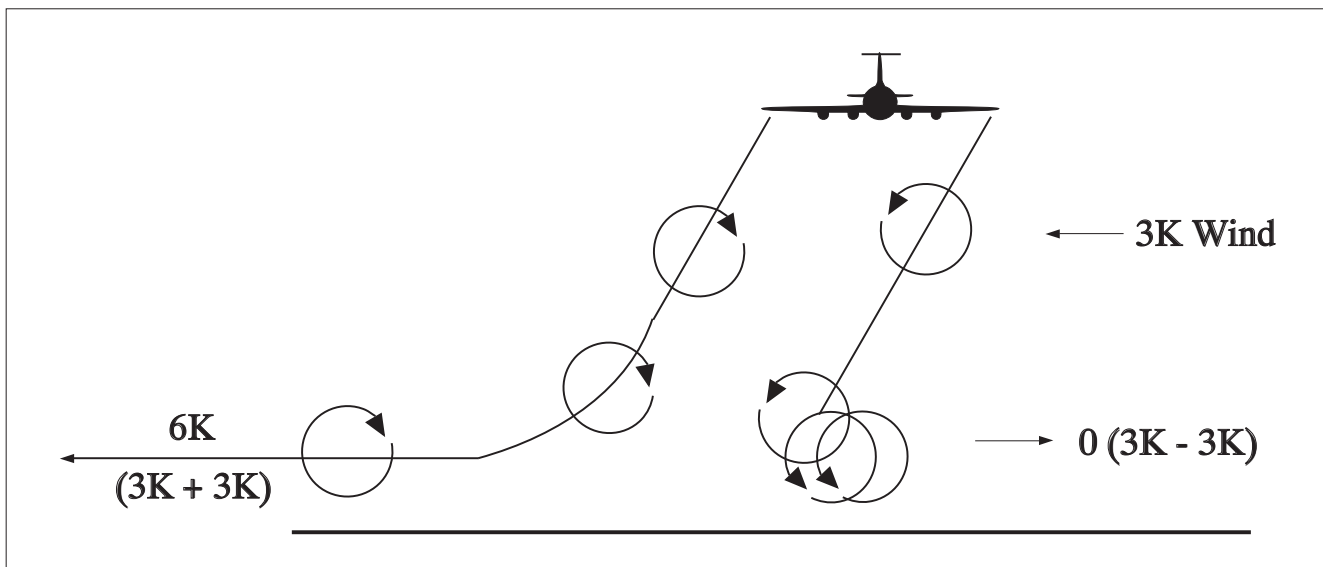


FIG 7-4-6  
Vortex Movement Near Ground - with Cross Winds

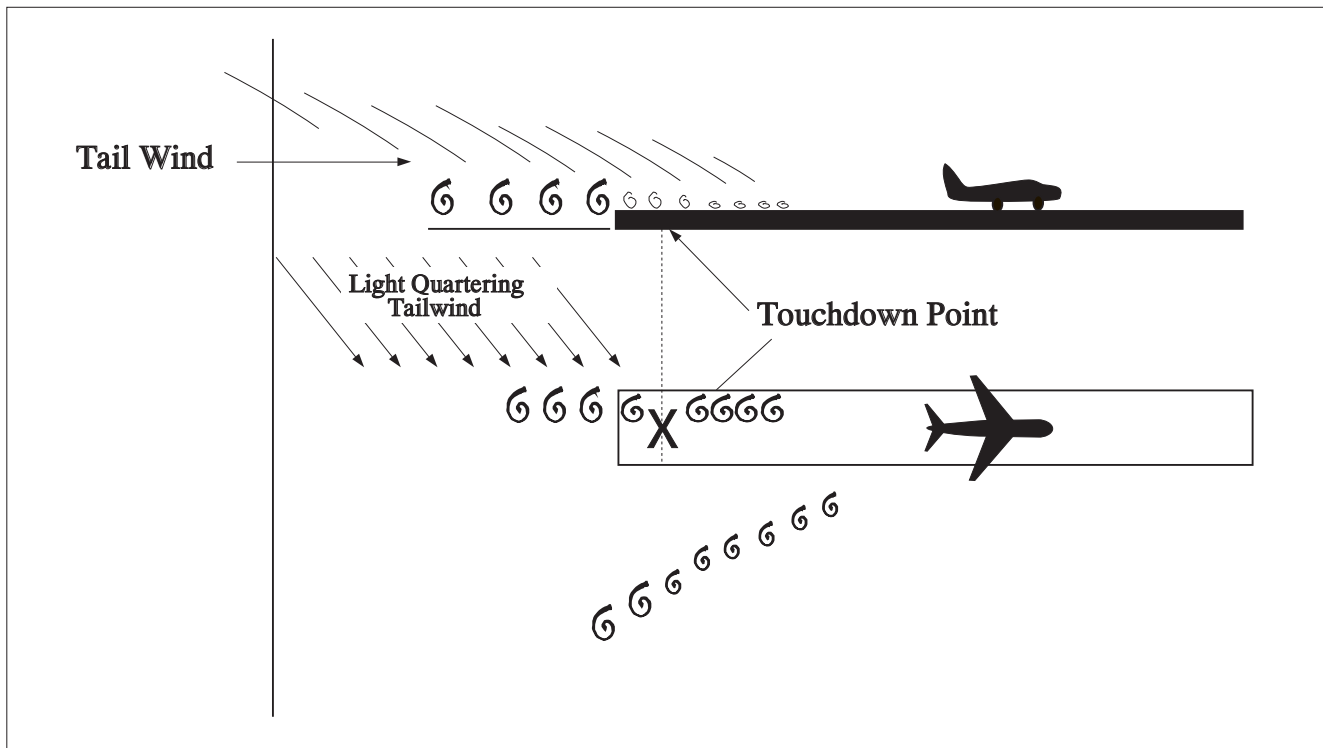


5. Pilots should be alert at all times for possible wake vortex encounters when conducting approach and landing operations. The pilot is ultimately responsible for maintaining an appropriate interval, and should consider all available information in positioning the aircraft in the terminal area, to avoid the wake turbulence created by a preceding aircraft. Test data shows that vortices can rise with the air mass in which they are embedded. The effects of wind shear can cause vortex flow field “tilting.” In addition, ambient thermal lifting and orographic effects (rising terrain or tree lines) can cause a vortex flow field to rise and possibly bounce.

b. A crosswind will decrease the lateral movement

of the upwind vortex and increase the movement of the downwind vortex. Thus, a light wind with a cross-runway component of 1 to 5 knots could result in the upwind vortex remaining in the touchdown zone for a period of time and hasten the drift of the downwind vortex toward another runway. (See FIG 7-4-6.) Similarly, a tailwind condition can move the vortices of the preceding aircraft forward into the touchdown zone. THE LIGHT QUARTERING TAILWIND REQUIRES MAXIMUM CAUTION. Pilots should be alert to large aircraft upwind from their approach and takeoff flight paths. (See FIG 7-4-7.)

FIG 7-4-7  
Vortex Movement in Ground Effect – Tailwind



#### 7-4-5. Operations Problem Areas

a. A wake turbulence encounter can range from negligible to catastrophic. The impact of the encounter depends on the weight, wingspan, size of the generating aircraft, distance from the generating aircraft, and point of vortex encounter. The probability of induced roll increases when the encountering aircraft's heading is generally aligned with the flight path of the generating aircraft.

b. AVOID THE AREA BELOW AND BEHIND THE WAKE GENERATING AIRCRAFT, ESPECIALLY AT LOW ALTITUDE WHERE EVEN A MOMENTARY WAKE ENCOUNTER COULD BE CATASTROPHIC.

#### NOTE-

*A common scenario for a wake encounter is in terminal airspace after accepting clearance for a visual approach behind landing traffic. Pilots must be cognizant of their position relative to the traffic and use all means of vertical*

*guidance to ensure they do not fly below the flight path of the wake generating aircraft.*

c. Pilots should be particularly alert in calm wind conditions and situations where the vortices could:

1. Remain in the touchdown area.
2. Drift from aircraft operating on a nearby runway.
3. Sink into the takeoff or landing path from a crossing runway.
4. Sink into the traffic pattern from other airport operations.
5. Sink into the flight path of VFR aircraft operating on the hemispheric altitude 500 feet below.

d. Pilots should attempt to visualize the vortex trail of aircraft whose projected flight path they may encounter. When possible, pilots of larger aircraft should adjust their flight paths to minimize vortex exposure to other aircraft.

#### ■ 7-4-6. Vortex Avoidance Procedures

a. Under certain conditions, airport traffic controllers apply procedures for separating IFR aircraft. If a pilot accepts a clearance to visually follow a preceding aircraft, the pilot accepts responsibility for separation and wake turbulence avoidance. The controllers will also provide to VFR aircraft, with whom they are in communication and which in the tower's opinion may be adversely affected by wake turbulence from a larger aircraft, the position, altitude and direction of flight of larger aircraft followed by the phrase "CAUTION – WAKE TURBULENCE." After issuing the caution for wake turbulence, the airport traffic controllers generally do not provide additional information to the following aircraft unless the airport traffic controllers know the following aircraft is overtaking the preceding aircraft. **WHETHER OR NOT A WARNING OR INFORMATION HAS BEEN GIVEN, HOWEVER, THE PILOT IS EXPECTED TO ADJUST AIRCRAFT OPERATIONS AND FLIGHT PATH AS NECESSARY TO PRECLUDE SERIOUS WAKE ENCOUNTERS.** When any doubt exists about maintaining safe separation distances between aircraft during approaches, pilots should ask the control tower for updates on separation distance and aircraft groundspeed.

b. The following vortex avoidance procedures are recommended for the various situations:

**1. Landing behind a larger aircraft– same runway.** Stay at or above the larger aircraft's final approach flight path–note its touchdown point–land beyond it.

**2. Landing behind a larger aircraft– when parallel runway is closer than 2,500 feet.** Consider possible drift to your runway. Stay at or above the larger aircraft's final approach flight path– note its touchdown point.

**3. Landing behind a larger aircraft– crossing runway.** Cross above the larger aircraft's flight path.

**4. Landing behind a departing larger aircraft– same runway.** Note the larger aircraft's rotation point– land well prior to rotation point.

**5. Landing behind a departing larger aircraft– crossing runway.** Note the larger aircraft's rotation point– if past the intersection– continue the approach– land prior to the intersection. If larger aircraft rotates prior to the intersection, avoid flight below the larger aircraft's flight path. Abandon the approach unless a landing is ensured well before reaching the intersection.

**6. Departing behind a larger aircraft.** Note the larger aircraft's rotation point and rotate prior to the larger aircraft's rotation point. Continue climbing above the larger aircraft's climb path until turning clear of the larger aircraft's wake. Avoid subsequent headings which will cross below and behind a larger aircraft. Be alert for any critical takeoff situation which could lead to a vortex encounter.

**7. Intersection takeoffs– same runway.** Be alert to adjacent larger aircraft operations, particularly upwind of your runway. If intersection takeoff clearance is received, avoid subsequent heading which will cross below a larger aircraft's path.

**8. Departing or landing after a larger aircraft executing a low approach, missed approach, or touch-and-go landing.** Because vortices settle and move laterally near the ground, the vortex hazard may exist along the runway and in your flight path after a larger aircraft has executed a low approach, missed approach, or a touch-and-go landing, particular in light quartering wind conditions. You should ensure that an interval of at least 2 minutes has elapsed before your takeoff or landing.

**9. En route VFR (thousand-foot altitude plus 500 feet).** Avoid flight below and behind a large aircraft's path. If a larger aircraft is observed above on the same track (meeting or overtaking) adjust your position laterally, preferably upwind.

## ■ 7-4-7. Helicopters

In a slow hover taxi or stationary hover near the surface, helicopter main rotor(s) generate downwash producing high velocity outwash vortices to a distance approximately three times the diameter of the rotor. When rotor downwash hits the surface, the resulting outwash vortices have behavioral characteristics similar to wing tip vortices produced by fixed wing aircraft. However, the vortex circulation is outward, upward, around, and away from the main rotor(s) in all directions. Pilots of small aircraft should avoid operating within three rotor diameters of any helicopter in a slow hover taxi or stationary hover. In forward flight, departing or landing helicopters produce a pair of strong, high-speed trailing vortices similar to wing tip vortices of larger fixed wing aircraft. Pilots of small aircraft should use caution when operating behind or crossing behind landing and departing helicopters.

## ■ 7-4-8. Pilot Responsibility

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

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

1. Traffic information.
2. Instructions to follow an aircraft; and
3. The acceptance of a visual approach clearance.

**c.** For operations conducted behind **super** or **heavy** aircraft, ATC will specify the word "**super**" or "**heavy**" as appropriate, when this information is

known. Pilots of **super** or **heavy** aircraft should always use the word "**super**" or "**heavy**" in radio communications.

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

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

### **EXAMPLE-**

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

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

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

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

### **EXAMPLE-**

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

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

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

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

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

**EXAMPLE–**

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

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

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

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

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

## 7-4-9. Air Traffic Wake Turbulence Separations

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

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

(a) **Heavy** behind **super** – 6 miles.

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

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

(d) **Heavy** behind **heavy** – 4 miles.

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

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

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

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

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

**REFERENCE–**

*Pilot/Controller Glossary Term– Aircraft Classes.*

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

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

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

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

**NOTE–**

*Controllers may not reduce or waive these intervals.*

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

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

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

**NOTE–**

*This 3-minute interval may be waived upon specific pilot request.*

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

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

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

**NOTE—**

*This 3-minute interval may not be waived.*

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

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

**NOTE—**

*14 CFR Section 91.3(a) states: “The pilot-in-command of an aircraft is directly responsible for and is the final authority as to the operation of that aircraft.”*

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

**NOTE—**

*With the advent of new wake turbulence separation methodologies known as Wake Turbulence Recategoriza-*

*tion, some of the requirements listed above may vary at facilities authorized to operate in accordance with Wake Turbulence Recategorization directives.*

**REFERENCE—**

*FAA Order JO 7110.659 Wake Turbulence Recategorization*

*FAA Order JO 7110.123 Wake Turbulence Recategorization – Phase II*

*FAA Order JO 7110.126, Consolidated Wake Turbulence*

## 7-4-10. Development and New Capabilities

a. The suite of available wake turbulence tools, rules, and procedures is expanding, with the development of new methodologies. Based on extensive analysis of wake vortex behavior, new procedures and separation standards are being developed and implemented in the US and throughout the world. Wake research involves the wake generating aircraft as well as the wake toleration of the trailing aircraft.

b. The FAA and ICAO are leading initiatives, in terminal environments, to implement next-generation wake turbulence procedures and separation standards. The FAA has undertaken an effort to recategorize the existing fleet of aircraft and modify associated wake turbulence separation minima. This initiative is termed Wake Turbulence Recategorization (RECAT), and changes the current weight-based classes (Super, Heavy, B757, Large, Small+, and Small) to a wake-based categorical system that utilizes the aircraft matrices of weight, wingspan, and approach speed. RECAT is currently in use at a limited number of airports in the National Airspace System.



## Section 5. Bird Hazards and Flight Over National Refuges, Parks, and Forests

### 7-5-1. 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.

### 7-5-2. 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.

### 7-5-3. 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 [https://www.faa.gov/airports/airport\\_safety/wildlife/](https://www.faa.gov/airports/airport_safety/wildlife/). 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.

### 7-5-4. 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.

### 7-5-5. 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.

### 7-5-6. 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.

## Section 6. Potential Flight Hazards

### 7-6-1. Accident Cause Factors

a. The 10 most frequent cause factors for general aviation accidents that involve the pilot-in-command are:

1. Inadequate preflight preparation and/or planning.
2. Failure to obtain and/or maintain flying speed.
3. Failure to maintain direction control.
4. Improper level off.
5. Failure to see and avoid objects or obstructions.
6. Mismanagement of fuel.
7. Improper inflight decisions or planning.
8. Misjudgment of distance and speed.
9. Selection of unsuitable terrain.
10. Improper operation of flight controls.

b. This list remains relatively stable and points out the need for continued refresher training to establish a higher level of flight proficiency for all pilots. A part of the FAA's continuing effort to promote increased aviation safety is the Aviation Safety Program. For information on Aviation Safety Program activities contact your nearest Flight Standards District Office.

c. **Alertness.** Be alert at all times, especially when the weather is good. Most pilots pay attention to business when they are operating in full IFR weather conditions, but strangely, air collisions almost invariably have occurred under ideal weather conditions. Unlimited visibility appears to encourage a sense of security which is not at all justified. Considerable information of value may be obtained by listening to advisories being issued in the terminal area, even though controller workload may prevent a pilot from obtaining individual service.

d. **Giving Way.** If you think another aircraft is too close to you, give way instead of waiting for the other pilot to respect the right-of-way to which you may be

entitled. It is a lot safer to pursue the right-of-way angle after you have completed your flight.

### 7-6-2. VFR in Congested Areas

A high percentage of near midair collisions occur below 8,000 feet AGL and within 30 miles of an airport. When operating VFR in these highly congested areas, whether you intend to land at an airport within the area or are just flying through, it is recommended that extra vigilance be maintained and that you monitor an appropriate control frequency. Normally the appropriate frequency is an approach control frequency. By such monitoring action you can "get the picture" of the traffic in your area. When the approach controller has radar, radar traffic advisories may be given to VFR pilots upon request.

#### REFERENCE—

AIM, Paragraph 4-1-15, Radar Traffic Information Service

### 7-6-3. Obstructions To Flight

a. **General.** Many structures exist that could significantly affect the safety of your flight when operating below 500 feet AGL, and particularly below 200 feet AGL. While 14 CFR Part 91.119 allows flight below 500 AGL when over sparsely populated areas or open water, such operations are very dangerous. At and below 200 feet AGL there are numerous power lines, antenna towers, etc., that are not marked and lighted as obstructions and; therefore, may not be seen in time to avoid a collision. Notices to Airmen (NOTAMs) are issued on those lighted structures experiencing temporary light outages. However, some time may pass before the FAA is notified of these outages, and the NOTAM issued, thus pilot vigilance is imperative.

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

at least 2,000 feet. Additionally, new towers may not be on your current chart because the information was not received prior to the printing of the chart.

**c. Overhead Wires.** Overhead transmission and utility lines often span approaches to runways, natural flyways such as lakes, rivers, gorges, and canyons, and cross other landmarks pilots frequently follow such as highways, railroad tracks, etc. As with antenna towers, these high voltage/power lines or the supporting structures of these lines may not always be readily visible and the wires may be virtually impossible to see under certain conditions. In some locations, the supporting structures of overhead transmission lines are equipped with unique sequence flashing white strobe light systems to indicate that there are wires between the structures. However, many power lines do not require notice to the FAA and, therefore, are not marked and/or lighted. Many of those that do require notice do not exceed 200 feet AGL or meet the Obstruction Standard of 14 CFR Part 77 and, therefore, are not marked and/or lighted. All pilots are cautioned to remain extremely vigilant for these power lines or their supporting structures when following natural flyways or during the approach and landing phase. This is particularly important for seaplane and/or float equipped aircraft when landing on, or departing from, unfamiliar lakes or rivers.

**d. Other Objects/Structures.** There are other objects or structures that could adversely affect your flight such as construction cranes near an airport, newly constructed buildings, new towers, etc. Many of these structures do not meet charting requirements or may not yet be charted because of the charting cycle. Some structures do not require obstruction marking and/or lighting and some may not be marked and lighted even though the FAA recommended it.

#### 7-6-4. Avoid Flight Beneath Unmanned Balloons

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

should remain well clear of all unmanned free balloons and flight below them should be avoided at all times.

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

#### 7-6-5. Unmanned Aircraft Systems

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

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

are operated under instrument flight rules, are in communication with ATC, and are appropriately equipped).

**c.** UAS operations may be approved at either controlled or uncontrolled airports and are typically disseminated by NOTAM. In all cases, approved UAS operations must comply with all applicable regulations and/or special provisions specified in the COA or in the operating limitations of the special airworthiness certificate. At uncontrolled airports, UAS operations are advised to operate well clear of all known manned aircraft operations. Pilots of manned aircraft are advised to follow normal operating procedures and are urged to monitor the CTAF for any potential UAS activity. At controlled airports, local ATC procedures may be in place to handle UAS operations and should not require any special procedures from manned aircraft entering or departing the traffic pattern or operating in the vicinity of the airport.

**d.** In addition to approved UAS operations described above, a recently approved agreement between the FAA and the Department of Defense authorizes small UAS operations wholly contained within Class G airspace, and in no instance, greater than 1200 feet AGL over military owned or leased property. These operations do not require any special authorization as long as the UA remains within the lateral boundaries of the military installation as well as other provisions including the issuance of a NOTAM. Unlike special use airspace, these areas may not be depicted on an aeronautical chart.

**e.** There are several factors a pilot should consider regarding UAS activity in an effort to reduce potential flight hazards. Pilots are urged to exercise increased vigilance when operating in the vicinity of restricted or other special use airspace, military operations areas, and any military installation. Areas with a preponderance of UAS activity are typically noted on sectional charts advising pilots of this activity. Since the size of a UA can be very small, they may be difficult to see and track. If a UA is encountered during flight, as with manned aircraft, never assume that the pilot or crew of the UAS can see you, maintain increased vigilance with the UA and always be prepared for evasive action if necessary. Always check NOTAMs for potential UAS activity along the intended route of flight and exercise increased vigilance in areas specified in the NOTAM.

## 7-6-6. Mountain Flying

**a.** Your first experience of flying over mountainous terrain (particularly if most of your flight time has been over the flatlands of the midwest) could be a *never-to-be-forgotten nightmare* if proper planning is not done and if you are not aware of the potential hazards awaiting. Those familiar section lines are not present in the mountains; those flat, level fields for forced landings are practically nonexistent; abrupt changes in wind direction and velocity occur; severe updrafts and downdrafts are common, particularly near or above abrupt changes of terrain such as cliffs or rugged areas; even the clouds look different and can build up with startling rapidity. Mountain flying need not be hazardous if you follow the recommendations below.

**b. File a Flight Plan.** Plan your route to avoid topography which would prevent a safe forced landing. The route should be over populated areas and well known mountain passes. Sufficient altitude should be maintained to permit gliding to a safe landing in the event of engine failure.

**c.** Don't fly a light aircraft when the winds aloft, at your proposed altitude, exceed 35 miles per hour. Expect the winds to be of much greater velocity over mountain passes than reported a few miles from them. Approach mountain passes with as much altitude as possible. Downdrafts of from 1,500 to 2,000 feet per minute are not uncommon on the leeward side.

**d.** Don't fly near or above abrupt changes in terrain. Severe turbulence can be expected, especially in high wind conditions.

**e. Understand Mountain Obscuration.** The term Mountain Obscuration (MTOS) is used to describe a visibility condition that is distinguished from IFR because ceilings, by definition, are described as "above ground level" (AGL). In mountainous terrain clouds can form at altitudes significantly higher than the weather reporting station and at the same time nearby mountaintops may be obscured by low visibility. In these areas the ground level can also vary greatly over a small area. Beware if operating VFR-on-top. You could be operating closer to the terrain than you think because the tops of mountains are hidden in a cloud deck below. MTOS areas are identified daily on The Aviation Weather Center located at:

**<http://www.aviationweather.gov>.**

**f.** Some canyons run into a dead end. Don't fly so far up a canyon that you get trapped. **ALWAYS BE ABLE TO MAKE A 180 DEGREE TURN!**

**g.** VFR flight operations may be conducted at night in mountainous terrain with the application of sound judgment and common sense. Proper pre-flight planning, giving ample consideration to winds and weather, knowledge of the terrain and pilot experience in mountain flying are prerequisites for safety of flight. Continuous visual contact with the surface and obstructions is a major concern and flight operations under an overcast or in the vicinity of clouds should be approached with extreme caution.

**h.** When landing at a high altitude field, the same indicated airspeed should be used as at low elevation fields. *Remember:* that due to the less dense air at altitude, this same indicated airspeed actually results in higher true airspeed, a faster landing speed, and more important, a longer landing distance. During gusty wind conditions which often prevail at high altitude fields, a power approach and power landing is recommended. Additionally, due to the faster groundspeed, your takeoff distance will increase considerably over that required at low altitudes.

**i. Effects of Density Altitude.** Performance figures in the aircraft owner's handbook for length of takeoff run, horsepower, rate of climb, etc., are generally based on standard atmosphere conditions (59 degrees Fahrenheit (15 degrees Celsius), pressure 29.92 inches of mercury) at sea level. However, inexperienced pilots, as well as experienced pilots, may run into trouble when they encounter an altogether different set of conditions. This is particularly true in hot weather and at higher elevations. Aircraft operations at altitudes above sea level and at higher than standard temperatures are commonplace in mountainous areas. Such operations quite often result in a drastic reduction of aircraft performance capabilities because of the changing air density. Density altitude is a measure of air density. It is not to be confused with pressure altitude, true altitude or absolute altitude. It is not to be used as a height reference, but as a determining criteria in the performance capability of an aircraft. Air density

decreases with altitude. As air density decreases, density altitude increases. The further effects of high temperature and high humidity are cumulative, resulting in an increasing high density altitude condition. High density altitude reduces all aircraft performance parameters. To the pilot, this means that the normal horsepower output is reduced, propeller efficiency is reduced and a higher true airspeed is required to sustain the aircraft throughout its operating parameters. It means an increase in runway length requirements for takeoff and landings, and decreased rate of climb. An average small airplane, for example, requiring 1,000 feet for takeoff at sea level under standard atmospheric conditions will require a takeoff run of approximately 2,000 feet at an operational altitude of 5,000 feet.

**NOTE-**

*A turbo-charged aircraft engine provides some slight advantage in that it provides sea level horsepower up to a specified altitude above sea level.*

**1. Density Altitude Advisories.** At airports with elevations of 2,000 feet and higher, control towers and FSSs will broadcast the advisory "Check Density Altitude" when the temperature reaches a predetermined level. These advisories will be broadcast on appropriate tower frequencies or, where available, ATIS. FSSs will broadcast these advisories as a part of Local Airport Advisory, and on TWEB.

**2.** These advisories are provided by air traffic facilities, as a reminder to pilots that high temperatures and high field elevations will cause significant changes in aircraft characteristics. The pilot retains the responsibility to compute density altitude, when appropriate, as a part of preflight duties.

**NOTE-**

*All FSSs will compute the current density altitude upon request.*

**j. Mountain Wave.** Many pilots go all their lives without understanding what a mountain wave is. Quite a few have lost their lives because of this lack of understanding. One need not be a licensed meteorologist to understand the mountain wave phenomenon.

1. Mountain waves occur when air is being blown over a mountain range or even the ridge of a sharp bluff area. As the air hits the upwind side of the range, it starts to climb, thus creating what is generally a smooth updraft which turns into a turbulent downdraft as the air passes the crest of the ridge. From this point, for many miles downwind, there will be a series of downdrafts and updrafts. Satellite photos of the Rockies have shown mountain waves extending as far as 700 miles downwind of the range. Along the east coast area, such photos of the Appalachian chain have picked up the mountain wave phenomenon over a hundred miles eastward. All it takes to form a mountain wave is wind blowing across the range at 15 knots or better at an intersection angle of not less than 30 degrees.

2. Pilots from flatland areas should understand a few things about mountain waves in order to stay out of trouble. When approaching a mountain range from the upwind side (generally the west), there will usually be a smooth updraft; therefore, it is not quite as dangerous an area as the lee of the range. From the leeward side, it is always a good idea to add an extra thousand feet or so of altitude because downdrafts can exceed the climb capability of the aircraft. Never expect an updraft when approaching a mountain chain from the leeward. Always be prepared to cope with a downdraft and turbulence.

3. When approaching a mountain ridge from the downwind side, it is recommended that the ridge be approached at approximately a 45 degree angle to the horizontal direction of the ridge. This permits a safer retreat from the ridge with less stress on the aircraft should severe turbulence and downdraft be experienced. If severe turbulence is encountered, simultaneously reduce power and adjust pitch until aircraft approaches maneuvering speed, then adjust power and trim to maintain maneuvering speed and fly away from the turbulent area.

## **7-6-7. Use of Runway Half-way Signs at Unimproved Airports**

When installed, runway half-way signs provide the pilot with a reference point to judge takeoff acceleration trends. Assuming that the runway length is appropriate for takeoff (considering runway

condition and slope, elevation, aircraft weight, wind, and temperature), typical takeoff acceleration should allow the airplane to reach 70 percent of lift-off airspeed by the midpoint of the runway. The “rule of thumb” is that should airplane acceleration not allow the airspeed to reach this value by the midpoint, the takeoff should be aborted, as it may not be possible to liftoff in the remaining runway.

Several points are important when considering using this “rule of thumb”:

a. Airspeed indicators in small airplanes are not required to be evaluated at speeds below stalling, and may not be usable at 70 percent of liftoff airspeed.

b. This “rule of thumb” is based on a uniform surface condition. Puddles, soft spots, areas of tall and/or wet grass, loose gravel, etc., may impede acceleration or even cause deceleration. Even if the airplane achieves 70 percent of liftoff airspeed by the midpoint, the condition of the remainder of the runway may not allow further acceleration. The entire length of the runway should be inspected prior to takeoff to ensure a usable surface.

c. This “rule of thumb” applies only to runway required for actual liftoff. In the event that obstacles affect the takeoff climb path, appropriate distance must be available after liftoff to accelerate to best angle of climb speed and to clear the obstacles. This will, in effect, require the airplane to accelerate to a higher speed by midpoint, particularly if the obstacles are close to the end of the runway. In addition, this technique does not take into account the effects of upslope or tailwinds on takeoff performance. These factors will also require greater acceleration than normal and, under some circumstances, prevent takeoff entirely.

d. Use of this “rule of thumb” does not alleviate the pilot’s responsibility to comply with applicable Federal Aviation Regulations, the limitations and performance data provided in the FAA approved Airplane Flight Manual (AFM), or, in the absence of an FAA approved AFM, other data provided by the aircraft manufacturer.

In addition to their use during takeoff, runway half-way signs offer the pilot increased awareness of his or her position along the runway during landing operations.

**NOTE—**

No FAA standard exists for the appearance of the runway half-way sign. FIG 7-6-1 shows a graphical depiction of a typical runway half-way sign.

## 7-6-8. Seaplane Safety

a. Acquiring a seaplane class rating affords access to many areas not available to landplane pilots. Adding a seaplane class rating to your pilot certificate can be relatively uncomplicated and inexpensive. However, more effort is required to become a safe, efficient, competent “bush” pilot. The natural hazards of the backwoods have given way to modern man-made hazards. Except for the far north, the available bodies of water are no longer the exclusive domain of the airman. Seaplane pilots must be vigilant for hazards such as electric power lines, power, sail and rowboats, rafts, mooring lines, water skiers, swimmers, etc.

FIG 7-6-1  
Typical Runway Half-way Sign



b. Seaplane pilots must have a thorough understanding of the right-of-way rules as they apply to aircraft versus other vessels. Seaplane pilots are expected to know and adhere to both the U.S. Coast Guard's (USCG) Navigation Rules, International-Inland, and 14 CFR Section 91.115, Right-of-Way Rules; Water Operations. The navigation rules of the road are a set of collision avoidance rules as they apply to aircraft on the water. A seaplane is considered a vessel when on the water for the purposes of these collision avoidance rules. In general, a seaplane on the water must keep well clear

of all vessels and avoid impeding their navigation. The CFR requires, in part, that aircraft operating on the water “. . . shall, insofar as possible, keep clear of all vessels and avoid impeding their navigation, and shall give way to any vessel or other aircraft that is given the right-of-way . . . .” This means that a seaplane should avoid boats and commercial shipping when on the water. If on a collision course, the seaplane should slow, stop, or maneuver to the right, away from the bow of the oncoming vessel. Also, while on the surface with an engine running, an aircraft must give way to all nonpowered vessels. Since a seaplane in the water may not be as maneuverable as one in the air, the aircraft on the water has right-of-way over one in the air, and one taking off has right-of-way over one landing. A seaplane is exempt from the USCG safety equipment requirements, including the requirements for Personal Flotation Devices (PFD). Requiring seaplanes on the water to comply with USCG equipment requirements in addition to the FAA equipment requirements would be an unnecessary burden on seaplane owners and operators.

c. Unless they are under Federal jurisdiction, navigable bodies of water are under the jurisdiction of the state, or in a few cases, privately owned. Unless they are specifically restricted, aircraft have as much right to operate on these bodies of water as other vessels. To avoid problems, check with Federal or local officials in advance of operating on unfamiliar waters. In addition to the agencies listed in TBL 7-6-1, the nearest Flight Standards District Office can usually offer some practical suggestions as well as regulatory information. If you land on a restricted body of water because of an inflight emergency, or in ignorance of the restrictions you have violated, report as quickly as practical to the nearest local official having jurisdiction and explain your situation.

d. When operating a seaplane over or into remote areas, appropriate attention should be given to survival gear. Minimum kits are recommended for summer and winter, and are required by law for flight into sparsely settled areas of Canada and Alaska. Alaska State Department of Transportation and Canadian Ministry of Transport officials can provide specific information on survival gear requirements. The kit should be assembled in one container and be easily reachable and preferably floatable.



**TBL 7-6-1****Jurisdictions Controlling Navigable Bodies of Water**

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

**e.** The FAA recommends that each seaplane owner or operator provide flotation gear for occupants any time a seaplane operates on or near water. 14 CFR Section 91.205(b)(12) requires approved flotation gear for aircraft operated for hire over water and beyond power-off gliding distance from shore. FAA-approved gear differs from that required for navigable waterways under USCG rules. FAA-approved life vests are inflatable designs as compared to the USCG's noninflatable PFD's that may consist of solid, bulky material. Such USCG PFDs are impractical for seaplanes and other aircraft because they may block passage through the relatively narrow exits available to pilots and passengers. Life vests approved under Technical Standard Order (TSO) TSO-C13E contain fully inflatable compartments. The wearer inflates the compartments (AFTER exiting the aircraft) primarily by independent CO<sub>2</sub> cartridges, with an oral inflation tube as a backup. The flotation gear also contains a water-activated, self-illuminating signal light. The fact that pilots and

passengers can easily don and wear inflatable life vests (when not inflated) provides maximum effectiveness and allows for unrestricted movement. It is imperative that passengers are briefed on the location and proper use of available PFDs prior to leaving the dock.

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

**7-6-9. Flight Operations in Volcanic Ash**

**a.** Severe volcanic eruptions which send ash and sulphur dioxide (SO<sub>2</sub>) gas into the upper atmosphere occur somewhere around the world several times each year. Flying into a volcanic ash cloud can be exceedingly dangerous. A B747-200 lost all four engines after such an encounter and a B747-400 had the same nearly catastrophic experience. Piston-powered aircraft are less likely to lose power but severe damage is almost certain to ensue after an encounter with a volcanic ash cloud which is only a few hours old.

**b.** Most important is to avoid any encounter with volcanic ash. The ash plume may not be visible, especially in instrument conditions or at night; and even if visible, it is difficult to distinguish visually between an ash cloud and an ordinary weather cloud. Volcanic ash clouds are not displayed on airborne or ATC radar. The pilot must rely on reports from air traffic controllers and other pilots to determine the location of the ash cloud and use that information to remain well clear of the area. Additionally, the presence of a sulphur-like odor throughout the cabin may indicate the presence of SO<sub>2</sub> emitted by volcanic activity, but may or may not indicate the presence of volcanic ash. Every attempt should be made to remain on the upwind side of the volcano.

**c.** It is recommended that pilots encountering an ash cloud should immediately reduce thrust to idle (altitude permitting), and reverse course in order to

escape from the cloud. Ash clouds may extend for hundreds of miles and pilots should not attempt to fly through or climb out of the cloud. In addition, the following procedures are recommended:

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

**2.** Turn on continuous ignition;

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

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

**1.** Smoke or dust appearing in the cockpit.

**2.** An acrid odor similar to electrical smoke.

**3.** Multiple engine malfunctions, such as compressor stalls, increasing EGT, torching from tailpipe, and flameouts.

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

**5.** A fire warning in the forward cargo area.

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

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

**g.** When landing at airports where volcanic ash has been deposited on the runway, be aware that even a thin layer of dry ash can be detrimental to braking

action. Wet ash on the runway may also reduce effectiveness of braking. It is recommended that reverse thrust be limited to minimum practical to reduce the possibility of reduced visibility and engine ingestion of airborne ash.

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

## 7-6-10. Emergency Airborne Inspection of Other Aircraft

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

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

**c.** Some of the safety considerations are:

**1.** Area, direction and speed of the intercept;

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

**3.** Minimum safe separation distances;

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

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

**6.** Emergency actions to terminate the intercept.

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

## ■ 7-6-11. 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.

## **7-6-12. 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 JO 7110.65, Paragraph 10-2-14, Unauthorized Laser Illumination of Aircraft  
FAA Order JO 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.

## 7-6-13. Flying in Flat Light, Brown Out Conditions, and White Out Conditions

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

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

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

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

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

4. Blowing sand and dust can cause an illusion of a tilted horizon. A pilot not using the flight

instruments for reference may instinctively try to level the aircraft with respect to the false horizon, resulting in an accident. Helicopter rotor wash also causes sand to blow around outside the cockpit windows, possibly leading the pilot to experience an illusion where the helicopter appears to be turning when it is actually in a level hover. This can also cause the pilot to make incorrect control inputs which can quickly lead to disaster when hovering near the ground. In night landings, aircraft lighting can enhance the visual illusions by illuminating the brownout cloud.

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

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

### **e. Never take off in a white out situation.**

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

2. Flat light is common to snow skiers. One way to compensate for the lack of visual contrast and

depth-of-field loss is by wearing amber tinted lenses (also known as blue blockers). Special note of caution: Eyewear is not ideal for every pilot. Take into consideration personal factors – age, light sensitivity, and ambient lighting conditions.

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

- (a) Trust the cockpit instruments.
- (b) Execute a 180 degree turnaround and start looking for outside references.
- (c) Above all – fly the aircraft.

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

**g. Airport Landings.**

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

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

**h. Off-Airport Landings.**

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

- (a) Over flight.
- (b) Use of markers.
- (c) Weighted flags.
- (d) Smoke bombs.
- (e) Any colored rags.

(f) Dye markers.

(g) Kool-aid.

(h) Trees or tree branches.

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

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

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

**i. Flying Around a Lake.**

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

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

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

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

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

## **7–6–14. Operations in Ground Icing Conditions**

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

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

**b.** The following recommendations are offered:

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

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

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

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

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

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

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

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

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

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

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

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

- 1.** <http://aircrafticing.grc.nasa.gov/index.html>

- 2.** <http://www.ibac.org/is-bao/isbao.htm>

- 3.** [http://www.natasafety1st.org/bus\\_deice.htm](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 website by selecting the current year’s information bulletins:

**[http://www.faa.gov/library/manuals/examiners\\_inspectors/8400/fsat](http://www.faa.gov/library/manuals/examiners_inspectors/8400/fsat)**

## 7-6-15. 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

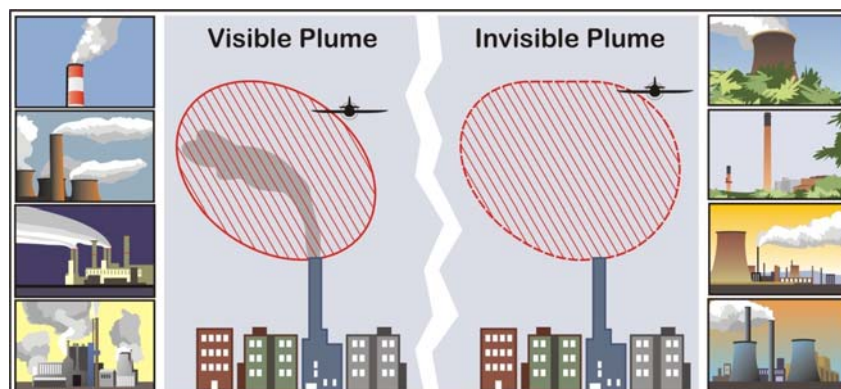
plume effluent, the ambient air temperature, and the wind speed affecting the plume. Smaller aircraft can expect to feel an effect at a higher altitude than heavier aircraft.

**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 7-6-2.

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 7-1-23, PIREPS Relating to Turbulence).

FIG 7-6-2  
Plumes





## Section 7. Safety, Accident, and Hazard Reports

### 7-7-1. Aviation Safety Reporting Program

a. The FAA has established a voluntary Aviation Safety Reporting Program designed to stimulate the free and unrestricted flow of information concerning deficiencies and discrepancies in the aviation system. This is a positive program intended to ensure the safest possible system by identifying and correcting unsafe conditions before they lead to accidents. The primary objective of the program is to obtain information to evaluate and enhance the safety and efficiency of the present system.

b. This cooperative safety reporting program invites pilots, controllers, flight attendants, maintenance personnel and other users of the airspace system, or any other person, to file written reports of actual or potential discrepancies and deficiencies involving the safety of aviation operations. The operations covered by the program include departure, en route, approach, and landing operations and procedures, air traffic control procedures and equipment, crew and air traffic control communications, aircraft cabin operations, aircraft movement on the airport, near midair collisions, aircraft maintenance and record keeping and airport conditions or services.

c. The report should give the date, time, location, persons and aircraft involved (if applicable), nature of the event, and all pertinent details.

d. To ensure receipt of this information, the program provides for the waiver of certain disciplinary actions against persons, including pilots and air traffic controllers, who file timely written reports concerning potentially unsafe incidents. To be considered timely, reports must be delivered or postmarked within 10 days of the incident unless that period is extended for good cause. Reports should be submitted on NASA ARC Forms 277, which are available free of charge, postage prepaid, at FAA Flight Standards District Offices and Flight Service Stations, and from NASA, ASRS, PO Box 189, Moffet Field, CA 94035.

e. The FAA utilizes the National Aeronautics and Space Administration (NASA) to act as an independent third party to receive and analyze reports submitted under the program. This program is

described in AC 00-46, Aviation Safety Reporting Program.

### 7-7-2. Aircraft Accident and Incident Reporting

a. **Occurrences Requiring Notification.** The operator of an aircraft must immediately, and by the most expeditious means available, notify the nearest National Transportation Safety Board (NTSB) Field Office when:

1. An aircraft accident or any of the following listed incidents occur:

(a) Flight control system malfunction or failure.

(b) Inability of any required flight crew member to perform their normal flight duties as a result of injury or illness.

(c) Failure of structural components of a turbine engine excluding compressor and turbine blades and vanes.

(d) Inflight fire.

(e) Aircraft collide in flight.

(f) Damage to property, other than the aircraft, estimated to exceed \$25,000 for repair (including materials and labor) or fair market value in the event of total loss, whichever is less.

(g) For large multi-engine aircraft (more than 12,500 pounds maximum certificated takeoff weight):

(1) Inflight failure of electrical systems which requires the sustained use of an emergency bus powered by a back-up source such as a battery, auxiliary power unit, or air-driven generator to retain flight control or essential instruments;

(2) Inflight failure of hydraulic systems that results in sustained reliance on the sole remaining hydraulic or mechanical system for movement of flight control surfaces;

(3) Sustained loss of the power or thrust produced by two or more engines; and

(4) An evacuation of aircraft in which an emergency egress system is utilized.

2. An aircraft is overdue and is believed to have been involved in an accident.

**b. Manner of Notification.**

1. The most expeditious method of notification to the NTSB by the operator will be determined by the circumstances existing at that time. The NTSB has advised that any of the following would be considered examples of the type of notification that would be acceptable:

(a) Direct telephone notification.

(b) Telegraphic notification.

(c) Notification to the FAA who would in turn notify the NTSB by direct communication; i.e., dispatch or telephone.

**c. Items to be Included in Notification.** The notification required above must contain the following information, if available:

1. Type, nationality, and registration marks of the aircraft.

2. Name of owner and operator of the aircraft.

3. Name of the pilot-in-command.

4. Date and time of the accident, or incident.

5. Last point of departure, and point of intended landing of the aircraft.

6. Position of the aircraft with reference to some easily defined geographical point.

7. Number of persons aboard, number killed, and number seriously injured.

8. Nature of the accident, or incident, the weather, and the extent of damage to the aircraft so far as is known; and

9. A description of any explosives, radioactive materials, or other dangerous articles carried.

**d. Follow-up Reports.**

1. The operator must file a report on NTSB Form 6120.1 or 6120.2, available from NTSB Field Offices or from the NTSB, Washington, DC, 20594:

(a) Within 10 days after an accident;

(b) When, after 7 days, an overdue aircraft is still missing;

(c) A report on an incident for which notification is required as described in subparagraph a(1) must be filed only as requested by an authorized representative of the NTSB.

2. Each crewmember, if physically able at the time the report is submitted, must attach a statement setting forth the facts, conditions, and circumstances relating to the accident or incident as they appeared. If the crewmember is incapacitated, a statement must be submitted as soon as physically possible.

**e. Where to File the Reports.**

1. The operator of an aircraft must file with the NTSB Field Office nearest the accident or incident any report required by this section.

2. The NTSB Field Offices are listed under U.S. Government in the telephone directories in the following cities: Anchorage, AK; Atlanta, GA; Chicago, IL; Denver, CO; Fort Worth, TX; Los Angeles, CA; Miami, FL; Parsippany, NJ; Seattle, WA.

### 7-7-3. Near Midair Collision Reporting

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

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

**c. Reporting Responsibility.** It is the responsibility of the pilot and/or flight crew to determine whether a near midair collision did actually occur and, if so, to initiate a NMAC report. Be specific, as

ATC will not interpret a casual remark to mean that a NMAC is being reported. The pilot should state “I wish to report a near midair collision.”

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

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

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

**e. Items to be Reported.**

1. Date and time (UTC) of incident.

2. Location of incident and altitude.

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

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

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

6. Detailed weather conditions at altitude or flight level.

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

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

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

10. Injuries, if any.

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

**g.** Existing radar, communication, and weather data will be examined in the conduct of the investigation. When possible, all cockpit crew members will be interviewed regarding factors involving the NMAC incident. Air traffic controllers will be interviewed in cases where one or more of the

involved aircraft was provided ATC service. Both flight and ATC procedures will be evaluated. When the investigation reveals a violation of an FAA regulation, enforcement action will be pursued.

## 7-7-4. Unidentified Flying Object (UFO) Reports

**a.** Persons wanting to report UFO/unexplained phenomena activity should contact a UFO/unexplained phenomena reporting data collection center, such as the National UFO Reporting Center, etc.

**b.** If concern is expressed that life or property might be endangered, report the activity to the local law enforcement department.

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

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

**b.** InFOs are similar to SAFOs, but contain valuable information for operators that should help them meet administrative requirements or certain regulatory requirements with relatively low urgency or impact in safety.

**c.** The SAFO and InFO system provides a means to rapidly distribute this information to operators and can be found at the following website:

[http://www.faa.gov/other\\_visit/aviation\\_industry/airline\\_operators/airline\\_safety/safo](http://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/safo) and [http://www.faa.gov/other\\_visit/aviation\\_industry/airline\\_operators/airline\\_safety/info](http://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/info)

or search keyword FAA SAFO or FAA INFO. Free electronic subscription is available on the “ALL SAFOs” or “ALL InFOs” page of the website.



**4. U.S. VFR Wall Planning Chart.** This chart is designed for VFR preflight planning and chart selection. It includes aeronautical and topographic information of the conterminous U.S. The aeronautical information includes airports, radio aids to navigation, Class B airspace and special use airspace. The topographic information includes city tint, populated places, principal roads, drainage patterns, and shaded relief. Scale 1 inch = 43 nm/ 1:3,100,000. The one-sided chart is 59 x 36 inches and ships unfolded for wall mounting. Chart is revised biennially. (See FIG 9-1-11.)

FIG 9-1-11  
U.S. VFR Wall Planning Chart



**5. 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 = 3.43 nm/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

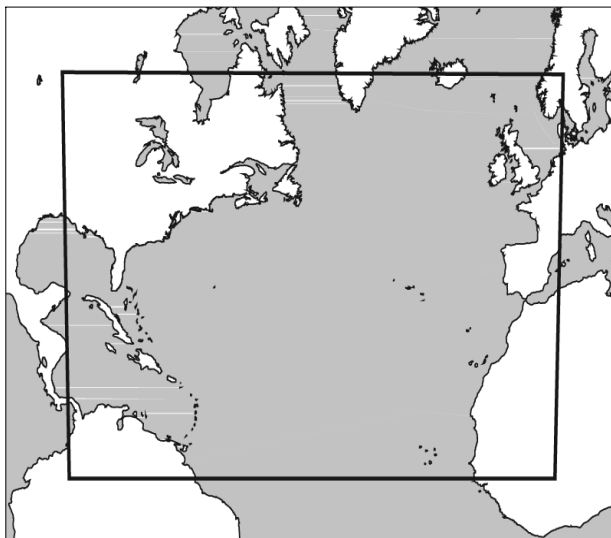
Islands. The Chart Supplement U.S. shows data that cannot be readily depicted in graphic form; for example, airport hours of operations, types of fuel available, runway widths, lighting codes, etc. The Chart Supplement U.S. also provides a means for pilots to update visual charts between edition dates (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 at the AIS website. Volumes are side-bound 5-3/8 x 8-1/4 inches. (See FIG 9-1-14.)

**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.

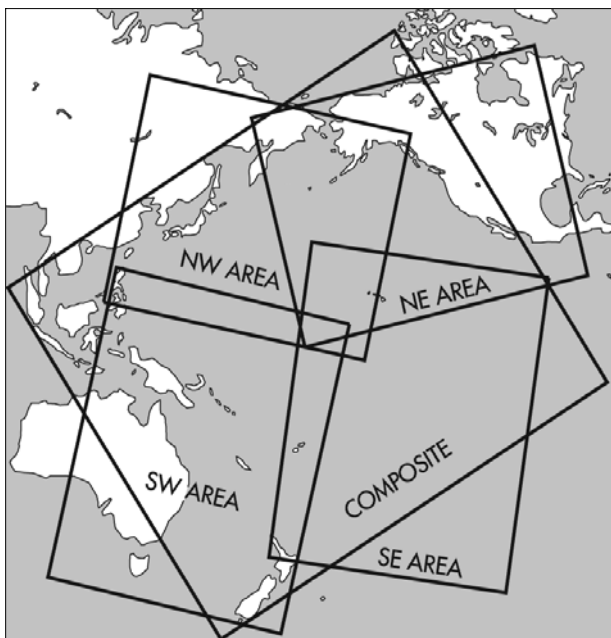
**4. North Atlantic Route Chart.** Designed for FAA controllers to monitor transatlantic flights, this 5-color chart shows oceanic control areas, coastal navigation aids, oceanic reporting points, and NAVAID geographic coordinates. Full Size Chart: Scale 1 inch = 113.1 nm/1:8,250,000. Chart is shipped flat only. Half Size Chart: Scale 1 inch = 150.8 nm/1:11,000,000. Chart is 29-3/4 x 20-1/2 inches, shipped folded to 5 x 10 inches only. Chart revised every 56 weeks. (See FIG 9-1-12.)

FIG 9-1-12  
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 = 164 nm/1:12,000,000. 48 x 41-1/2 inches. Area Charts: Scale 1 inch = 95.9 nm/1:7,000,000. 52 x 40-1/2 inches. All charts shipped unfolded. Charts revised every 56 days. (See FIG 9-1-13.)

FIG 9-1-13  
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 AIS website.

#### e. Digital Products.

**1. The Digital Aeronautical Information CD (DAICD).** The DAICD is a combination of the NAVAID Digital Data File, the Digital Chart Supplement, and the Digital Obstacle File on one Compact Disk. These three digital products are no longer sold separately. The files are updated every 56 days and are available by subscription only.

**(a) The NAVAID Digital Data File.** This file contains a current listing of NAVAIDs that are compatible with the National Airspace System. This file contains all NAVAIDs including ILS and its components, in the U.S., Puerto Rico, and the Virgin Islands plus bordering facilities in Canada, Mexico, and the Atlantic and Pacific areas.

**(b) The Digital Obstacle File.** This file describes all obstacles of interest to aviation users in the U.S., with limited coverage of the Pacific, Caribbean, Canada, and Mexico. The obstacles are assigned unique numerical identifiers, accuracy codes, and listed in order of ascending latitude within each state or area.

**2. The Coded Instrument Flight Procedures (CIFP) (ARINC 424 [Ver 13 & 15]).** The CIFP is a basic digital dataset, modeled to an international standard, which can be used as a basis to support GPS navigation. Initial data elements included are: Airport and Helicopter Records, VHF and NDB Navigation aids, en route waypoints and airways. Additional data elements will be added in subsequent releases to include: departure procedures, standard terminal arrivals, and GPS/RNAV instrument approach

procedures. The database is updated every 28 days. The data is available by subscription only and is distributed on CD-ROM or by ftp download.

**3. digital-Visual Charts (d-VC).** These digital VFR charts are geo-referenced images of FAA Sectional Aeronautical, TAC, and Helicopter Route charts. Additional digital data may easily be overlaid on the raster image using commonly available Geographic Information System software. Data such

as weather, temporary flight restrictions, obstacles, or other geospatial data can be combined with d-VC data to support a variety of needs. The file resolution is 300 dots per inch and the data is 8-bit color. The data is provided as a GeoTIFF and distributed on DVD-R media and on the AIS website. The root mean square error of the transformation will not exceed two pixels. Digital-VC DVDs are updated every 28 days and are available by subscription only.

*FIG 9-1-14*  
Chart Supplement U.S. Geographic Areas

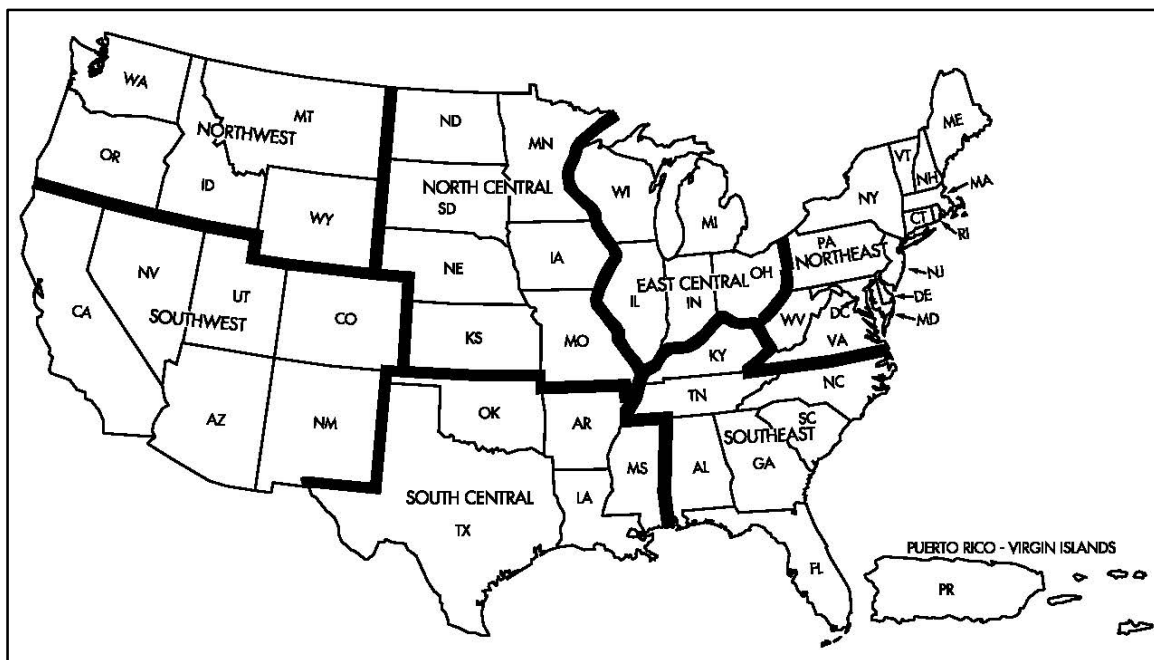
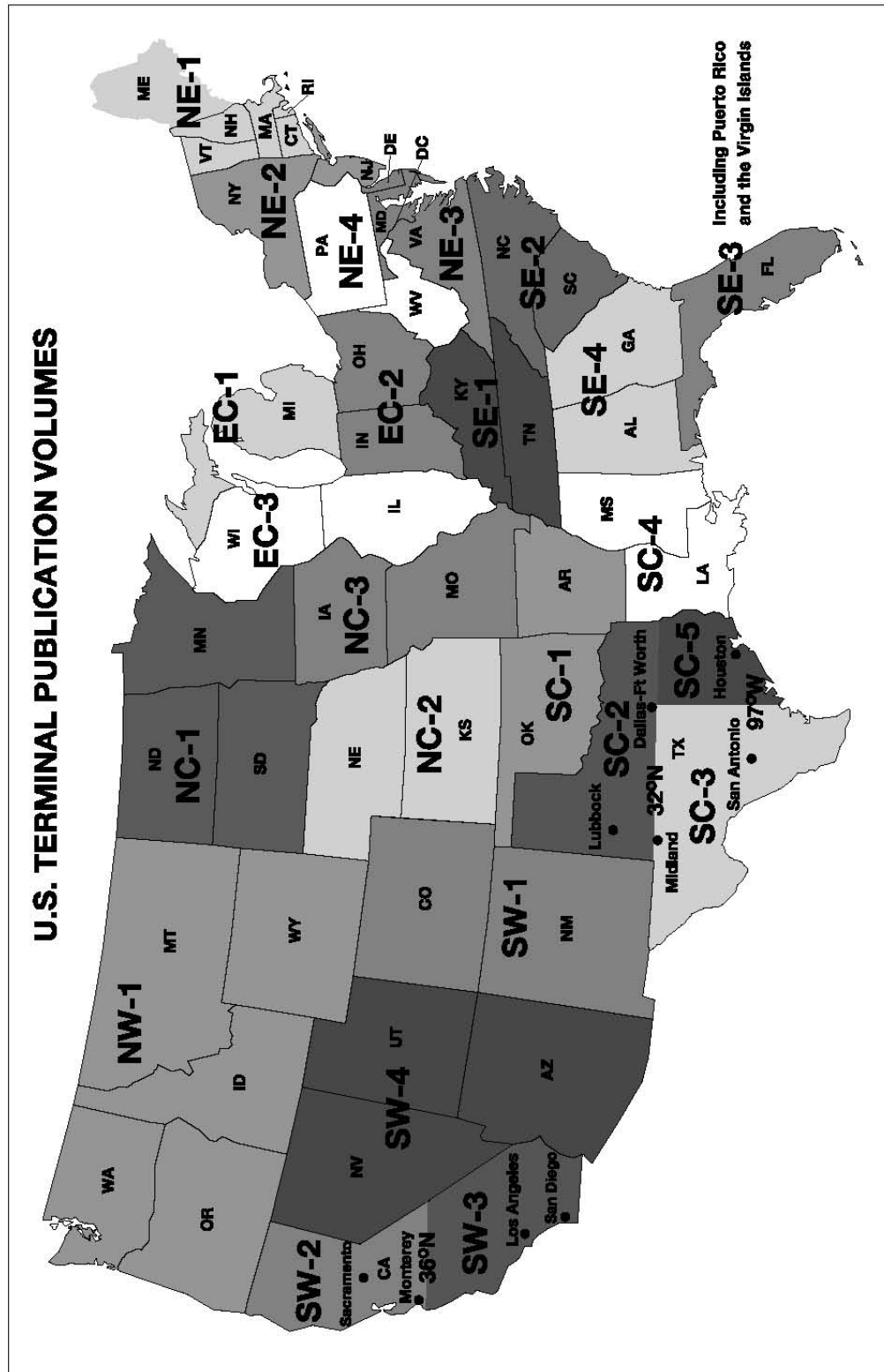


FIG 9-1-15  
U.S. Terminal Publication Volumes





Abbreviation/ Acronym	Meaning
LLWAS NE .	Low Level Wind Shear Alert System Network Expansion
LLWAS-RS .	Low Level Wind Shear Alert System Relocation/Sustainment
LNAV . . . . .	Lateral Navigation
LOC . . . . .	Localizer
LOP . . . . .	Line-of-position
LORAN . . . .	Long Range Navigation System
LP . . . . .	Localizer Performance
LPV . . . . .	Localizer Performance with Vertical Guidance
LUAW . . . . .	Line Up and Wait
LZ . . . . .	Landing Zone
MAHWP . . . .	Missed Approach Holding Waypoint
MAP . . . . .	Missed Approach Point
MAWP . . . . .	Missed Approach Waypoint
MDA . . . . .	Minimum Descent Altitude
MEA . . . . .	Minimum En Route Altitude
MEARTS . . . .	Micro En Route Automated Radar Tracking System
METAR . . . .	Aviation Routine Weather Report
MHz . . . . .	Megahertz
MIRL . . . . .	Medium Intensity Runway Lights
MM . . . . .	Middle Marker
MOA . . . . .	Military Operations Area
MOCA . . . . .	Minimum Obstruction Clearance Altitude
MRA . . . . .	Minimum Reception Altitude
MRB . . . . .	Magnetic Reference Bearing
MSA . . . . .	Minimum Safe Altitude
MSAW . . . . .	Minimum Safe Altitude Warning
MSL . . . . .	Mean Sea Level
MTI . . . . .	Moving Target Indicator
MTOS . . . . .	Mountain Obscuration
MTR . . . . .	Military Training Route
MVA . . . . .	Minimum Vectoring Altitude
MWA . . . . .	Mountain Wave Activity
MWO . . . . .	Meteorological Watch Office
NAS . . . . .	National Airspace System
NASA . . . . .	National Aeronautics and Space Administration
NAVAID . . . .	Navigational Aid
NAVCEN . . . .	Coast Guard Navigation Center
NCWF . . . . .	National Convective Weather Forecast
NDB . . . . .	Nondirectional Radio Beacon
NEXRAD . . . .	Next Generation Weather Radar
NFDC . . . . .	National Flight Data Center
NGA . . . . .	National Geospatial-Intelligence Agency
NM . . . . .	Nautical Mile

Abbreviation/ Acronym	Meaning
NMAC . . . . .	Near Midair Collision
NOAA . . . . .	National Oceanic and Atmospheric Administration
NOPAC . . . . .	North Pacific
NoPT . . . . .	No Procedure Turn Required
NPA . . . . .	Nonprecision Approach
NRS . . . . .	Navigation Reference System
NSA . . . . .	National Security Area
NSW . . . . .	No Significant Weather
NTSB . . . . .	National Transportation Safety Board
NTZ . . . . .	No Transgression Zone
NWS . . . . .	National Weather Service
OAT . . . . .	Outside Air Temperature
OBS . . . . .	Omni-bearing Selector
ODP . . . . .	Obstacle Departure Procedure
OIS . . . . .	Operational Information System
OIS . . . . .	Obstacle Identification Surface
OM . . . . .	Outer Marker
ORD . . . . .	Chicago O'Hare International Airport
PA . . . . .	Precision Approach
PAPI . . . . .	Precision Approach Path Indicator
PAR . . . . .	Precision Approach Radar
PAR . . . . .	Preferred Arrival Route
PC . . . . .	Personal Computer
P/CG . . . . .	Pilot/Controller Glossary
PDC . . . . .	Pre-departure Clearance
PFD . . . . .	Personal Flotation Device
PinS . . . . .	Point-in-Space
PIREP . . . . .	Pilot Weather Report
POB . . . . .	Persons on Board
POFZ . . . . .	Precision Obstacle Free Zone
POI . . . . .	Principal Operations Inspector
PPS . . . . .	Precise Positioning Service
PRM . . . . .	Precision Runway Monitor
PT . . . . .	Procedure Turn
QICP . . . . .	Qualified Internet Communications Provider
RA . . . . .	Resolution Advisory
RAA . . . . .	Remote Advisory Airport
RAIM . . . . .	Receiver Autonomous Integrity Monitoring
RAIS . . . . .	Remote Airport Information Service
RBDT . . . . .	Ribbon Display Terminals
RCAG . . . . .	Remote Center Air/Ground
RCC . . . . .	Rescue Coordination Center
RCLS . . . . .	Runway Centerline Lighting System
RCO . . . . .	Remote Communications Outlet
TAF . . . . .	Aerodrome Forecast

Abbreviation/ Acronym	Meaning
RD .....	Rotor Diameter
REIL .....	Runway End Identifier Lights
REL .....	Runway Entrance Lights
RFM .....	Rotorcraft Flight Manual
RIL .....	Runway Intersection Lights
RLIM .....	Runway Light Intensity Monitor
RMI .....	Radio Magnetic Indicator
RNAV .....	Area Navigation
RNP .....	Required Navigation Performance
ROC .....	Required Obstacle Clearance
RPAT .....	RNP Parallel Approach Runway Transitions
RVR .....	Runway Visual Range
RVSM .....	Reduced Vertical Separation Minimum
RWSL .....	Runway Status Light
SAFO .....	Safety Alerts For Operators
SAM .....	System Area Monitor
SAR .....	Search and Rescue
SAS .....	Stability Augmentation System
SATR .....	Special Air Traffic Rules
SBAS .....	Satellite-based Augmentation System
SCAT-1	
DGPS .....	Special Category I Differential GPS
SDF .....	Simplified Directional Facility
SFL .....	Sequenced Flashing Lights
SFR .....	Special Flight Rules
SFRA .....	Special Flight Rules Area
SIAP .....	Standard Instrument Approach Procedure
SID .....	Standard Instrument Departure
SIGMET ....	Significant Meteorological Information
SM .....	Statute Mile
SMGCS ....	Surface Movement Guidance Control System
SNR .....	Signal-to-noise Ratio
SOIA .....	Simultaneous Offset Instrument Approaches
SOP .....	Standard Operating Procedure
SPC .....	Storm Prediction Center
SPS .....	Standard Positioning Service
STAR .....	Standard Terminal Arrival
STARS .....	Standard Terminal Automation Replacement System
STMP .....	Special Traffic Management Program
TA .....	Traffic Advisory
TAA .....	Terminal Arrival Area
TAC .....	Terminal Area Chart
TACAN ....	Tactical Air Navigation
TAS .....	True Air Speed

Abbreviation/ Acronym	Meaning
TCAS .....	Traffic Alert and Collision Avoidance System
TCH .....	Threshold Crossing Height
TD .....	Time Difference
TDLS .....	Tower Data Link System
TDWR .....	Terminal Doppler Weather Radar
TDZ .....	Touchdown Zone
TDZE .....	Touchdown Zone Elevation
TDZL .....	Touchdown Zone Lights
TEC .....	Tower En Route Control
THL .....	Takeoff Hold Lights
TIBS .....	Telephone Information Briefing Service
TIS .....	Traffic Information Service
TIS-B .....	Traffic Information Service–Broadcast
TLS .....	Transponder Landing System
TPP .....	Terminal Procedures Publications
TRSA .....	Terminal Radar Service Area
TSO .....	Technical Standard Order
TWEB .....	Transcribed Weather Broadcast
TWIB .....	Terminal Weather Information for Pilots System
UA .....	Unmanned Aircraft
UAS .....	Unmanned Aircraft System
UAV .....	Unmanned Aerial Vehicle
UFO .....	Unidentified Flying Object
UHF .....	Ultrahigh Frequency
U.S. ....	United States
USCG .....	United States Coast Guard
UTC .....	Coordinated Universal Time
UWS .....	Urgent Weather SIGMET
VAR .....	Volcanic Activity Reporting
VASI .....	Visual Approach Slope Indicator
VCOA .....	Visual Climb Over the Airport
VDA .....	Vertical Descent Angle
VDP .....	Visual Descent Point
VFR .....	Visual Flight Rules
VGSI .....	Visual Glide Slope Indicator
VHF .....	Very High Frequency
VIP .....	Video Integrator Processor
VMC .....	Visual Meteorological Conditions
V <sub>MINI</sub> .....	Instrument flight minimum speed, utilized in complying with minimum limit speed requirements for instrument flight
VNAV .....	Vertical Navigation
V <sub>NE</sub> .....	Never exceed speed
V <sub>NEI</sub> .....	Instrument flight never exceed speed, utilized instead of V <sub>NE</sub> for compliance with maximum limit speed requirements for instrument flight

Abbreviation/ Acronym	Meaning
VOR . . . . .	Very High Frequency Omni-directional Range
VORTAC . . .	VHF Omni-directional Range/Tactical Air Navigation
VOT . . . . .	VOR Test Facility
VR . . . . .	VFR Military Training Route
V <sub>REF</sub> . . . . .	The reference landing approach speed, usually about 1.3 times V <sub>so</sub> plus 50 percent of the wind gust speed in excess of the mean wind speed.
V <sub>SO</sub> . . . . .	The stalling speed or the minimum steady flight speed in the landing configuration at maximum weight.
VTF . . . . .	Vector to Final
VV . . . . .	Vertical Visibility
VVI . . . . .	Vertical Velocity Indicator
V <sub>Y</sub> . . . . .	Speed for best rate of climb
V <sub>YI</sub> . . . . .	Instrument climb speed, utilized instead of V <sub>Y</sub> for compliance with the climb requirements for instrument flight

Abbreviation/ Acronym	Meaning
WA . . . . .	AIRMET
WAAS . . . . .	Wide Area Augmentation System
WFO . . . . .	Weather Forecast Office
WGS-84 . . . .	World Geodetic System of 1984
WMO . . . . .	World Meteorological Organization
WMS . . . . .	Wide-Area Master Station
WMSC . . . . .	Weather Message Switching Center
WMSCR . . . .	Weather Message Switching Center Replacement
WP . . . . .	Waypoint
WRA . . . . .	Weather Reconnaissance Area
WRS . . . . .	Wide-Area Ground Reference Station
WS . . . . .	SIGMET
WSO . . . . .	Weather Service Office
WSP . . . . .	Weather System Processor
WST . . . . .	Convective Significant Meteorological Information
WW . . . . .	Severe Weather Watch Bulletin



# PILOT/CONTROLLER GLOSSARY

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## 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:

DOMESTIC NOTICES  
INTERNATIONAL NOTICES

e. Terms Deleted:

AUTOMATED RADAR TERMINAL SYSTEMS (ARTS)  
CENTER RADAR ARTS PRESENTATION/PROCESSING (CENRAP)  
CENTER RADAR ARTS PRESENTATION/PROCESSING-PLUS (CENRAP-PLUS)  
HIGH ALTITUDE REDESIGN (HAR)  
NORTH MARK  
NOTICES TO AIRMEN PUBLICATION (NTAP)

f. Terms Modified:

MINIMUM SAFE ALTITUDE WARNING (MSAW)  
NAVIGATION REFERENCE SYSTEM (NRS)  
PREFERRED IFR ROUTES  
QUICK LOOK  
RADAR APPROACH CONTROL FACILITY  
TERMINAL AUTOMATION SYSTEM (TAS)  
TRAFFIC MANAGEMENT PROGRAM ALERT

g. Editorial/format changes were made where necessary. Revision bars were not used due to the insignificant nature of the changes.



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.)

**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.

(See SPECIAL USE AIRSPACE.)

**ATC CLEARANCE**–

(See AIR TRAFFIC CLEARANCE.)

**ATC CLEARS**– Used to prefix an ATC clearance when it is relayed to an aircraft by other than an air traffic controller.

**ATC INSTRUCTIONS**– Directives issued by air traffic control for the purpose of requiring a pilot to take specific actions; e.g., “Turn left heading two five zero,” “Go around,” “Clear the runway.”

(Refer to 14 CFR Part 91.)

**ATC PREFERRED ROUTE NOTIFICATION**– EDST notification to the appropriate controller of the need to determine if an ATC preferred route needs to be applied, based on destination airport.

(See ROUTE ACTION NOTIFICATION.)

(See EN ROUTE DECISION SUPPORT TOOL.)

**ATC PREFERRED ROUTES**– Preferred routes that are not automatically applied by Host.

**ATC REQUESTS**– Used to prefix an ATC request when it is relayed to an aircraft by other than an air traffic controller.

**ATC SECURITY SERVICES**– Communications and security tracking provided by an ATC facility in

support of the DHS, the DOD, or other Federal security elements in the interest of national security. Such security services are only applicable within designated areas. ATC security services do not include ATC basic radar services or flight following.

**ATC SECURITY SERVICES POSITION**– The position responsible for providing ATC security services as defined. This position does not provide ATC, IFR separation, or VFR flight following services, but is responsible for providing security services in an area comprising airspace assigned to one or more ATC operating sectors. This position may be combined with control positions.

**ATC SECURITY TRACKING**– The continuous tracking of aircraft movement by an ATC facility in support of the DHS, the DOD, or other security elements for national security using radar (i.e., radar tracking) or other means (e.g., manual tracking) without providing basic radar services (including traffic advisories) or other ATC services not defined in this section.

**ATS SURVEILLANCE SERVICE [ICAO]**– A term used to indicate a service provided directly by means of an ATS surveillance system.

**ATC SURVEILLANCE SOURCE**– Used by ATC for establishing identification, control and separation using a target depicted on an air traffic control facility's video display that has met the relevant safety standards for operational use and received from one, or a combination, of the following surveillance sources:

- a. Radar (See RADAR.)
- b. ADS-B (See AUTOMATIC DEPENDENT SURVEILLANCE–BROADCAST.)
- c. WAM (See WIDE AREA MULTILATERATION.)  
(See INTERROGATOR.)  
(See TRANSPONDER.)  
(See ICAO term RADAR.)  
(Refer to AIM.)

**ATS SURVEILLANCE SYSTEM [ICAO]**– A generic term meaning variously, ADS–B, PSR, SSR or any comparable ground–based system that enables the identification of aircraft.

**Note:** A comparable ground–based system is one that has been demonstrated, by comparative assessment or other methodology, to have a level of safety and performance equal to or better than monopulse SSR.

**ATCAA**–  
(See ATC ASSIGNED AIRSPACE.)

**ATCRBS**–  
(See RADAR.)

**ATCSCC**–  
(See AIR TRAFFIC CONTROL SYSTEM  
COMMAND CENTER.)

**ATCT**–  
(See TOWER.)

**ATD**–  
(See ALONG–TRACK DISTANCE.)

**ATIS**–  
(See AUTOMATIC TERMINAL INFORMATION  
SERVICE.)

**ATIS [ICAO]**–  
(See ICAO Term AUTOMATIC TERMINAL  
INFORMATION SERVICE.)

**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 (AIT)**– A precoordinated process, specifically defined in facility directives, during which a transfer of altitude control and/or radar identification is accomplished without verbal coordination between controllers using information communicated in a full data block.

**AUTOMATED MUTUAL-ASSISTANCE VESSEL RESCUE SYSTEM**– A facility which can deliver, in a matter of minutes, a surface picture (SURPIC) of



vessels in the area of a potential or actual search and rescue incident, including their predicted positions and their characteristics.

(See FAA Order JO 7110.65, Para 10-6-4, INFLIGHT CONTINGENCIES.)

**AUTOMATED PROBLEM DETECTION (APD)**– An Automation Processing capability that compares trajectories in order to predict conflicts.

**AUTOMATED PROBLEM DETECTION BOUNDARY (APB)**– The adapted distance beyond a facilities boundary defining the airspace within which EDST performs conflict detection.

(See EN ROUTE DECISION SUPPORT TOOL.)

**AUTOMATED PROBLEM DETECTION INHIBITED AREA (APDIA)**– Airspace surrounding a terminal area within which APD is inhibited for all flights within that airspace.

**AUTOMATED WEATHER SYSTEM**– Any of the automated weather sensor platforms that collect weather data at airports and disseminate the weather information via radio and/or landline. The systems currently consist of the Automated Surface Observing System (ASOS) and Automated Weather Observation System (AWOS).

**AUTOMATED UNICOM**– Provides completely automated weather, radio check capability and airport advisory information on an Automated UNICOM system. These systems offer a variety of features, typically selectable by microphone clicks, on the UNICOM frequency. Availability will be published in the Chart Supplement 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 GNSS-derived position and other required information such as identity and velocity, which is then received by a ground-based or space-based receiver for processing and display at an air traffic control facility, as well as by suitably equipped aircraft.

(See AUTOMATIC DEPENDENT SURVEILLANCE–BROADCAST IN.)

(See AUTOMATIC DEPENDENT SURVEILLANCE–BROADCAST OUT.)

(See COOPERATIVE SURVEILLANCE.)

(See GLOBAL POSITIONING SYSTEM.)

(See SPACE-BASED ADS-B.)

**AUTOMATIC DEPENDENT SURVEILLANCE–BROADCAST IN (ADS-B In)**– Aircraft avionics capable of receiving ADS-B Out transmissions directly from other aircraft, as well as traffic or weather information transmitted from ground stations.

(See AUTOMATIC DEPENDENT SURVEILLANCE–BROADCAST OUT.)

(See AUTOMATIC DEPENDENT SURVEILLANCE–REBROADCAST.)

(See FLIGHT INFORMATION SERVICE–BROADCAST.)

(See TRAFFIC INFORMATION SERVICE–BROADCAST.)

**AUTOMATIC DEPENDENT SURVEILLANCE–BROADCAST OUT (ADS-B Out)**– The transmitter onboard an aircraft or ground vehicle that periodically broadcasts its GNSS-derived position along with other required information, such as identity, altitude, and velocity.

(See AUTOMATIC DEPENDENT SURVEILLANCE–BROADCAST.)

(See AUTOMATIC DEPENDENT SURVEILLANCE–BROADCAST IN.)

**AUTOMATIC DEPENDENT SURVEILLANCE–CONTRACT (ADS-C)**– A data link position reporting system, controlled by a ground station, that establishes contracts with an aircraft's avionics that occur automatically whenever specific events occur, or specific time intervals are reached.

**AUTOMATIC DEPENDENT SURVEILLANCE-REBROADCAST (ADS-R)**– A datalink translation function of the ADS-B ground system required to accommodate the two separate operating frequencies (978 MHz and 1090 MHz). The ADS-B system receives the ADS-B messages transmitted on one frequency and ADS-R translates and reformats the information for rebroadcast and use on the other frequency. This allows ADS-B In equipped aircraft to see nearby ADS-B Out traffic regardless of the operating link of the other aircraft. Aircraft operating on the same ADS-B frequency exchange information directly and do not require the ADS-R translation function.

**AUTOMATIC DIRECTION FINDER**– An aircraft radio navigation system which senses and indicates the direction to a L/MF nondirectional radio beacon (NDB) ground transmitter. Direction is indicated to the pilot as a magnetic bearing or as a relative bearing to the longitudinal axis of the aircraft depending on the type of indicator installed in the aircraft. In certain applications, such as military, ADF operations may be based on airborne and ground transmitters in the VHF/UHF frequency spectrum.

(See BEARING.)

(See NONDIRECTIONAL BEACON.)

**AUTOMATIC FLIGHT INFORMATION SERVICE (AFIS) – ALASKA FSSs ONLY**– The continuous broadcast of recorded non-control information at airports in Alaska where a FSS provides local airport advisory service. The AFIS broadcast automates the repetitive transmission of essential but routine information such as weather, wind, altimeter, favored runway, braking action, airport NOTAMS, and other applicable information. The information is continuously broadcast over a discrete VHF radio frequency (usually the ASOS/AWOS frequency).

**AUTOMATIC TERMINAL INFORMATION SERVICE**– The continuous broadcast of recorded noncontrol information in selected terminal areas. Its purpose is to improve controller effectiveness and to relieve frequency congestion by automating the repetitive transmission of essential but routine information; e.g., “Los Angeles information Alfa. One three zero zero Coordinated Universal Time. Weather, measured ceiling two thousand overcast,

visibility three, haze, smoke, temperature seven one, dew point five seven, wind two five zero at five, altimeter two niner niner six. I-L-S Runway Two Five Left approach in use, Runway Two Five Right closed, advise you have Alfa.”

(See ICAO term AUTOMATIC TERMINAL INFORMATION SERVICE.)

(Refer to AIM.)

**AUTOMATIC TERMINAL INFORMATION SERVICE [ICAO]**– The provision of current, routine information to arriving and departing aircraft by means of continuous and repetitive broadcasts throughout the day or a specified portion of the day.

**AUTOROTATION**– A rotorcraft flight condition in which the lifting rotor is driven entirely by action of the air when the rotorcraft is in motion.

**a. Autorotative Landing/Touchdown Autorotation.** Used by a pilot to indicate that the landing will be made without applying power to the rotor.

**b. Low Level Autorotation.** Commences at an altitude well below the traffic pattern, usually below 100 feet AGL and is used primarily for tactical military training.

**c. 180 degrees Autorotation.** Initiated from a downwind heading and is commenced well inside the normal traffic pattern. “Go around” may not be possible during the latter part of this maneuver.

**AVAILABLE LANDING DISTANCE (ALD)**– The portion of a runway available for landing and roll-out for aircraft cleared for LAHSO. This distance is measured from the landing threshold to the hold-short point.

**AVIATION 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.)

# 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.

**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 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)**– An FAA radar display certified for use in the NAS.

**CFR**–

(See CALL FOR RELEASE.)

**CHA**

(See CONTINGENCY HAZARD AREA)

**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.)

**CHOP**– A form of turbulence.

**a. Light Chop**– Turbulence that causes slight, rapid and somewhat rhythmic bumpiness without appreciable changes in altitude or attitude.

**b. Moderate Chop**– Turbulence similar to Light Chop but of greater intensity. It causes rapid bumps or jolts without appreciable changes in aircraft altitude or attitude.

(See TURBULENCE.)

**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**– Airspace that is not designated in 14 CFR Part 71 as Class A, Class B, Class C, Class D, or Class E controlled airspace is Class G (uncontrolled) airspace.

(See UNCONTROLLED AIRSPACE.)

**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. Pilots should advise ATC if they decide to remain on the runway, of any delay in their stop and go, delay clearing the runway, or are unable to comply with the instruction(s).

(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) for which ATC is 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.)

**COMPULSORY REPORTING POINTS**– Reporting points which must be reported to ATC. They are designated on aeronautical charts by solid triangles or filed in a flight plan as fixes selected to define direct routes. These points are geographical locations which are defined by navigation aids/fixes. Pilots should discontinue position reporting over compulsory reporting points when informed by ATC that their aircraft is in “radar contact.”

**COMPUTER NAVIGATION FIX (CNF)**– A Computer Navigation Fix is a point defined by a latitude/longitude coordinate and is required to support Performance-Based Navigation (PBN) operations. A five-letter identifier denoting a CNF can be found next to an “x” on en route charts and on some approach charts. Eventually, all CNFs will be labeled and begin with the letters “CF” followed by three consonants (e.g., ‘CFWBG’). CNFs are not recognized by ATC, are not contained in ATC fix or automation databases, and are not used for ATC purposes. Pilots should not use CNFs for point-to-point navigation (e.g., proceed direct), filing a flight plan, or in aircraft/ATC communications. Use of CNFs has not been adopted or recognized by the International Civil Aviation Organization (ICAO).

(REFER to AIM 1-1-17b5(i)(2), Global Positioning System (GPS).)

**CONDITIONS NOT MONITORED**– When an airport operator cannot monitor the condition of the movement area or airfield surface area, this information is issued as a NOTAM. Usually necessitated due to staffing, operating hours or other mitigating factors associated with airport operations.

**CONFIDENCE MANEUVER**– A confidence maneuver consists of one or more turns, a climb or descent, or other maneuver to determine if the pilot in command (PIC) is able to receive and comply with ATC instructions.

**CONFLICT ALERT**– A function of certain air traffic control automated systems designed to alert radar controllers to existing or pending situations between tracked targets (known IFR or VFR aircraft) that require his/her immediate attention/action.

(See MODE C INTRUDER ALERT.)

**CONFLICT RESOLUTION**– The resolution of potential conflicts 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.

**CONTINGENCY HAZARD AREA (CHA)**– Used by ATC. Areas of airspace that are defined and distributed in advance of a launch or reentry operation and are activated in response to a failure.

(See AIRCRAFT HAZARD AREA.)

(See REFINED HAZARD AREA.)

(See TRANSITIONAL HAZARD AREA.)

**CONTINUE**– When used as a control instruction should be followed by another word or words clarifying what is expected of the pilot. Example: “continue taxi,” “continue descent,” “continue inbound,” etc.

**CONTROL AREA [ICAO]**– A controlled airspace extending upwards from a specified limit above the earth.

**CONTROL SECTOR**– An airspace area of defined horizontal and vertical dimensions for which a controller or group of controllers has air traffic control responsibility, normally within an air route traffic control center or an approach control facility. Sectors are established based on predominant traffic flows, altitude strata, and 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 airspace 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  $\frac{4}{10}$  (40%) or more, and hail  $\frac{3}{4}$  inch or greater.

(See **AIRMET**.)

(See **AWW**.)

(See **CWA**.)

(See **SIGMET**.)

(Refer to **AIM**.)

**CONVECTIVE SIGNIFICANT METEOROLOGICAL INFORMATION**–

(See **CONVECTIVE SIGMET**.)

**COOPERATIVE SURVEILLANCE**– Any surveillance system, such as secondary surveillance radar (SSR), wide-area multilateration (WAM), or ADS-B, that is dependent upon the presence of certain equipment onboard the aircraft or vehicle to be detected.

(See **AUTOMATIC DEPENDENT SURVEILLANCE-BROADCAST**.)

(See **NON-COOPERATIVE SURVEILLANCE**.)

(See **RADAR**.)

(See **WIDE AREA MULTILATERATION**.)

**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 AUTHORIZA-

TION 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.)

**DIRECT**– Straight line flight between two navigational aids, fixes, points, or any combination thereof. When used by pilots in describing off-airway routes, points defining direct route segments become compulsory reporting points unless the aircraft is under radar contact.

**DIRECTLY BEHIND**– An aircraft is considered to be operating directly behind when it is following the actual flight path of the lead aircraft over the surface of the earth except when applying wake turbulence separation criteria.

**DISCRETE BEACON CODE**–

(See DISCRETE CODE.)

**DISCRETE CODE**– As used in the Air Traffic Control Radar Beacon System (ATCRBS), any one of the 4096 selectable Mode 3/A aircraft transponder codes except those ending in zero zero; e.g., discrete codes: 0010, 1201, 2317, 7777; nondiscrete codes: 0100, 1200, 7700. Nondiscrete codes are normally reserved for radar facilities that are not equipped with discrete decoding capability and for other purposes such as emergencies (7700), VFR aircraft (1200), etc.

(See RADAR.)

(Refer to AIM.)

**DISCRETE FREQUENCY**– A separate radio frequency for use in direct pilot-controller communications in air traffic control which reduces frequency congestion by controlling the number of aircraft operating on a particular frequency at one time. Discrete frequencies are normally designated for each control sector in en route/terminal ATC facilities. Discrete frequencies are listed in the Chart Supplement U.S. and the DOD FLIP IFR En Route Supplement.

(See CONTROL SECTOR.)

**DISPLACED THRESHOLD**– A threshold that is located at a point on the runway other than the designated beginning of the runway.

(See THRESHOLD.)

(Refer to AIM.)

**DISTANCE MEASURING EQUIPMENT (DME)**– Equipment (airborne and ground) used to measure, in nautical miles, the slant range distance of an aircraft from the DME navigational aid.

(See TACAN.)

(See VORTAC.)

**DISTRESS**– A condition of being threatened by serious and/or imminent danger and of requiring immediate assistance.

**DIVE BRAKES**–

(See SPEED BRAKES.)

**DIVERSE VECTOR AREA**– In a radar environment, that area in which a prescribed departure route is not required as the only suitable route to avoid obstacles. The area in which random radar vectors below the MVA/MIA, established in accordance with the TERPS criteria for diverse departures, obstacles and terrain avoidance, may be issued to departing aircraft.

**DIVERSION (DVRSN)**– Flights that are required to land at other than their original destination for reasons beyond the control of the pilot/company, e.g. periods of significant weather.

**DME**–

(See DISTANCE MEASURING EQUIPMENT.)

**DME FIX**– A geographical position determined by reference to a navigational aid which provides distance and azimuth information. It is defined by a specific distance in nautical miles and a radial, azimuth, or course (i.e., localizer) in degrees magnetic from that aid.

(See DISTANCE MEASURING EQUIPMENT.)

(See FIX.)

**DME SEPARATION**– Spacing of aircraft in terms of distances (nautical miles) determined by reference to distance measuring equipment (DME).

(See DISTANCE MEASURING EQUIPMENT.)

**DOD FLIP**– Department of Defense Flight Information Publications used for flight planning, en route, and terminal operations. FLIP is produced by the National Geospatial-Intelligence Agency (NGA) for world-wide use. United States Government Flight Information Publications (en route charts and instrument approach procedure charts) are incorporated in DOD FLIP for use in the National Airspace System (NAS).

**DOMESTIC AIRSPACE**– Airspace which overlies the continental land mass of the United States plus Hawaii and U.S. possessions. Domestic airspace extends to 12 miles offshore.

**DOMESTIC NOTICES**– A special notice or notice containing graphics or plain language text pertaining to almost every aspect of aviation, such as military

training areas, large scale sporting events, air show information, Special Traffic Management Programs (STMPs), and airport-specific information. These notices are applicable to operations within the United States and can be found on the Domestic Notices website, updated every 28 days.

**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 FAA Order JO 7110.65, Para 1–2–1, **WORD MEANINGS**.)

**DUTY RUNWAY**–

(See **RUNWAY IN USE/ACTIVE RUNWAY/DUTY RUNWAY**.)

**DVA**–

(See **DIVERSE VECTOR AREA**.)

**DVFR**–

(See **DEFENSE VISUAL FLIGHT RULES**.)

**DVFR FLIGHT PLAN**– A flight plan filed for a VFR aircraft which intends to operate in airspace within which the ready identification, location, and control of aircraft are required in the interest of national security.

**DVRSN**–

(See **DIVERSION**.)

**DYNAMIC**– Continuous review, evaluation, and change to meet demands.

**DYNAMIC RESTRICTIONS**– Those restrictions imposed by the local facility on an “as needed” basis to manage unpredictable fluctuations in traffic demands.

# H

**HAA–**

(See HEIGHT ABOVE AIRPORT.)

**HAL–**

(See HEIGHT ABOVE LANDING.)

**HANDOFF–** An action taken to transfer the radar identification of an aircraft from one controller to another if the aircraft will enter the receiving controller's airspace and radio communications with the aircraft will be transferred.

**HAT–**

(See HEIGHT ABOVE TOUCHDOWN.)

**HAVE NUMBERS–** Used by pilots to inform ATC that they have received runway, wind, and altimeter information only.

**HAZARDOUS WEATHER INFORMATION–** Summary of significant meteorological information (SIGMET/WS), convective significant meteorological information (convective SIGMET/WST), urgent pilot weather reports (urgent PIREP/UUA), center weather advisories (CWA), airmen's meteorological information (AIRMET/WA) and any other weather such as isolated thunderstorms that are rapidly developing and increasing in intensity, or low ceilings and visibilities that are becoming widespread which is considered significant and are not included in a current hazardous weather advisory.

**HEAVY (AIRCRAFT)–**

(See AIRCRAFT CLASSES.)

**HEIGHT ABOVE AIRPORT (HAA)–** The height of the Minimum Descent Altitude above the published airport elevation. This is published in conjunction with circling minimums.

(See MINIMUM DESCENT ALTITUDE.)

**HEIGHT ABOVE LANDING (HAL)–** The height above a designated helicopter landing area used for helicopter instrument approach procedures.

(Refer to 14 CFR Part 97.)

**HEIGHT ABOVE TOUCHDOWN (HAT)–** The height of the Decision Height or Minimum Descent Altitude above the highest runway elevation in the touchdown zone (first 3,000 feet of the runway). HAT

is published on instrument approach charts in conjunction with all straight-in minimums.

(See DECISION HEIGHT.)

(See MINIMUM DESCENT ALTITUDE.)

**HELICOPTER–** A heavier-than-air aircraft supported in flight chiefly by the reactions of the air on one or more power-driven rotors on substantially vertical axes.

**HELIPAD–** A small, designated area, usually with a prepared surface, on a heliport, airport, landing/take-off area, apron/ramp, or movement area used for takeoff, landing, or parking of helicopters.

**HELIPORT–** An area of land, water, or structure used or intended to be used for the landing and takeoff of helicopters and includes its buildings and facilities if any.

**HELIPORT REFERENCE POINT (HRP)–** The geographic center of a heliport.

**HERTZ–** The standard radio equivalent of frequency in cycles per second of an electromagnetic wave. Kilohertz (kHz) is a frequency of one thousand cycles per second. Megahertz (MHz) is a frequency of one million cycles per second.

**HF–**

(See HIGH FREQUENCY.)

**HF COMMUNICATIONS–**

(See HIGH FREQUENCY COMMUNICATIONS.)

**HIGH FREQUENCY–** The frequency band between 3 and 30 MHz.

(See HIGH FREQUENCY COMMUNICATIONS.)

**HIGH FREQUENCY COMMUNICATIONS–** High radio frequencies (HF) between 3 and 30 MHz used for air-to-ground voice communication in overseas operations.

**HIGH SPEED EXIT–**

(See HIGH SPEED TAXIWAY.)

**HIGH SPEED TAXIWAY–** A long radius taxiway designed and provided with lighting or marking to define the path of aircraft, traveling at high speed (up to 60 knots), from the runway center to a point on the center of a taxiway. Also referred to as long radius exit or turn-off taxiway. The high speed taxiway is

designed to expedite aircraft turning off the runway after landing, thus reducing runway occupancy time.

**HIGH SPEED TURNOFF–**

(See HIGH SPEED TAXIWAY.)

**HOLD FOR RELEASE–** Used by ATC to delay an aircraft for traffic management reasons; i.e., weather, traffic volume, etc. Hold for release instructions (including departure delay information) are used to inform a pilot or a controller (either directly or through an authorized relay) that an IFR departure clearance is not valid until a release time or additional instructions have been received.

(See ICAO term HOLDING POINT.)

**HOLD-IN-LIEU OF PROCEDURE TURN–** A hold-in-lieu of procedure turn shall be established over a final or intermediate fix when an approach can be made from a properly aligned holding pattern. The hold-in-lieu of procedure turn permits the pilot to align with the final or intermediate segment of the approach and/or descend in the holding pattern to an altitude that will permit a normal descent to the final approach fix altitude. The hold-in-lieu of procedure turn is a required maneuver (the same as a procedure turn) unless the aircraft is being radar vectored to the final approach course, when “NoPT” is shown on the approach chart, or when the pilot requests or the controller advises the pilot to make a “straight-in” approach.

**HOLD PROCEDURE–** A predetermined maneuver which keeps aircraft within a specified airspace while awaiting further clearance from air traffic control. Also used during ground operations to keep aircraft within a specified area or at a specified point while awaiting further clearance from air traffic control.

(See HOLDING FIX.)

(Refer to AIM.)

**HOLDING FIX–** A specified fix identifiable to a pilot by NAVAIDs or visual reference to the ground used as a reference point in establishing and maintaining the position of an aircraft while holding.

(See FIX.)

(See VISUAL HOLDING.)

(Refer to AIM.)

**HOLDING POINT [ICAO]–** A specified location, identified by visual or other means, in the vicinity of which the position of an aircraft in flight is maintained in accordance with air traffic control clearances.

**HOLDING PROCEDURE–**

(See HOLD PROCEDURE.)

**HOLD-SHORT POINT–** A point on the runway beyond which a landing aircraft with a LAHSO clearance is not authorized to proceed. This point may be located prior to an intersecting runway, taxiway, predetermined point, or approach/departure flight path.

**HOLD-SHORT POSITION LIGHTS–** Flashing in-pavement white lights located at specified hold-short points.

**HOLD-SHORT POSITION MARKING–** The painted runway marking located at the hold-short point on all LAHSO runways.

**HOLD-SHORT POSITION SIGNS–** Red and white holding position signs located alongside the hold-short point.

***HOMING–*** Flight toward a NAVAID, without correcting for wind, by adjusting the aircraft heading to maintain a relative bearing of zero degrees.

(See BEARING.)

(See ICAO term HOMING.)

**HOMING [ICAO]–** The procedure of using the direction-finding equipment of one radio station with the emission of another radio station, where at least one of the stations is mobile, and whereby the mobile station proceeds continuously towards the other station.

**HOVER CHECK–** Used to describe when a helicopter/VTOL aircraft requires a stabilized hover to conduct a performance/power check prior to hover taxi, air taxi, or takeoff. Altitude of the hover will vary based on the purpose of the check.

**HOVER TAXI–** Used to describe a helicopter/VTOL aircraft movement conducted above the surface and in ground effect at airspeeds less than approximately 20 knots. The actual height may vary, and some helicopters may require hover taxi above 25 feet AGL to reduce ground effect turbulence or provide clearance for cargo slingloads.

(See AIR TAXI.)

(See HOVER CHECK.)

(Refer to AIM.)

***HOW DO YOU HEAR ME?–*** A question relating to the quality of the transmission or to determine how well the transmission is being received.

**HZ–**

(See HERTZ.)



**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.)

**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.

**INTERNATIONAL NOTICES**– A notice containing flight prohibitions, potential hostile situations, or other international/ foreign oceanic airspace matters. These notices can be found on the International Notices website, updated every 28 days.

**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.)

**IRREGULAR SURFACE**– A surface that is open for use but not per regulations.

**ISR**–

(See INCREASED SEPARATION REQUIRED.)

1300 Hz tone, which is received aurally and visually by compatible airborne equipment.

(See INSTRUMENT LANDING SYSTEM.)

(See MARKER BEACON.)

(Refer to AIM.)

**MILES-IN-TRAIL**– A specified distance between aircraft, normally, in the same stratum associated with the same destination or route of flight.

**MILITARY AUTHORITY ASSUMES RESPONSIBILITY FOR SEPARATION OF AIRCRAFT (MARSA)**– A condition whereby the military services involved assume responsibility for separation between participating military aircraft in the ATC system. It is used only for required IFR operations which are specified in letters of agreement or other appropriate FAA or military documents.

**MILITARY LANDING ZONE**– A landing strip used exclusively by the military for training. A military landing zone does not carry a runway designation.

**MILITARY OPERATIONS AREA**–

(See SPECIAL USE AIRSPACE.)

**MILITARY TRAINING ROUTES**– Airspace of defined vertical and lateral dimensions established for the conduct of military flight training at airspeeds in excess of 250 knots IAS.

(See IFR MILITARY TRAINING ROUTES.)

(See VFR MILITARY TRAINING ROUTES.)

**MINIMA**–

(See MINIMUMS.)

**MINIMUM CROSSING ALTITUDE (MCA)**– The lowest altitude at certain fixes at which an aircraft must cross when proceeding in the direction of a higher minimum en route IFR altitude (MEA).

(See MINIMUM EN ROUTE IFR ALTITUDE.)

**MINIMUM DESCENT ALTITUDE (MDA)**– The lowest altitude, expressed in feet above mean sea level, to which descent is authorized on final approach or during circle-to-land maneuvering in execution of a standard instrument approach procedure where no electronic glideslope is provided.

(See NONPRECISION APPROACH PROCEDURE.)

**MINIMUM EN ROUTE IFR ALTITUDE (MEA)**– The lowest published altitude between radio fixes

which assures acceptable navigational signal coverage and meets obstacle clearance requirements between those fixes. The MEA prescribed for a Federal airway or segment thereof, area navigation low or high route, or other direct route applies to the entire width of the airway, segment, or route between the radio fixes defining the airway, segment, or route.

(Refer to 14 CFR Part 91.)

(Refer to 14 CFR Part 95.)

(Refer to AIM.)

**MINIMUM FRICTION LEVEL**– The friction level specified in AC 150/5320-12, Measurement, Construction, and Maintenance of Skid Resistant Airport Pavement Surfaces, that represents the minimum recommended wet pavement surface friction value for any turbojet aircraft engaged in LAHSO. This value will vary with the particular friction measurement equipment used.

**MINIMUM FUEL**– Indicates that an aircraft's fuel supply has reached a state where, upon reaching the destination, it can accept little or no delay. This is not an emergency situation but merely indicates an emergency situation is possible should any undue delay occur.

(Refer to AIM.)

**MINIMUM HOLDING ALTITUDE**– The lowest altitude prescribed for a holding pattern which assures navigational signal coverage, communications, and meets obstacle clearance requirements.

**MINIMUM IFR ALTITUDES (MIA)**– Minimum altitudes for IFR operations as prescribed in 14 CFR Part 91. These altitudes are published on aeronautical charts and prescribed in 14 CFR Part 95 for airways and routes, and in 14 CFR Part 97 for standard instrument approach procedures. If no applicable minimum altitude is prescribed in 14 CFR Part 95 or 14 CFR Part 97, the following minimum IFR altitude applies:

**a.** In designated mountainous areas, 2,000 feet above the highest obstacle within a horizontal distance of 4 nautical miles from the course to be flown; or

**b.** Other than mountainous areas, 1,000 feet above the highest obstacle within a horizontal distance of 4 nautical miles from the course to be flown; or

c. As otherwise authorized by the Administrator or assigned by ATC.

(See MINIMUM CROSSING ALTITUDE.)

(See MINIMUM EN ROUTE IFR ALTITUDE.)

(See MINIMUM OBSTRUCTION CLEARANCE ALTITUDE.)

(See MINIMUM SAFE ALTITUDE.)

(See MINIMUM VECTORING ALTITUDE.)

(Refer to 14 CFR Part 91.)

**MINIMUM OBSTRUCTION CLEARANCE ALTITUDE (MOCA)**– The lowest published altitude in effect between radio fixes on VOR airways, off-airway routes, or route segments which meets obstacle clearance requirements for the entire route segment and which assures acceptable navigational signal coverage only within 25 statute (22 nautical) miles of a VOR.

(Refer to 14 CFR Part 91.)

(Refer to 14 CFR Part 95.)

**MINIMUM RECEPTION ALTITUDE (MRA)**– The lowest altitude at which an intersection can be determined.

(Refer to 14 CFR Part 95.)

**MINIMUM SAFE ALTITUDE (MSA)**–

a. The minimum altitude specified in 14 CFR Part 91 for various aircraft operations.

b. Altitudes depicted on approach charts which provide at least 1,000 feet of obstacle clearance for emergency use. These altitudes will be identified as Minimum Safe Altitudes or Emergency Safe Altitudes and are established as follows:

1. **Minimum Safe Altitude (MSA)**. Altitudes depicted on approach charts which provide at least 1,000 feet of obstacle clearance within a 25-mile radius of the navigation facility, waypoint, or airport reference point upon which the MSA is predicated. MSAs are for emergency use only and do not necessarily assure acceptable navigational signal coverage.

(See ICAO term Minimum Sector Altitude.)

2. **Emergency Safe Altitude (ESA)**. Altitudes depicted on approach charts which provide at least 1,000 feet of obstacle clearance in nonmountainous areas and 2,000 feet of obstacle clearance in designated mountainous areas within a 100-mile radius of the navigation facility or waypoint used as the ESA center. These altitudes are normally used only in military procedures and are identified on

published procedures as “Emergency Safe Altitudes.”

**MINIMUM SAFE ALTITUDE WARNING (MSAW)**– A function of the EAS and STARS computer that aids the controller by alerting him/her when a tracked Mode C equipped aircraft is below or is predicted by the computer to go below a predetermined minimum safe altitude.

(Refer to AIM.)

**MINIMUM SECTOR ALTITUDE [ICAO]**– The lowest altitude which may be used under emergency conditions which will provide a minimum clearance of 300 m (1,000 feet) above all obstacles located in an area contained within a sector of a circle of 46 km (25 NM) radius centered on a radio aid to navigation.

**MINIMUMS**– Weather condition requirements established for a particular operation or type of operation; e.g., IFR takeoff or landing, alternate airport for IFR flight plans, VFR flight, etc.

(See IFR CONDITIONS.)

(See IFR TAKEOFF MINIMUMS AND DEPARTURE PROCEDURES.)

(See LANDING MINIMUMS.)

(See VFR CONDITIONS.)

(Refer to 14 CFR Part 91.)

(Refer to AIM.)

**MINIMUM VECTORING ALTITUDE (MVA)**– The lowest MSL altitude at which an IFR aircraft will be vectored by a radar controller, except as otherwise authorized for radar approaches, departures, and missed approaches. The altitude meets IFR obstacle clearance criteria. It may be lower than the published MEA along an airway or J-route segment. It may be utilized for radar vectoring only upon the controller’s determination that an adequate radar return is being received from the aircraft being controlled. Charts depicting minimum vectoring altitudes are normally available only to the controllers and not to pilots.

(Refer to AIM.)

**MINUTES-IN-TRAIL**– A specified interval between aircraft expressed in time. This method would more likely be utilized regardless of altitude.

**MIS**–

(See METEOROLOGICAL IMPACT STATEMENT.)

**MISSED APPROACH**–

a. A maneuver conducted by a pilot when an instrument approach cannot be completed to a

# N

## NAS–

(See NATIONAL AIRSPACE SYSTEM.)

## NAT HLA–

(See NORTH ATLANTIC HIGH LEVEL AIRSPACE.)

**NATIONAL AIRSPACE SYSTEM**– The common network of U.S. airspace; air navigation facilities, equipment and services, airports or landing areas; aeronautical charts, information and services; rules, regulations and procedures, technical information, and manpower and material. Included are system components shared jointly with the military.

**NATIONAL BEACON CODE ALLOCATION PLAN AIRSPACE (NBCAP)**– Airspace over United States territory located within the North American continent between Canada and Mexico, including adjacent territorial waters outward to about boundaries of oceanic control areas (CTA)/Flight Information Regions (FIR).

(See FLIGHT INFORMATION REGION.)

**NATIONAL FLIGHT DATA CENTER (NFDC)**– 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 (NFDD)**– A daily (except weekends and Federal holidays) publication of flight information appropriate to aeronautical charts, aeronautical publications, Notices to Airmen, or other media serving the purpose of providing operational flight data essential to safe and efficient aircraft operations.

**NATIONAL SEARCH AND RESCUE PLAN**– An interagency agreement which provides for the effective utilization of all available facilities in all types of search and rescue missions.

## 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. 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 alert-

ing, designated by the prefix RNAV; e.g., RNAV 5, RNAV 1.

**Note:** The Performance-based Navigation Manual (Doc 9613), Volume II contains detailed guidance on navigation specifications.

**NAVIGATIONAL AID**– Any visual or electronic device airborne or on the surface which provides point-to-point guidance information or position data to aircraft in flight.

(See AIR NAVIGATION FACILITY.)

**NAVSPEC**–

(See NAVIGATION SPECIFICATION [ICAO].)

**NBCAP AIRSPACE**–

(See NATIONAL BEACON CODE ALLOCATION PLAN AIRSPACE.)

**NDB**–

(See NONDIRECTIONAL BEACON.)

**NEGATIVE**– “No,” or “permission not granted,” or “that is not correct.”

**NEGATIVE CONTACT**– Used by pilots to inform ATC that:

a. Previously issued traffic is not in sight. It may be followed by the pilot’s request for the controller to provide assistance in avoiding the traffic.

b. They were unable to contact ATC on a particular frequency.

**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.

**NON-COOPERATIVE SURVEILLANCE**– Any surveillance system, such as primary radar, that is not dependent upon the presence of any equipment on the aircraft or vehicle to be tracked.

(See COOPERATIVE SURVEILLANCE.)

(See RADAR.)

**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.)

**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 ATLANTIC HIGH LEVEL AIRSPACE (NAT HLA)–** That volume of airspace (as defined in ICAO Document 7030) between FL 285 and FL 420 within the Oceanic Control Areas of Bodo Oceanic, Gander Oceanic, New York Oceanic East, Reykjavik, Santa Maria, and Shanwick, excluding the Shannon and Brest Ocean Transition Areas. ICAO Doc 007 *North Atlantic Operations and Airspace Manual* provides detailed information on related aircraft and operational requirements.

**NORTH PACIFIC–** An organized route system between the Alaskan west coast and Japan.

**NOT STANDARD–** Varying from what is expected or published. For use in NOTAMs only.

NOT STD-

(See NOT STANDARD.)

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 (NOTAM)- 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.

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.

**c. FDC NOTAM-** A NOTAM regulatory in nature, transmitted by USNOF and given system wide dissemination.

(See ICAO term NOTAM.)

NRR-

(See NON-RESTRICTIVE ROUTING.)

NRS-

(See NAVIGATION REFERENCE SYSTEM.)

**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.)



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 on board some aircraft to alert the flight crew to the presence of a potential wind shear. PWS systems typically monitor 3 miles ahead and 25 degrees left and right of the

aircraft's heading at or below 1200' AGL. Departing flights may receive a wind shear alert after they start the takeoff roll and may elect to abort the takeoff. Aircraft on approach receiving an alert may elect to go around or perform a wind shear escape maneuver.

**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.)

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 AREA NAVIGATION (RNAV) GLOBAL POSITIONING SYSTEM (GPS) PRECISION RUNWAY MONITORING (PRM) APPROACH.)

(See PRM APPROACH.)

(See PRECISION RUNWAY MONITOR SYSTEM.)

PRM APPROACH– An instrument approach procedure titled ILS PRM, RNAV PRM, LDA PRM, or GLS PRM conducted to parallel runways separated by less than 4,300 feet and at least 3,000 feet where independent closely spaced approaches are permitted. Use of an enhanced display with alerting, a No Transgression Zone (NTZ), secondary monitor frequency, pilot PRM training, and publication of an Attention All Users Page are required for all PRM approaches. Depending on the runway spacing, the approach courses may be parallel or one approach course must be offset. PRM procedures are also used to conduct Simultaneous Offset Instrument Approach (SOIA) operations. In SOIA, one straight-in ILS PRM, RNAV PRM, GLS PRM, and one offset LDA PRM, RNAV PRM or GLS PRM approach are utilized. PRM procedures are terminated and a visual segment begins at the offset approach missed approach point where the minimum distance between the approach courses is

3000 feet. Runway spacing can be as close as 750 feet.

(Refer to AIM.)

PROCEDURAL CONTROL [ICAO]– Term used to indicate that information derived from an ATS surveillance system is not required for the provision of air traffic control service.

PROCEDURAL SEPARATION [ICAO]– The separation used when providing procedural control.

PROCEDURE TURN– The maneuver prescribed when it is necessary to reverse direction to establish an aircraft on the intermediate approach segment or final approach course. The outbound course, direction of turn, distance within which the turn must be completed, and minimum altitude are specified in the procedure. However, unless otherwise restricted, the point at which the turn may be commenced and the type and rate of turn are left to the discretion of the pilot.

(See ICAO term PROCEDURE TURN.)

PROCEDURE TURN [ICAO]– A maneuver in which a turn is made away from a designated track followed by a turn in the opposite direction to permit the aircraft to intercept and proceed along the reciprocal of the designated track.

Note 1: Procedure turns are designated “left” or “right” according to the direction of the initial turn.

Note 2: Procedure turns may be designated as being made either in level flight or while descending, according to the circumstances of each individual approach procedure.

PROCEDURE TURN INBOUND– That point of a procedure turn maneuver where course reversal has been completed and an aircraft is established inbound on the intermediate approach segment or final approach course. A report of “procedure turn inbound” is normally used by ATC as a position report for separation purposes.

(See FINAL APPROACH COURSE.)

(See PROCEDURE TURN.)

(See SEGMENTS OF AN INSTRUMENT APPROACH PROCEDURE.)

PROFILE DESCENT– An uninterrupted descent (except where level flight is required for speed adjustment; e.g., 250 knots at 10,000 feet MSL) from cruising altitude/level to interception of a glideslope or to a minimum altitude specified for the initial or intermediate approach segment of a nonprecision instrument approach. The profile descent normally

# Q

**Q ROUTE**– ‘Q’ is the designator assigned to published RNAV routes used by the United States.

**QFE**– The atmospheric pressure at aerodrome elevation (or at runway threshold).

**QNE**– The barometric pressure used for the standard altimeter setting (29.92 inches Hg.).

**QNH**– The barometric pressure as reported by a particular station.

**QUADRANT**– A quarter part of a circle, centered on a NAVAID, oriented clockwise from magnetic north

as follows: NE quadrant 000-089, SE quadrant 090-179, SW quadrant 180-269, NW quadrant 270-359.

**QUEUING**–

(See STAGING/QUEUING.)

**QUICK LOOK**– A feature of the EAS and STARS which provides the controller the capability to display full data blocks of tracked aircraft from other control positions. ■



# R

**RADAR**– A device that provides information on range, azimuth, and/or elevation of objects by measuring the time interval between transmission and reception of directional radio pulses and correlating the angular orientation of the radiated antenna beam or beams in azimuth and/or elevation.

**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 COOPERATIVE SURVEILLANCE.)

(See INTERROGATOR.)

(See NON-COOPERATIVE SURVEILLANCE.)

(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)** (US Army).

**2. Radar Air Traffic Control Facility (RATCF)** (USN/FAA and USMC/FAA).

**3. Radar Approach Control (RAPCON)** (USAF/FAA, USN/FAA, and USMC/FAA).

**4. Terminal Radar Approach Control (TRACON)** (FAA).

**5. Airport 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.)

**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

# T

## TACAN–

(See TACTICAL AIR NAVIGATION.)

**TACAN-ONLY AIRCRAFT**– An aircraft, normally military, possessing TACAN with DME but no VOR navigational system capability. Clearances must specify TACAN or VORTAC fixes and approaches.

**TACTICAL AIR NAVIGATION (TCAN)**– An ultra-high frequency electronic rho-theta air navigation aid which provides suitably equipped aircraft a continuous indication of bearing and distance to the TACAN station.

(See VORTAC.)

(Refer to AIM.)

**TAILWIND**– Any wind more than 90 degrees to the longitudinal axis of the runway. The magnetic direction of the runway shall be used as the basis for determining the longitudinal axis.

## TAKEOFF AREA–

(See LANDING AREA.)

**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.

(See ICAO term TAKEOFF DISTANCE AVAILABLE.)

**TAKEOFF DISTANCE AVAILABLE [ICAO]**– The length of the takeoff run available plus the length of the clearway, if provided.

**TAKEOFF HOLD LIGHTS (THL)**– The THL system is composed of in-pavement lighting in a double, longitudinal row of lights aligned either side of the runway centerline. The lights are focused toward the arrival end of the runway at the “line up and wait” point, and they extend for 1,500 feet in front of the holding aircraft. Illuminated red lights indicate to an aircraft in position for takeoff or rolling that it is unsafe to takeoff because the runway is occupied or about to be occupied by an aircraft or vehicle.

**TAKEOFF ROLL** – The process whereby an aircraft is aligned with the runway centerline and the aircraft is moving with the intent to take off. For helicopters,

this pertains to the act of becoming airborne after departing a takeoff area.

**TAKEOFF RUN AVAILABLE (TORA)** – The runway length declared available and suitable for the ground run of an airplane taking off.

(See ICAO term TAKEOFF RUN AVAILABLE.)

**TAKEOFF RUN AVAILABLE [ICAO]**– The length of runway declared available and suitable for the ground run of an aeroplane take-off.

**TARGET**– The indication shown on a display resulting from a primary radar return, a radar beacon reply, or an ADS-B report. The specific target symbol presented to ATC may vary based on the surveillance source and automation platform.

(See ASSOCIATED.)

(See DIGITAL TARGET.)

(See DIGITIZED RADAR TARGET.)

(See FUSED TARGET.)

(See PRIMARY RADAR TARGET.)

(See RADAR.)

(See SECONDARY RADAR TARGET.)

(See ICAO term TARGET.)

(See UNASSOCIATED.)

**TARGET [ICAO]**– In radar:

**a.** Generally, any discrete object which reflects or retransmits energy back to the radar equipment.

**b.** Specifically, an object of radar search or surveillance.

**TARGET RESOLUTION**– A process to ensure that correlated radar targets do not touch. Target resolution must be applied as follows:

**a.** Between the edges of two primary targets or the edges of the ASR-9/11 primary target symbol.

**b.** Between the end of the beacon control slash and the edge of a primary target.

**c.** Between the ends of two beacon control slashes.

Note 1: Mandatory traffic advisories and safety alerts must be issued when this procedure is used.

Note 2: This procedure must not be used when utilizing mosaic radar systems or multi-sensor mode.

## TARGET SYMBOL–

(See TARGET.)

(See ICAO term TARGET.)

**TARMAC DELAY**– The holding of an aircraft on the ground either before departure or after landing with no opportunity for its passengers to deplane.

**TARMAC DELAY AIRCRAFT**– An aircraft whose pilot-in-command has requested to taxi to the ramp, gate, or alternate deplaning area to comply with the Three-hour Tarmac Rule.

**TARMAC DELAY REQUEST**– A request by the pilot-in-command to taxi to the ramp, gate, or alternate deplaning location to comply with the Three-hour Tarmac Rule.

**TAS**–

(See **TERMINAL AUTOMATION SYSTEMS**.)

**TAWS**–

(See **TERRAIN AWARENESS WARNING SYSTEM**.)

**TAXI**– The movement of an airplane under its own power on the surface of an airport (14 CFR Section 135.100 [Note]). Also, it describes the surface movement of helicopters equipped with wheels.

(See **AIR TAXI**.)

(See **HOVER TAXI**.)

(Refer to 14 CFR Section 135.100.)

(Refer to **AIM**.)

**TAXI PATTERNS**– Patterns established to illustrate the desired flow of ground traffic for the different runways or airport areas available for use.

**TCAS**–

(See **TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEM**.)

**TCH**–

(See **THRESHOLD CROSSING HEIGHT**.)

**TCLT**–

(See **TENTATIVE CALCULATED LANDING TIME**.)

**TDLS**–

(See **TERMINAL DATA LINK SYSTEM**.)

**TDZE**–

(See **TOUCHDOWN ZONE ELEVATION**.)

**TELEPHONE INFORMATION BRIEFING SERVICE**– A continuous telephone recording of meteorological and/or aeronautical information.

(Refer to **AIM**.)

**TEMPORARY FLIGHT RESTRICTION (TFR)**– A TFR is a regulatory action issued by the FAA via the U.S. NOTAM System, under the authority of United States Code, Title 49. TFRs are issued within the sovereign airspace of the United States and its territories to restrict certain aircraft from operating within a defined area on a temporary basis to protect persons or property in the air or on the ground. While not all inclusive, TFRs may be issued for disaster or hazard situations such as: toxic gas leaks or spills, fumes from flammable agents, aircraft accident/incident sites, aviation or ground resources engaged in wildfire suppression, or aircraft relief activities following a disaster. TFRs may also be issued in support of VIP movements, for reasons of national security; or when determined necessary for the management of air traffic in the vicinity of aerial demonstrations or major sporting events. NAS users or other interested parties should contact a FSS for TFR information. Additionally, TFR information can be found in automated briefings, NOTAM publications, and on the internet at <http://www.faa.gov>. The FAA also distributes TFR information to aviation user groups for further dissemination.

**TENTATIVE CALCULATED LANDING TIME (TCLT)**– A projected time calculated for 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 VTA of the aircraft or the TCLT/ACLT of the previous aircraft plus the AAI, whichever is later. This time will be updated in response to an aircraft's progress and its current relationship to other arrivals.

**TERMINAL AREA**– A general term used to describe airspace in which approach control service or airport traffic control service is provided.

**TERMINAL AREA FACILITY**– A facility providing air traffic control service for arriving and departing IFR, VFR, Special VFR, and on occasion en route aircraft.

(See **APPROACH CONTROL FACILITY**.)

(See **TOWER**.)

**TERMINAL AUTOMATION SYSTEMS (TAS)**– TAS is used to identify the numerous automated tracking systems including STARS and MEARTS. ■

**TERMINAL DATA LINK SYSTEM (TDLS)**– A system that provides Digital Automatic Terminal Information Service (D-ATIS) both on a specified



**TOUCH-AND-GO LANDING–**

(See TOUCH-AND-GO.)

**TOUCHDOWN–**

a. The point at which an aircraft first makes contact with the landing surface.

b. Concerning a precision radar approach (PAR), it is the point where the glide path intercepts the landing surface.

(See ICAO term TOUCHDOWN.)

**TOUCHDOWN [ICAO]–** The point where the nominal glide path intercepts the runway.

Note: Touchdown as defined above is only a datum and is not necessarily the actual point at which the aircraft will touch the runway.

**TOUCHDOWN RVR–**

(See VISIBILITY.)

**TOUCHDOWN ZONE–** The first 3,000 feet of the runway beginning at the threshold. The area is used for determination of Touchdown Zone Elevation in the development of straight-in landing minimums for instrument approaches.

(See ICAO term TOUCHDOWN ZONE.)

**TOUCHDOWN ZONE [ICAO]–** The portion of a runway, beyond the threshold, where it is intended landing aircraft first contact the runway.

**TOUCHDOWN ZONE ELEVATION–** The highest elevation in the first 3,000 feet of the landing surface. TDZE is indicated on the instrument approach procedure chart when straight-in landing minimums are authorized.

(See TOUCHDOWN ZONE.)

**TOUCHDOWN ZONE LIGHTING–**

(See AIRPORT LIGHTING.)

**TOWER–** A terminal facility that uses air/ground communications, visual signaling, and other devices to provide ATC services to aircraft operating in the vicinity of an airport or on the movement area. Authorizes aircraft to land or takeoff at the airport controlled by the tower or to transit the Class D airspace area regardless of flight plan or weather

conditions (IFR or VFR). A tower may also provide approach control services (radar or nonradar).

(See AIRPORT TRAFFIC CONTROL SERVICE.)

(See APPROACH CONTROL FACILITY.)

(See APPROACH CONTROL SERVICE.)

(See MOVEMENT AREA.)

(See TOWER EN ROUTE CONTROL SERVICE.)

(See ICAO term AERODROME CONTROL TOWER.)

(Refer to AIM.)

**TOWER EN ROUTE CONTROL SERVICE–** The control of IFR en route traffic within delegated airspace between two or more adjacent approach control facilities. This service is designed to expedite traffic and reduce control and pilot communication requirements.

**TOWER TO TOWER–**

(See TOWER EN ROUTE CONTROL SERVICE.)

**TRACEABLE PRESSURE STANDARD–** The facility station pressure instrument, with certification/calibration traceable to the National Institute of Standards and Technology. Traceable pressure standards may be mercurial barometers, commissioned ASOS or dual transducer AWOS, or portable pressure standards or DASI.

**TRACK–** The actual flight path of an aircraft over the surface of the earth.

(See COURSE.)

(See FLIGHT PATH.)

(See ROUTE.)

(See ICAO term TRACK.)

**TRACK [ICAO]–** The projection on the earth's surface of the path of an aircraft, the direction of which path at any point is usually expressed in degrees from North (True, Magnetic, or Grid).

**TRACK OF INTEREST (TOI)–** Displayed data representing an airborne object that threatens or has the potential to threaten North America or National Security. Indicators may include, but are not limited to: noncompliance with air traffic control instructions or aviation regulations; extended loss of communications; unusual transmissions or unusual flight behavior; unauthorized intrusion into controlled airspace or an ADIZ; noncompliance with issued flight restrictions/security procedures; or unlawful interference with airborne flight crews, up to and including hijack. In certain circumstances, an object

may become a TOI based on specific and credible intelligence pertaining to that particular aircraft/object, its passengers, or its cargo.

**TRACK OF INTEREST RESOLUTION**– A TOI will normally be considered resolved when: the aircraft/object is no longer airborne; the aircraft complies with air traffic control instructions, aviation regulations, and/or issued flight restrictions/security procedures; radio contact is re-established and authorized control of the aircraft is verified; the aircraft is intercepted and intent is verified to be nonthreatening/nonhostile; TOI was identified based on specific and credible intelligence that was later determined to be invalid or unreliable; or displayed data is identified and characterized as invalid.

### **TRAFFIC**–

**a.** A term used by a controller to transfer radar identification of an aircraft to another controller for the purpose of coordinating separation action. Traffic is normally issued:

1. In response to a handoff or point out,
2. In anticipation of a handoff or point out, or
3. In conjunction with a request for control of an aircraft.

**b.** A term used by ATC to refer to one or more aircraft.

**TRAFFIC ADVISORIES**– Advisories issued to alert pilots to other known or observed air traffic which may be in such proximity to the position or intended route of flight of their aircraft to warrant their attention. Such advisories may be based on:

- a.** Visual observation.
- b.** Observation of radar identified and nonidentified aircraft targets on an ATC radar display, or
- c.** Verbal reports from pilots or other facilities.

**Note 1:** The word “traffic” followed by additional information, if known, is used to provide such advisories; e.g., “Traffic, 2 o’clock, one zero miles, southbound, eight thousand.”

**Note 2:** Traffic advisory service will be provided to the extent possible depending on higher priority duties of the controller or other limitations; e.g., radar limitations, volume of traffic, frequency congestion, or controller workload. Radar/nonradar traffic advisories do not relieve the pilot of his/her responsibility to see and avoid other aircraft. Pilots are cautioned that there are many times when the controller is not able to give traffic

advisories concerning all traffic in the aircraft’s proximity; in other words, when a pilot requests or is receiving traffic advisories, he/she should not assume that all traffic will be issued.

(Refer to AIM.)

**TRAFFIC ALERT (aircraft call sign), TURN (left/right) IMMEDIATELY, (climb/descend) AND MAINTAIN (altitude).**

(See SAFETY ALERT.)

**TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEM (TCAS)**– An airborne collision avoidance system based on radar beacon signals which operates independent of ground-based equipment. TCAS-I generates traffic advisories only. TCAS-II generates traffic advisories, and resolution (collision avoidance) advisories in the vertical plane.

**TRAFFIC INFORMATION**–

(See TRAFFIC ADVISORIES.)

**TRAFFIC INFORMATION SERVICE–BROADCAST (TIS-B)**– The broadcast of ATC derived traffic information to ADS-B equipped (1090ES or UAT) aircraft. The source of this traffic information is derived from ground-based air traffic surveillance sensors, typically from radar targets. TIS-B service will be available throughout the NAS where there are both adequate surveillance coverage (radar) and adequate broadcast coverage from ADS-B ground stations. Loss of TIS-B will occur when an aircraft enters an area not covered by the GBT network. If this occurs in an area with adequate surveillance coverage (radar), nearby aircraft that remain within the adequate broadcast coverage (ADS-B) area will view the first aircraft. TIS-B may continue when an aircraft enters an area with inadequate surveillance coverage (radar); nearby aircraft that remain within the adequate broadcast coverage (ADS-B) area will not view the first aircraft.

**TRAFFIC IN SIGHT**– Used by pilots to inform a controller that previously issued traffic is in sight.

(See NEGATIVE CONTACT.)

(See TRAFFIC ADVISORIES.)

**TRAFFIC MANAGEMENT PROGRAM ALERT**– A term used in a Notice to Airmen (NOTAM) issued in conjunction with a special traffic management program to alert pilots to the existence of the program and to refer them to a special traffic management program advisory message for program details. The contraction TMPA is used in NOTAM text.

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