



U.S. Department  
of Transportation

**Federal Aviation  
Administration**

# ***AERONAUTICAL INFORMATION MANUAL***

---

***Change 3  
August 22, 2013***

---

**DO NOT DESTROY  
CHANGE 1 DATED**

**JULY 26, 2012**



# Aeronautical Information Manual

## Explanation of Changes

**Effective: August 22, 2013**

**a. 1-1-16. VHF Direction Finder  
6-2-3. Direction Finding Instrument  
Approach Procedure  
Appendix 4. Abbreviation/Acronyms**

The FAA has decommissioned all Direction Finders (DF) in the national airspace system. As such, all references to DFs have been removed from approaches, procedures, supplements, charts, and publications.

**b. 1-1-19. Global Positioning System (GPS)  
1-1-20. Wide Area Augmentation System (WAAS)  
1-2-3. Use of Suitable Area Navigation (RNAV) Systems on Conventional Procedures and Routes  
5-4-5. Instrument Approach Procedure Charts**

This change explains the types of Global Navigation Satellite System procedures that may be used for alternate planning. This change also added circling where appropriate.

**c. 4-1-13. Automatic Terminal Information Service (ATIS)**

The Spectrum Engineering Office is amending ambiguous content associated with the ATIS to clarify requirements and coverage between arrival and departure messages.

**d. 4-2-4. Aircraft Call Signs  
4-6-1. Applicability and RVSM Mandate (Date/Time and Area)  
4-6-5. Pilot RVSM Operating Practices and Procedures  
4-6-10. Procedures for Accommodation of Non-RVSM Aircraft  
5-1-9. International Flight Plan (FAA Form 7233-4) – IFR Flights**

The term “Lifeguard” is being replaced by the term “MEDEVAC.” The previous “MEDEVAC” meaning has been removed. The term “HOSP” has been added.

**e. 4-3-20. Exiting the Runway After Landing**

This change was made to harmonize the language in said paragraph with the regulatory language in Title 14, Code of Federal Regulation (CFR) 91.129 and AIM paragraph 4-3-18. It emphasizes the fact that the clearance does not authorize the aircraft to “enter” or “cross” any runways.

**f. 5-1-3. Notice to Airmen (NOTAM) System**

This change amends the AIM to agree with changes made during the rewrite of FAA Order JO 7930.2, Notices to Airmen.

**g. 5-1-6. Flight Plan – Defense VFR (DVFR) Flights**

In accordance with the Title 14 CFR 99.3 definition for DVFR, DVFR procedures do not apply to Department of Defense (DOD) and law enforcement flights. This change clarifies that DOD and law enforcement aircraft are not required to file DVFR flight plans.

**h. 4-4-12. Speed Adjustments**

**5-2-8. Instrument Departure Procedures (DP) – Obstacle Departure Procedures (ODP) and Standard Instrument Departures (SID)**

**5-4-1. Standard Terminal Arrival (STAR), Area Navigation (RNAV) STAR, and Flight Management System Procedures (FMSP) for Arrivals**

This change implements FAA InFO 07011, dated May 17, 2007. It emphasizes that separation and sequencing of airplanes by air traffic control depends on uniform performance by pilots with respect to published altitude and speed constraints, especially when conducting RNAV procedures.

**i. 5-2-8. Instrument Departure Procedures (DP) – Obstacle Departure Procedures (ODP) and Standard Instrument Departures (SID)**

This change updates references to the U.S. Terminal Procedures booklets.

**j. 5-3-2. Position Reporting**

This change updates the AIM to reflect existing policy contained in FAA Order 7110.65, Air Traffic Control, and the Advanced Technologies and Oceanic Procedures Operating Manual. Ocean21 requires a position report for any fix that is filed in the flight plan even if it is considered to be non-compulsory. This change requires pilots to report over all non-compulsory reporting points as well as compulsory reporting points.

**k. 5-4-6. Approach Clearance****5-4-7. Instrument Approach Procedures**

This change provides guidance when the glideslope is unusable; all references to the MLS approach have been removed, and LDA, SDF, and GLS approaches are added as examples. It provides guidance for informing the pilot when the controller requires the aircraft to fly a straight-in approach and not fly the hold-in-lieu-of procedure turn. This change adds a provision that permits vectoring to any fix along the final approach course prior to the final approach fix (FAF). It allows appropriately-equipped RNAV aircraft to be cleared to the intermediate fix (IF) on conventional and RNAV instrument approach procedures when the IF is identified with "IF" on the instrument approach procedures. This change creates new procedures and graphics for aircraft on unpublished routes cleared direct to a fix between the IF and FAF and for handling radius to fix (RF) legs contained on RNAV approaches. This change clarifies air traffic control procedures to be applied in conjunction with aircraft executing RNAV approaches containing RF legs.

**l. 5-4-16. Simultaneous Close Parallel ILS PRM Approaches (Independent) and Simultaneous Offset Instrument Approaches (SOIA) (See FIG 5-4-21)**

This change reflects a major update to guidance for Precision Runway Monitor and SOIA approaches and introduces RNAV (GPS).

**m. 5-4-20. Approach and Landing Minimums**

This change was made to make pilots aware of the fact that circling approach protected areas developed after late 2012 use the radius distance shown in the table on page B2 of the U.S. Terminal Procedures Publication. They are dependent not only on aircraft approach category, but also on the altitude of the circling minimum descent altitude (MDA), which accounts for true airspeed increase with altitude. The approaches using expanded circling approach areas can be identified by the presence of the "negative C" symbol on the circling line of minima.

**n. 7-1-27. PIREPs Relating to Volcanic Ash Activity****7-5-9. Flight Operations in Volcanic Ash**

This change provides expanded and updated information related to Volcanic Ash and the Volcanic Advisory Report as specified by the International Civil Aviation Organization.

**o. 7-5-12. Light Amplification By Stimulated Emission of Radiation (LASER) Operations and Reporting Illumination of Aircraft****Appendix 3. Laser Beam Exposure Questionnaire**

This change updates the formal reporting process for pilots that experience an unauthorized laser illumination of aircraft incident. Pilots will now be referred to the FAA Laser Safety Initiative website at <http://www.faa.gov/about/initiatives/lasers/> for access to the updated Laser Beam Exposure Questionnaire where they will have the option to submit the completed questionnaire electronically. The Laser Beam Exposure Questionnaire is being removed from the AIM.

**p. Entire publication.**

Editorial/format changes were made where necessary, to include recent organization name changes. Revision bars were not used when changes are insignificant in nature.

# AIM Change 3

## Page Control Chart

### August 22, 2013

REMOVE PAGES	DATED	INSERT PAGES	DATED
Checklist of Pages CK-1 through CK-6 . . . .	3/7/13	Checklist of Pages CK-1 through CK-6 . . . .	8/22/13
Table of Contents i and ii . . . . .	3/7/13	Table of Contents i and ii . . . . .	8/22/13
Table of Contents iii through xi . . . . .	7/26/12	Table of Contents iii through xi . . . . .	8/22/13
1-1-17 through 1-1-36 . . . . .	3/7/13	1-1-17 through 1-1-36 . . . . .	8/22/13
1-2-7 . . . . .	7/26/12	1-2-7 . . . . .	8/22/13
3-2-5 . . . . .	7/26/12	3-2-5 . . . . .	7/26/12
3-2-6 . . . . .	7/26/12	3-2-6 . . . . .	8/22/13
3-4-1 . . . . .	7/26/12	3-4-1 . . . . .	7/26/12
3-4-2 . . . . .	7/26/12	3-4-2 . . . . .	8/22/13
3-5-5 . . . . .	7/26/12	3-5-5 . . . . .	7/26/12
3-5-6 . . . . .	7/26/12	3-5-6 . . . . .	8/22/13
3-5-9 . . . . .	7/26/12	3-5-9 . . . . .	8/22/13
4-1-7 through 4-1-10 . . . . .	7/26/12	4-1-7 through 4-1-10 . . . . .	8/22/13
4-2-3 . . . . .	7/26/12	4-2-3 . . . . .	7/26/12
4-2-4 . . . . .	7/26/12	4-2-4 . . . . .	8/22/13
4-3-21 . . . . .	7/26/12	4-3-21 . . . . .	8/22/13
4-3-22 . . . . .	7/26/12	4-3-22 . . . . .	7/26/12
4-4-7 . . . . .	7/26/12	4-4-7 . . . . .	7/26/12
4-4-8 through 4-4-10 . . . . .	7/26/12	4-4-8 through 4-4-10 . . . . .	8/22/13
4-6-1 . . . . .	7/26/12	4-6-1 . . . . .	8/22/13
4-6-2 . . . . .	7/26/12	4-6-2 . . . . .	7/26/12
4-6-3 . . . . .	7/26/12	4-6-3 . . . . .	8/22/13
4-6-4 . . . . .	7/26/12	4-6-4 . . . . .	7/26/12
4-6-9 . . . . .	7/26/12	4-6-9 . . . . .	7/26/12
4-6-10 . . . . .	7/26/12	4-6-10 . . . . .	8/22/13
5-1-3 . . . . .	3/7/13	5-1-3 . . . . .	8/22/13
5-1-4 through 5-1-31 . . . . .	7/26/12	5-1-4 through 5-1-32 . . . . .	8/22/13
5-2-7 . . . . .	3/7/13	5-2-7 . . . . .	3/7/13
5-2-8 and 5-2-9 . . . . .	3/7/13	5-2-8 through 5-2-10 . . . . .	8/22/13
5-3-3 and 5-3-4 . . . . .	7/26/12	5-3-3 and 5-3-4 . . . . .	8/22/13
5-4-1 through 5-4-8 . . . . .	7/26/12	5-4-1 through 5-4-8 . . . . .	8/22/13
5-4-21 . . . . .	3/7/13	5-4-21 . . . . .	3/7/13
5-4-22 . . . . .	3/7/13	5-4-22 . . . . .	8/22/13
5-4-25 through 5-4-29 . . . . .	3/7/13	5-4-25 through 5-4-29 . . . . .	8/22/13
5-4-30 through 5-4-60 . . . . .	7/26/12	5-4-30 through 5-4-62 . . . . .	8/22/13
6-2-1 through 6-2-12 . . . . .	7/26/12	6-2-1 through 6-2-11 . . . . .	8/22/13
7-1-59 and 7-1-60 . . . . .	7/26/12	7-1-59 and 7-1-60 . . . . .	8/22/13
7-5-7 and 7-5-8 . . . . .	7/26/12	7-5-7 and 7-5-8 . . . . .	8/22/13
7-5-9 . . . . .	7/26/12	7-5-9 . . . . .	7/26/12
7-5-10 through 7-5-13 . . . . .	7/26/12	7-5-10 through 7-5-13 . . . . .	8/22/13

REMOVE PAGES	DATED	INSERT PAGES	DATED
7-5-14 .....	7/26/12	7-5-14 .....	7/26/12
Appendix 3-1 through Appendix 4-5 .....	7/26/12	Appendix 3-1 through Appendix 3-5 .....	8/22/13
PCG-1 .....	3/7/13	PCG-1 .....	8/22/13
PCG A-11 .....	2/9/12	PCG A-11 .....	2/9/12
PCG A-12 through A-16 .....	2/9/12	PCG A-12 through A-16 .....	8/22/13
PCG C-7 and C-8 .....	2/9/12	PCG C-7 and C-8 .....	8/22/13
PCG D-1 .....	2/9/12	PCG D-1 .....	2/9/12
PCG D-2 through D-4 .....	2/9/12	PCG D-2 through D-4 .....	8/22/13
PCG G-1 through G-3 .....	3/7/13	PCG G-1 and G-2 .....	8/22/13
PCG I-1 .....	2/9/12	PCG I-1 .....	2/9/12
PCG I-2 through I-5 .....	2/9/12	PCG I-2 through I-5 .....	8/22/13
PCG L-1 .....	2/9/12	PCG L-1 .....	2/9/12
PCG L-2 and L-3 .....	2/9/12	PCG L-2 and L-3 .....	8/22/13
PCG N-1 .....	2/9/12	PCG N-1 .....	2/9/12
PCG N-2 .....	2/9/12	PCG N-2 .....	8/22/13
PCG P-3 and P-4 .....	2/9/12	PCG P-3 and P-4 .....	8/22/13
PCG P-5 .....	7/26/12	PCG P-5 .....	8/22/13
PCG S-1 .....	2/9/12	PCG S-1 .....	2/9/12
PCG S-2 .....	2/9/12	PCG S-2 .....	8/22/13
PCG S-3 .....	2/9/12	PCG S-3 .....	2/9/12
PCG S-4 through S-8 .....	2/9/12	PCG S-4 through S-8 .....	8/22/13
PCG U-1 .....	2/9/12	PCG U-1 .....	8/22/13
PCG V-1 and V-2 .....	2/9/12	PCG V-1 and V-2 .....	8/22/13
Index I-1 through I-13 .....	3/7/13	Index I-1 through I-13 .....	8/22/13

## Checklist of Pages

PAGE	DATE
Cover	7/26/12
Record of Changes	N/A
Exp of Chg-3	8/22/13
 <b>Checklist of Pages</b>	
CK-1	8/22/13
CK-2	8/22/13
CK-3	8/22/13
CK-4	8/22/13
CK-5	8/22/13
CK-6	8/22/13
Subscription Info	7/26/12
Comments/Corr	3/7/13
Comments/Corr	3/7/13
Basic Flight Info	7/26/12
Publication Policy	7/26/12
Reg & Advis Cir	7/26/12
 <b>Table of Contents</b>	
i	8/22/13
ii	8/22/13
iii	8/22/13
iv	8/22/13
v	8/22/13
vi	8/22/13
vii	8/22/13
viii	8/22/13
ix	8/22/13
x	8/22/13
xi	8/22/13
 <b>Chapter 1. Air Navigation</b>	
<b>Section 1. Navigation Aids</b>	
1-1-1	7/26/12
1-1-2	7/26/12
1-1-3	7/26/12
1-1-4	7/26/12
1-1-5	7/26/12
1-1-6	7/26/12
1-1-7	7/26/12
1-1-8	7/26/12
1-1-9	7/26/12
1-1-10	7/26/12
1-1-11	7/26/12

PAGE	DATE
1-1-12	7/26/12
1-1-13	7/26/12
1-1-14	7/26/12
1-1-15	7/26/12
1-1-16	7/26/12
1-1-17	8/22/13
1-1-18	8/22/13
1-1-19	8/22/13
1-1-20	8/22/13
1-1-21	8/22/13
1-1-22	8/22/13
1-1-23	8/22/13
1-1-24	8/22/13
1-1-25	8/22/13
1-1-26	8/22/13
1-1-27	8/22/13
1-1-28	8/22/13
1-1-29	8/22/13
1-1-30	8/22/13
1-1-31	8/22/13
1-1-32	8/22/13
1-1-33	8/22/13
1-1-34	8/22/13
1-1-35	8/22/13
1-1-36	8/22/13
 <b>Section 2. Area Navigation (RNAV) and Required Navigation Performance (RNP)</b>	
1-2-1	7/26/12
1-2-2	7/26/12
1-2-3	7/26/12
1-2-4	7/26/12
1-2-5	7/26/12
1-2-6	7/26/12
1-2-7	8/22/13

PAGE	DATE
 <b>Chapter 2. Aeronautical Lighting and Other Airport Visual Aids</b>	
<b>Section 1. Airport Lighting Aids</b>	
2-1-1	7/26/12
2-1-2	7/26/12
2-1-3	7/26/12
2-1-4	7/26/12
2-1-5	7/26/12
2-1-6	7/26/12
2-1-7	7/26/12
2-1-8	7/26/12
2-1-9	7/26/12
2-1-10	7/26/12
2-1-11	7/26/12
2-1-12	7/26/12
2-1-13	7/26/12
2-1-14	7/26/12
2-1-15	7/26/12
 <b>Section 2. Air Navigation and Obstruction Lighting</b>	
2-2-1	7/26/12
2-2-2	7/26/12
 <b>Section 3. Airport Marking Aids and Signs</b>	
2-3-1	7/26/12
2-3-2	7/26/12
2-3-3	7/26/12
2-3-4	7/26/12
2-3-5	7/26/12
2-3-6	7/26/12
2-3-7	3/7/13
2-3-8	7/26/12
2-3-9	7/26/12
2-3-10	7/26/12
2-3-11	7/26/12
2-3-12	7/26/12
2-3-13	7/26/12
2-3-14	7/26/12
2-3-15	7/26/12
2-3-16	7/26/12
2-3-17	7/26/12
2-3-18	7/26/12
2-3-19	7/26/12
2-3-20	7/26/12
2-3-21	7/26/12

## Checklist of Pages

PAGE	DATE
2-3-22	7/26/12
2-3-23	7/26/12
2-3-24	7/26/12
2-3-25	7/26/12
2-3-26	7/26/12
2-3-27	7/26/12
2-3-28	7/26/12
2-3-29	7/26/12
2-3-30	7/26/12
2-3-31	7/26/12
<b>Chapter 3. Airspace</b>	
<b>Section 1. General</b>	
3-1-1	7/26/12
3-1-2	7/26/12
<b>Section 2. Controlled Airspace</b>	
3-2-1	7/26/12
3-2-2	3/7/13
3-2-3	7/26/12
3-2-4	7/26/12
3-2-5	7/26/12
3-2-6	8/22/13
3-2-7	7/26/12
3-2-8	7/26/12
3-2-9	7/26/12
<b>Section 3. Class G Airspace</b>	
3-3-1	7/26/12
<b>Section 4. Special Use Airspace</b>	
3-4-1	7/26/12
3-4-2	8/22/13
<b>Section 5. Other Airspace Areas</b>	
3-5-1	7/26/12
3-5-2	7/26/12
3-5-3	7/26/12
3-5-4	7/26/12
3-5-5	7/26/12
3-5-6	8/22/13
3-5-7	7/26/12
3-5-8	7/26/12
3-5-9	8/22/13

PAGE	DATE
<b>Chapter 4. Air Traffic Control</b>	
<b>Section 1. Services Available to Pilots</b>	
4-1-1	7/26/12
4-1-2	7/26/12
4-1-3	7/26/12
4-1-4	7/26/12
4-1-5	7/26/12
4-1-6	7/26/12
4-1-7	8/22/13
4-1-8	8/22/13
4-1-9	8/22/13
4-1-10	8/22/13
4-1-11	7/26/12
4-1-12	7/26/12
4-1-13	7/26/12
4-1-14	7/26/12
4-1-15	7/26/12
4-1-16	7/26/12
4-1-17	7/26/12
4-1-18	7/26/12
4-1-19	7/26/12
4-1-20	7/26/12
4-1-21	7/26/12
4-1-22	7/26/12
4-1-23	7/26/12
<b>Section 2. Radio Communications Phraseology and Techniques</b>	
4-2-1	7/26/12
4-2-2	7/26/12
4-2-3	7/26/12
4-2-4	8/22/13
4-2-5	7/26/12
4-2-6	7/26/12
4-2-7	7/26/12
4-2-8	7/26/12
<b>Section 3. Airport Operations</b>	
4-3-1	7/26/12
4-3-2	7/26/12
4-3-3	7/26/12
4-3-4	7/26/12
4-3-5	7/26/12
4-3-6	7/26/12
4-3-7	7/26/12
4-3-8	7/26/12

PAGE	DATE
4-3-9	7/26/12
4-3-10	7/26/12
4-3-11	7/26/12
4-3-13	7/26/12
4-3-14	7/26/12
4-3-15	7/26/12
4-3-16	7/26/12
4-3-17	7/26/12
4-3-18	7/26/12
4-3-19	7/26/12
4-3-20	7/26/12
4-3-21	8/22/13
4-3-22	7/26/12
4-3-23	7/26/12
4-3-24	7/26/12
4-3-25	7/26/12
4-3-26	7/26/12
4-3-27	7/26/12
4-3-28	7/26/12
<b>Section 4. ATC Clearances and Aircraft Separation</b>	
4-4-1	7/26/12
4-4-2	7/26/12
4-4-3	7/26/12
4-4-4	7/26/12
4-4-5	7/26/12
4-4-6	7/26/12
4-4-7	7/26/12
4-4-8	8/22/13
4-4-9	8/22/13
4-4-10	8/22/13
4-4-11	7/26/12
<b>Section 5. Surveillance Systems</b>	
4-5-1	7/26/12
4-5-2	7/26/12
4-5-3	7/26/12
4-5-4	7/26/12
4-5-5	7/26/12
4-5-6	7/26/12
4-5-7	7/26/12
4-5-8	7/26/12
4-5-9	7/26/12
4-5-10	7/26/12
4-5-11	7/26/12
4-5-12	7/26/12
4-5-13	7/26/12



# Checklist of Pages

PAGE	DATE
4-5-14	7/26/12
4-5-15	7/26/12
4-5-16	7/26/12
4-5-17	7/26/12
4-5-18	7/26/12
4-5-19	7/26/12
4-5-20	7/26/12
<b>Section 6. Operational Policy/ Procedures for Reduced Vertical Separation Minimum (RVSM) in the Domestic U.S., Alaska, Offshore Airspace and the San Juan FIR</b>	
4-6-1	8/22/13
4-6-2	7/26/12
4-6-3	8/22/13
4-6-4	7/26/12
4-6-5	7/26/12
4-6-6	7/26/12
4-6-7	7/26/12
4-6-8	7/26/12
4-6-9	7/26/12
4-6-10	8/22/13
4-6-11	7/26/12
<b>Section 7. Operational Policy/ Procedures for the Gulf of Mexico 50 NM Lateral Separation Initiative</b>	
4-7-1	7/26/12
4-7-2	7/26/12
4-7-3	7/26/12
4-7-4	7/26/12
4-7-5	7/26/12
<b>Chapter 5. Air Traffic Procedures</b>	
<b>Section 1. Preflight</b>	
5-1-1	7/26/12
5-1-2	7/26/12
5-1-3	8/22/13
5-1-4	8/22/13
5-1-5	8/22/13
5-1-6	8/22/13
5-1-7	8/22/13
5-1-8	8/22/13
5-1-9	8/22/13
5-1-10	8/22/13
5-1-11	8/22/13
5-1-12	8/22/13

PAGE	DATE
5-1-13	8/22/13
5-1-14	8/22/13
5-1-15	8/22/13
5-1-16	8/22/13
5-1-17	8/22/13
5-1-18	8/22/13
5-1-19	8/22/13
5-1-20	8/22/13
5-1-21	8/22/13
5-1-22	8/22/13
5-1-23	8/22/13
5-1-24	8/22/13
5-1-25	8/22/13
5-1-26	8/22/13
5-1-27	8/22/13
5-1-28	8/22/13
5-1-29	8/22/13
5-1-30	8/22/13
5-1-31	8/22/13
5-1-32	8/22/13
<b>Section 2. Departure Procedures</b>	
5-2-1	7/26/12
5-2-2	7/26/12
5-2-3	7/26/12
5-2-4	7/26/12
5-2-5	3/7/13
5-2-6	3/7/13
5-2-7	3/7/13
5-2-8	8/22/13
5-2-9	8/22/13
5-2-10	8/22/13
<b>Section 3. En Route Procedures</b>	
5-3-1	7/26/12
5-3-2	7/26/12
5-3-3	8/22/13
5-3-4	8/22/13
5-3-5	3/7/13
5-3-6	3/7/13
5-3-7	3/7/13
5-3-8	7/26/12
5-3-9	7/26/12
5-3-10	7/26/12
5-3-11	7/26/12
5-3-12	7/26/12
5-3-13	7/26/12
5-3-14	7/26/12

PAGE	DATE
<b>Section 4. Arrival Procedures</b>	
5-4-1	8/22/13
5-4-2	8/22/13
5-4-3	8/22/13
5-4-4	8/22/13
5-4-5	8/22/13
5-4-6	8/22/13
5-4-7	8/22/13
5-4-8	8/22/13
5-4-9	7/26/12
5-4-10	7/26/12
5-4-11	7/26/12
5-4-12	7/26/12
5-4-13	7/26/12
5-4-14	7/26/12
5-4-15	7/26/12
5-4-16	7/26/12
5-4-17	7/26/12
5-4-18	7/26/12
5-4-19	7/26/12
5-4-20	7/26/12
5-4-21	3/7/13
5-4-22	8/22/13
5-4-23	3/7/13
5-4-24	3/7/13
5-4-25	8/22/13
5-4-26	8/22/13
5-4-27	8/22/13
5-4-28	8/22/13
5-4-29	8/22/13
5-4-30	8/22/13
5-4-31	8/22/13
5-4-32	8/22/13
5-4-33	8/22/13
5-4-34	8/22/13
5-4-35	8/22/13
5-4-36	8/22/13
5-4-37	8/22/13
5-4-38	8/22/13
5-4-39	8/22/13
5-4-40	8/22/13
5-4-41	8/22/13
5-4-42	8/22/13
5-4-43	8/22/13
5-4-44	8/22/13
5-4-45	8/22/13
5-4-46	8/22/13
5-4-47	8/22/13
5-4-48	8/22/13

## Checklist of Pages

PAGE	DATE
5-4-49	8/22/13
5-4-50	8/22/13
5-4-51	8/22/13
5-4-52	8/22/13
5-4-53	8/22/13
5-4-54	8/22/13
5-4-55	8/22/13
5-4-56	8/22/13
5-4-57	8/22/13
5-4-58	8/22/13
5-4-59	8/22/13
5-4-60	8/22/13
5-4-61	8/22/13
5-4-62	8/22/13
<b>Section 5. Pilot/Controller Roles and Responsibilities</b>	
5-5-1	7/26/12
5-5-2	7/26/12
5-5-3	7/26/12
5-5-4	7/26/12
5-5-5	7/26/12
5-5-6	7/26/12
5-5-7	7/26/12
5-5-8	7/26/12
<b>Section 6. National Security and Interception Procedures</b>	
5-6-1	7/26/12
5-6-2	7/26/12
5-6-3	7/26/12
5-6-4	7/26/12
5-6-5	7/26/12
5-6-6	7/26/12
5-6-7	7/26/12
5-6-8	7/26/12
5-6-9	7/26/12
<b>Chapter 6. Emergency Procedures</b>	
<b>Section 1. General</b>	
6-1-1	7/26/12
<b>Section 2. Emergency Services Available to Pilots</b>	
6-2-1	8/22/13
6-2-2	8/22/13
6-2-3	8/22/13
6-2-4	8/22/13

PAGE	DATE
6-2-5	8/22/13
6-2-6	8/22/13
6-2-7	8/22/13
6-2-8	8/22/13
6-2-9	8/22/13
6-2-10	8/22/13
6-2-11	8/22/13
<b>Section 3. Distress and Urgency Procedures</b>	
6-3-1	7/26/12
6-3-2	7/26/12
6-3-3	7/26/12
6-3-4	7/26/12
6-3-5	7/26/12
6-3-6	7/26/12
6-3-7	7/26/12
<b>Section 4. Two-way Radio Communications Failure</b>	
6-4-1	7/26/12
6-4-2	7/26/12
<b>Section 5. Aircraft Rescue and Fire Fighting Communications</b>	
6-5-1	7/26/12
6-5-2	7/26/12
<b>Chapter 7. Safety of Flight</b>	
<b>Section 1. Meteorology</b>	
7-1-1	3/7/13
7-1-2	7/26/12
7-1-3	7/26/12
7-1-4	7/26/12
7-1-5	7/26/12
7-1-6	7/26/12
7-1-7	7/26/12
7-1-8	7/26/12
7-1-9	7/26/12
7-1-10	7/26/12
7-1-11	7/26/12
7-1-12	7/26/12
7-1-13	7/26/12
7-1-14	7/26/12
7-1-15	7/26/12
7-1-16	7/26/12
7-1-17	7/26/12

PAGE	DATE
7-1-18	7/26/12
7-1-19	7/26/12
7-1-20	7/26/12
7-1-21	7/26/12
7-1-22	7/26/12
7-1-23	3/7/13
7-1-24	7/26/12
7-1-25	7/26/12
7-1-26	7/26/12
7-1-27	7/26/12
7-1-28	7/26/12
7-1-29	7/26/12
7-1-30	7/26/12
7-1-31	7/26/12
7-1-32	7/26/12
7-1-33	7/26/12
7-1-34	7/26/12
7-1-35	7/26/12
7-1-36	7/26/12
7-1-37	7/26/12
7-1-38	7/26/12
7-1-39	7/26/12
7-1-40	7/26/12
7-1-41	7/26/12
7-1-42	7/26/12
7-1-43	7/26/12
7-1-44	7/26/12
7-1-45	7/26/12
7-1-46	7/26/12
7-1-47	7/26/12
7-1-48	7/26/12
7-1-49	7/26/12
7-1-50	7/26/12
7-1-51	7/26/12
7-1-52	7/26/12
7-1-53	7/26/12
7-1-54	7/26/12
7-1-55	7/26/12
7-1-56	7/26/12
7-1-57	7/26/12
7-1-58	7/26/12
7-1-59	8/22/13
7-1-60	8/22/13
7-1-61	7/26/12
7-1-62	7/26/12
7-1-63	7/26/12
7-1-64	7/26/12
7-1-65	7/26/12
7-1-66	7/26/12

## Checklist of Pages

PAGE	DATE
7-1-67	7/26/12
7-1-68	7/26/12
7-1-69	7/26/12
7-1-70	7/26/12
7-1-71	7/26/12
7-1-72	7/26/12
7-1-73	7/26/12
<b>Section 2. Altimeter Setting Procedures</b>	
7-2-1	7/26/12
7-2-2	7/26/12
7-2-3	7/26/12
7-2-4	7/26/12
<b>Section 3. Wake Turbulence</b>	
7-3-1	7/26/12
7-3-2	7/26/12
7-3-3	7/26/12
7-3-4	7/26/12
7-3-5	7/26/12
7-3-6	7/26/12
7-3-7	7/26/12
7-3-8	7/26/12
<b>Section 4. Bird Hazards and Flight Over National Refuges, Parks, and Forests</b>	
7-4-1	7/26/12
7-4-2	7/26/12
<b>Section 5. Potential Flight Hazards</b>	
7-5-1	3/7/13
7-5-2	7/26/12
7-5-3	7/26/12
7-5-4	7/26/12
7-5-5	7/26/12
7-5-6	7/26/12
7-5-7	8/22/13
7-5-8	8/22/13
7-5-9	7/26/12
7-5-10	8/22/13
7-5-11	8/22/13
7-5-12	8/22/13
7-5-13	8/22/13
7-5-14	7/26/12

PAGE	DATE
<b>Section 6. Safety, Accident, and Hazard Reports</b>	
7-6-1	7/26/12
7-6-2	7/26/12
7-6-3	7/26/12
<b>Chapter 8. Medical Facts for Pilots</b>	
<b>Section 1. Fitness for Flight</b>	
8-1-1	7/26/12
8-1-2	7/26/12
8-1-3	7/26/12
8-1-4	7/26/12
8-1-5	7/26/12
8-1-6	7/26/12
8-1-7	7/26/12
8-1-8	7/26/12
8-1-9	7/26/12
<b>Chapter 9. Aeronautical Charts and Related Publications</b>	
<b>Section 1. Types of Charts Available</b>	
9-1-1	7/26/12
9-1-2	7/26/12
9-1-3	7/26/12
9-1-4	7/26/12
9-1-5	7/26/12
9-1-6	7/26/12
9-1-7	7/26/12
9-1-8	7/26/12
9-1-9	7/26/12
9-1-10	7/26/12
9-1-11	7/26/12
9-1-12	7/26/12
9-1-13	7/26/12
<b>Chapter 10. Helicopter Operations</b>	
<b>Section 1. Helicopter IFR Operations</b>	
10-1-1	7/26/12
10-1-2	7/26/12
10-1-3	7/26/12
10-1-4	7/26/12
10-1-5	7/26/12
10-1-6	7/26/12
10-1-7	7/26/12

PAGE	DATE
<b>Section 2. Special Operations</b>	
10-2-1	7/26/12
10-2-2	7/26/12
10-2-3	7/26/12
10-2-4	7/26/12
10-2-5	7/26/12
10-2-6	7/26/12
10-2-7	7/26/12
10-2-8	7/26/12
10-2-9	7/26/12
10-2-10	7/26/12
10-2-11	7/26/12
10-2-12	7/26/12
10-2-13	7/26/12
10-2-14	7/26/12
10-2-15	7/26/12
10-2-16	7/26/12
10-2-17	7/26/12
<b>Appendices</b>	
Appendix 1-1	7/26/12
Env	N/A
Appendix 2-1	7/26/12
Appendix 3-1	8/22/13
Appendix 3-2	8/22/13
Appendix 3-3	8/22/13
Appendix 3-4	8/22/13
Appendix 3-5	8/22/13
<b>Pilot/Controller Glossary</b>	
PCG-1	8/22/13
PCG A-1	2/9/12
PCG A-2	2/9/12
PCG A-3	2/9/12
PCG A-4	2/9/12
PCG A-5	2/9/12
PGC A-6	2/9/12
PCG A-7	2/9/12
PCG A-8	2/9/12
PCG A-9	2/9/12
PCG A-10	2/9/12
PCG A-11	2/9/12
PCG A-12	8/22/13
PCG A-13	8/22/13
PCG A-14	8/22/13
PCG A-15	8/22/13
PCG A-16	8/22/13
PCG B-1	2/9/12

## Checklist of Pages

PAGE	DATE
PCG C-1	2/9/12
PCG C-2	2/9/12
PCG C-3	2/9/12
PCG C-4	2/9/12
PCG C-5	2/9/12
PCG C-6	2/9/12
PCG C-7	8/22/13
PCG C-8	8/22/13
PCG C-9	2/9/12
PCG D-1	2/9/12
PCG D-2	8/22/13
PCG D-3	8/22/13
PCG D-4	8/22/13
PCG E-1	2/9/12
PCG E-2	2/9/12
PCG F-1	2/9/12
PCG F-2	2/9/12
PCG F-3	2/9/12
PCG F-4	2/9/12
PCG F-5	2/9/12
PCG G-1	8/22/13
PCG G-2	8/22/13
PCG H-1	2/9/12
PCG H-2	2/9/12
PCG H-3	2/9/12
PCG I-1	2/9/12
PCG I-2	8/22/13
PCG I-3	8/22/13
PCG I-4	8/22/13
PCG I-5	8/22/13
PCG J-1	2/9/12
PCG K-1	2/9/12
PCG L-1	2/9/12
PCG L-2	8/22/13
PCG L-3	8/22/13

PAGE	DATE
PCG M-1	2/9/12
PCG M-2	2/9/12
PCG M-3	2/9/12
PCG M-4	2/9/12
PCG M-5	2/9/12
PCG M-6	2/9/12
PCG N-1	2/9/12
PCG N-2	8/22/13
PCG N-3	2/9/12
PCG N-4	2/9/12
PCG O-1	2/9/12
PCG O-2	7/26/12
PCG O-3	7/26/12
PCG O-4	7/26/12
PCG P-1	2/9/12
PCG P-2	2/9/12
PCG P-3	8/22/13
PCG P-4	8/22/13
PCG P-5	8/22/13
PCG Q-1	2/9/12
PCG R-1	2/9/12
PCG R-2	2/9/12
PCG R-3	2/9/12
PCG R-4	2/9/12
PCG R-5	2/9/12
PCG R-6	2/9/12
PCG R-7	2/9/12
PCG R-8	2/9/12
PCG S-1	2/9/12
PCG S-2	8/22/13
PCG S-3	2/9/12
PCG S-4	8/22/13
PCG S-5	8/22/13
PCG S-6	8/22/13
PCG S-7	8/22/13
PCG S-8	8/22/13

PAGE	DATE
PCG T-1	2/9/12
PCG T-2	2/9/12
PCG T-3	2/9/12
PCG T-4	2/9/12
PCG T-5	2/9/12
PCG T-6	2/9/12
PCG T-7	2/9/12
PCG T-8	2/9/12
PCG U-1	8/22/13
PCG V-1	8/22/13
PCG V-2	8/22/13
PCG V-3	2/9/12
PCG V-4	2/9/12
PCG W-1	2/9/12
<b>Index</b>	
I-1	8/22/13
I-2	8/22/13
I-3	8/22/13
I-4	8/22/13
I-5	8/22/13
I-6	8/22/13
I-7	8/22/13
I-8	8/22/13
I-9	8/22/13
I-10	8/22/13
I-11	8/22/13
I-12	8/22/13
I-13	8/22/13
Back Cover	N/A

# Table of Contents

## Chapter 1. Air Navigation

### Section 1. Navigation Aids

Paragraph	Page
1-1-1. General .....	1-1-1
1-1-2. Nondirectional Radio Beacon (NDB) .....	1-1-1
1-1-3. VHF Omni-directional Range (VOR) .....	1-1-1
1-1-4. VOR Receiver Check .....	1-1-2
1-1-5. Tactical Air Navigation (TACAN) .....	1-1-3
1-1-6. VHF Omni-directional Range/Tactical Air Navigation (VORTAC) .....	1-1-3
1-1-7. Distance Measuring Equipment (DME) .....	1-1-3
1-1-8. Navigational Aid (NAVAID) Service Volumes .....	1-1-4
1-1-9. Instrument Landing System (ILS) .....	1-1-7
1-1-10. Simplified Directional Facility (SDF) .....	1-1-12
1-1-11. Microwave Landing System (MLS) .....	1-1-14
1-1-12. NAVAID Identifier Removal During Maintenance .....	1-1-16
1-1-13. NAVAIDs with Voice .....	1-1-17
1-1-14. User Reports Requested on NAVAID or Global Navigation Satellite System (GNSS) Performance or Interference .....	1-1-17
1-1-15. LORAN .....	1-1-17
1-1-16. Inertial Reference Unit (IRU), Inertial Navigation System (INS), and Attitude Heading Reference System (AHRS) .....	1-1-17
1-1-17. Doppler Radar .....	1-1-18
1-1-18. Global Positioning System (GPS) .....	1-1-18
1-1-19. Wide Area Augmentation System (WAAS) .....	1-1-31
1-1-20. Ground Based Augmentation System (GBAS) Landing System (GLS) .....	1-1-35
1-1-21. Precision Approach Systems other than ILS, GLS, and MLS .....	1-1-36

### Section 2. Area Navigation (RNAV) and Required Navigation Performance (RNP)

1-2-1. Area Navigation (RNAV) .....	1-2-1
1-2-2. Required Navigation Performance (RNP) .....	1-2-4
1-2-3. Use of Suitable Area Navigation (RNAV) Systems on Conventional Procedures and Routes .....	1-2-5

## Chapter 2. Aeronautical Lighting and Other Airport Visual Aids

### Section 1. Airport Lighting Aids

2-1-1. Approach Light Systems (ALS) .....	2-1-1
2-1-2. Visual Glideslope Indicators .....	2-1-1
2-1-3. Runway End Identifier Lights (REIL) .....	2-1-6
2-1-4. Runway Edge Light Systems .....	2-1-6
2-1-5. In-runway Lighting .....	2-1-6
2-1-6. Runway Status Light (RWSL) System .....	2-1-7
2-1-7. Stand-Alone Final Approach Runway Occupancy Signal (FAROS) .....	2-1-10
2-1-8. Control of Lighting Systems .....	2-1-11

<b>Paragraph</b>	<b>Page</b>
2-1-9. Pilot Control of Airport Lighting .....	2-1-11
2-1-10. Airport/Heliport Beacons .....	2-1-14
2-1-11. Taxiway Lights .....	2-1-15

## **Section 2. Air Navigation and Obstruction Lighting**

2-2-1. Aeronautical Light Beacons .....	2-2-1
2-2-2. Code Beacons and Course Lights .....	2-2-1
2-2-3. Obstruction Lights .....	2-2-1

## **Section 3. Airport Marking Aids and Signs**

2-3-1. General .....	2-3-1
2-3-2. Airport Pavement Markings .....	2-3-1
2-3-3. Runway Markings .....	2-3-1
2-3-4. Taxiway Markings .....	2-3-7
2-3-5. Holding Position Markings .....	2-3-12
2-3-6. Other Markings .....	2-3-16
2-3-7. Airport Signs .....	2-3-19
2-3-8. Mandatory Instruction Signs .....	2-3-20
2-3-9. Location Signs .....	2-3-23
2-3-10. Direction Signs .....	2-3-25
2-3-11. Destination Signs .....	2-3-28
2-3-12. Information Signs .....	2-3-29
2-3-13. Runway Distance Remaining Signs .....	2-3-29
2-3-14. Aircraft Arresting Systems .....	2-3-30
2-3-15. Security Identifications Display Area (Airport Ramp Area) .....	2-3-31

# **Chapter 3. Airspace**

## **Section 1. General**

3-1-1. General .....	3-1-1
3-1-2. General Dimensions of Airspace Segments .....	3-1-1
3-1-3. Hierarchy of Overlapping Airspace Designations .....	3-1-1
3-1-4. Basic VFR Weather Minimums .....	3-1-1
3-1-5. VFR Cruising Altitudes and Flight Levels .....	3-1-2

## **Section 2. Controlled Airspace**

3-2-1. General .....	3-2-1
3-2-2. Class A Airspace .....	3-2-2
3-2-3. Class B Airspace .....	3-2-2
3-2-4. Class C Airspace .....	3-2-4
3-2-5. Class D Airspace .....	3-2-8
3-2-6. Class E Airspace .....	3-2-9

## **Section 3. Class G Airspace**

3-3-1. General .....	3-3-1
3-3-2. VFR Requirements .....	3-3-1
3-3-3. IFR Requirements .....	3-3-1

## Section 4. Special Use Airspace

Paragraph	Page
3-4-1. General .....	3-4-1
3-4-2. Prohibited Areas .....	3-4-1
3-4-3. Restricted Areas .....	3-4-1
3-4-4. Warning Areas .....	3-4-1
3-4-5. Military Operations Areas .....	3-4-2
3-4-6. Alert Areas .....	3-4-2
3-4-7. Controlled Firing Areas .....	3-4-2
3-4-8. National Security Areas .....	3-4-2

## Section 5. Other Airspace Areas

3-5-1. Airport Advisory/Information Services .....	3-5-1
3-5-2. Military Training Routes .....	3-5-1
3-5-3. Temporary Flight Restrictions .....	3-5-2
3-5-4. Parachute Jump Aircraft Operations .....	3-5-5
3-5-5. Published VFR Routes .....	3-5-5
3-5-6. Terminal Radar Service Area (TRSA) .....	3-5-9

# Chapter 4. Air Traffic Control

## Section 1. Services Available to Pilots

4-1-1. Air Route Traffic Control Centers .....	4-1-1
4-1-2. Control Towers .....	4-1-1
4-1-3. Flight Service Stations .....	4-1-1
4-1-4. Recording and Monitoring .....	4-1-1
4-1-5. Communications Release of IFR Aircraft Landing at an Airport Without an Operating Control Tower .....	4-1-1
4-1-6. Pilot Visits to Air Traffic Facilities .....	4-1-1
4-1-7. Operation Take-off and Operation Raincheck .....	4-1-2
4-1-8. Approach Control Service for VFR Arriving Aircraft .....	4-1-2
4-1-9. Traffic Advisory Practices at Airports Without Operating Control Towers ....	4-1-2
4-1-10. IFR Approaches/Ground Vehicle Operations .....	4-1-6
4-1-11. Designated UNICOM/MULTICOM Frequencies .....	4-1-6
4-1-12. Use of UNICOM for ATC Purposes .....	4-1-7
4-1-13. Automatic Terminal Information Service (ATIS) .....	4-1-7
4-1-14. Automatic Flight Information Service (AFIS) – Alaska FSSs Only .....	4-1-8
4-1-15. Radar Traffic Information Service .....	4-1-8
4-1-16. Safety Alert .....	4-1-10
4-1-17. Radar Assistance to VFR Aircraft .....	4-1-11
4-1-18. Terminal Radar Services for VFR Aircraft .....	4-1-12
4-1-19. Tower En Route Control (TEC) .....	4-1-14
4-1-20. Transponder Operation .....	4-1-15
4-1-21. Hazardous Area Reporting Service .....	4-1-18
4-1-22. Airport Reservation Operations and Special Traffic Management Programs .	4-1-21
4-1-23. Requests for Waivers and Authorizations from Title 14, Code of Federal Regulations (14 CFR) .....	4-1-23
4-1-24. Weather System Processor .....	4-1-23

## Section 2. Radio Communications Phraseology and Techniques

Paragraph	Page
4-2-1. General .....	4-2-1
4-2-2. Radio Technique .....	4-2-1
4-2-3. Contact Procedures .....	4-2-1
4-2-4. Aircraft Call Signs .....	4-2-3
4-2-5. Description of Interchange or Leased Aircraft .....	4-2-4
4-2-6. Ground Station Call Signs .....	4-2-4
4-2-7. Phonetic Alphabet .....	4-2-5
4-2-8. Figures .....	4-2-6
4-2-9. Altitudes and Flight Levels .....	4-2-6
4-2-10. Directions .....	4-2-6
4-2-11. Speeds .....	4-2-6
4-2-12. Time .....	4-2-6
4-2-13. Communications with Tower when Aircraft Transmitter or Receiver or Both are Inoperative .....	4-2-7
4-2-14. Communications for VFR Flights .....	4-2-8

## Section 3. Airport Operations

4-3-1. General .....	4-3-1
4-3-2. Airports with an Operating Control Tower .....	4-3-1
4-3-3. Traffic Patterns .....	4-3-2
4-3-4. Visual Indicators at Airports Without an Operating Control Tower .....	4-3-5
4-3-5. Unexpected Maneuvers in the Airport Traffic Pattern .....	4-3-6
4-3-6. Use of Runways/Declared Distances .....	4-3-6
4-3-7. Low Level Wind Shear/Microburst Detection Systems .....	4-3-11
4-3-8. Braking Action Reports and Advisories .....	4-3-11
4-3-9. Runway Friction Reports and Advisories .....	4-3-11
4-3-10. Intersection Takeoffs .....	4-3-12
4-3-11. Pilot Responsibilities When Conducting Land and Hold Short Operations (LAHSO) .....	4-3-13
4-3-12. Low Approach .....	4-3-15
4-3-13. Traffic Control Light Signals .....	4-3-15
4-3-14. Communications .....	4-3-16
4-3-15. Gate Holding Due to Departure Delays .....	4-3-17
4-3-16. VFR Flights in Terminal Areas .....	4-3-17
4-3-17. VFR Helicopter Operations at Controlled Airports .....	4-3-17
4-3-18. Taxiing .....	4-3-19
4-3-19. Taxi During Low Visibility .....	4-3-20
4-3-20. Exiting the Runway After Landing .....	4-3-21
4-3-21. Practice Instrument Approaches .....	4-3-21
4-3-22. Option Approach .....	4-3-23
4-3-23. Use of Aircraft Lights .....	4-3-23
4-3-24. Flight Inspection/'Flight Check' Aircraft in Terminal Areas .....	4-3-24
4-3-25. Hand Signals .....	4-3-24
4-3-26. Operations at Uncontrolled Airports With Automated Surface Observing System (ASOS)/Automated Weather Sensor System(AWSS)/Automated Weather Observing System (AWOS) .....	4-3-28



## Section 4. ATC Clearances and Aircraft Separation

Paragraph	Page
4-4-1. Clearance .....	4-4-1
4-4-2. Clearance Prefix .....	4-4-1
4-4-3. Clearance Items .....	4-4-1
4-4-4. Amended Clearances .....	4-4-2
4-4-5. Coded Departure Route (CDR) .....	4-4-3
4-4-6. Special VFR Clearances .....	4-4-3
4-4-7. Pilot Responsibility upon Clearance Issuance .....	4-4-4
4-4-8. IFR Clearance VFR-on-top .....	4-4-4
4-4-9. VFR/IFR Flights .....	4-4-5
4-4-10. Adherence to Clearance .....	4-4-5
4-4-11. IFR Separation Standards .....	4-4-7
4-4-12. Speed Adjustments .....	4-4-7
4-4-13. Runway Separation .....	4-4-9
4-4-14. Visual Separation .....	4-4-9
4-4-15. Use of Visual Clearing Procedures .....	4-4-10
4-4-16. Traffic Alert and Collision Avoidance System (TCAS I & II) .....	4-4-10
4-4-17. Traffic Information Service (TIS) .....	4-4-10

## Section 5. Surveillance Systems

4-5-1. Radar .....	4-5-1
4-5-2. Air Traffic Control Radar Beacon System (ATCRBS) .....	4-5-2
4-5-3. Surveillance Radar .....	4-5-7
4-5-4. Precision Approach Radar (PAR) .....	4-5-7
4-5-5. Airport Surface Detection Equipment – Model X (ASDE-X) .....	4-5-7
4-5-6. Traffic Information Service (TIS) .....	4-5-8
4-5-7. Automatic Dependent Surveillance–Broadcast (ADS-B) Services .....	4-5-14
4-5-8. Traffic Information Service– Broadcast (TIS-B) .....	4-5-17
4-5-9. Flight Information Service– Broadcast (FIS-B) .....	4-5-18
4-5-10. Automatic Dependent Surveillance–Rebroadcast (ADS-R) .....	4-5-20

## Section 6. Operational Policy/Procedures for Reduced Vertical Separation Minimum (RVSM) in the Domestic U.S., Alaska, Offshore Airspace and the San Juan FIR

4-6-1. Applicability and RVSM Mandate (Date/Time and Area) .....	4-6-1
4-6-2. Flight Level Orientation Scheme .....	4-6-1
4-6-3. Aircraft and Operator Approval Policy/Procedures, RVSM Monitoring and Databases for Aircraft and Operator Approval .....	4-6-2
4-6-4. Flight Planning into RVSM Airspace .....	4-6-3
4-6-5. Pilot RVSM Operating Practices and Procedures .....	4-6-3
4-6-6. Guidance on Severe Turbulence and Mountain Wave Activity (MWA) .....	4-6-4
4-6-7. Guidance on Wake Turbulence .....	4-6-5
4-6-8. Pilot/Controller Phraseology .....	4-6-6
4-6-9. Contingency Actions: Weather Encounters and Aircraft System Failures .....	4-6-8
4-6-10. Procedures for Accommodation of Non-RVSM Aircraft .....	4-6-10
4-6-11. Non-RVSM Aircraft Requesting Climb to and Descent from Flight Levels Above RVSM Airspace Without Intermediate Level Off .....	4-6-11

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

<b>Paragraph</b>	<b>Page</b>
4-7-1. Introduction and Background .....	4-7-1
4-7-2. Gulf of Mexico 50 NM Lateral Separation Initiative Web Page: Policy, Procedures and Guidance for Operators and Regulators .....	4-7-1
4-7-3. Lateral Separation Minima Applied .....	4-7-1
4-7-4. Operation on Routes on the periphery of the Gulf of Mexico CTAs .....	4-7-2
4-7-5. Provisions for Accommodation of NonRNP10 Aircraft (Aircraft Not Authorized RNP 10 or RNP 4) .....	4-7-2
4-7-6. Operator Action .....	4-7-2
4-7-7. RNP 10 or RNP 4 Authorization: Policy and Procedures for Aircraft and Operators .....	4-7-2
4-7-8. Flight Planning Requirements .....	4-7-4
4-7-9. Pilot and Dispatcher Procedures: Basic and In-flight Contingency Procedures .	4-7-5

## **Chapter 5. Air Traffic Procedures**

### **Section 1. Preflight**

5-1-1. Preflight Preparation .....	5-1-1
5-1-2. Follow IFR Procedures Even When Operating VFR .....	5-1-2
5-1-3. Notice to Airmen (NOTAM) System .....	5-1-2
5-1-4. Flight Plan – VFR Flights .....	5-1-7
5-1-5. Operational Information System (OIS) .....	5-1-10
5-1-6. Flight Plan– Defense VFR (DVFR) Flights .....	5-1-10
5-1-7. Composite Flight Plan (VFR/IFR Flights) .....	5-1-11
5-1-8. Flight Plan (FAA Form 7233-1)– Domestic IFR Flights .....	5-1-11
5-1-9. International Flight Plan (FAA Form 7233-4)– IFR Flights (For Domestic or International Flights) .....	5-1-18
5-1-10. IFR Operations to High Altitude Destinations .....	5-1-29
5-1-11. Flights Outside the U.S. and U.S. Territories .....	5-1-30
5-1-12. Change in Flight Plan .....	5-1-32
5-1-13. Change in Proposed Departure Time .....	5-1-32
5-1-14. Closing VFR/DVFR Flight Plans .....	5-1-32
5-1-15. Canceling IFR Flight Plan .....	5-1-32
5-1-16. RNAV and RNP Operations .....	5-1-32

### **Section 2. Departure Procedures**

5-2-1. Pre-taxi Clearance Procedures .....	5-2-1
5-2-2. Pre-departure Clearance Procedures .....	5-2-1
5-2-3. Taxi Clearance .....	5-2-1
5-2-4. Line Up and Wait (LUAW) .....	5-2-1
5-2-5. Abbreviated IFR Departure Clearance (Cleared. .as Filed) Procedures .....	5-2-2
5-2-6. Departure Restrictions, Clearance Void Times, Hold for Release, and Release Times .....	5-2-4
5-2-7. Departure Control .....	5-2-5
5-2-8. Instrument Departure Procedures (DP) – Obstacle Departure Procedures (ODP) and Standard Instrument Departures (SID) .....	5-2-5

### Section 3. En Route Procedures

Paragraph	Page
5-3-1. ARTCC Communications .....	5-3-1
5-3-2. Position Reporting .....	5-3-3
5-3-3. Additional Reports .....	5-3-4
5-3-4. Airways and Route Systems .....	5-3-5
5-3-5. Airway or Route Course Changes .....	5-3-7
5-3-6. Changeover Points (COPs) .....	5-3-8
5-3-7. Minimum Turning Altitude (MTA) .....	5-3-8
5-3-8. Holding .....	5-3-8

### Section 4. Arrival Procedures

5-4-1. Standard Terminal Arrival (STAR), Area Navigation (RNAV) STAR, and Flight Management System Procedures (FMSP) for Arrivals .....	5-4-1
5-4-2. Local Flow Traffic Management Program .....	5-4-2
5-4-3. Approach Control .....	5-4-3
5-4-4. Advance Information on Instrument Approach .....	5-4-3
5-4-5. Instrument Approach Procedure Charts .....	5-4-4
5-4-6. Approach Clearance .....	5-4-25
5-4-7. Instrument Approach Procedures .....	5-4-27
5-4-8. Special Instrument Approach Procedures .....	5-4-28
5-4-9. Procedure Turn and Hold-in-lieu of Procedure Turn .....	5-4-29
5-4-10. Timed Approaches from a Holding Fix .....	5-4-32
5-4-11. Radar Approaches .....	5-4-35
5-4-12. Radar Monitoring of Instrument Approaches .....	5-4-36
5-4-13. ILS/MLS Approaches to Parallel Runways .....	5-4-37
5-4-14. Parallel ILS/MLS Approaches (Dependent) (See FIG 5-4-20.) .....	5-4-39
5-4-15. Simultaneous Parallel ILS/MLS Approaches (Independent) (See FIG 5-4-21.) .....	5-4-40
5-4-16. Simultaneous Close Parallel ILS PRM and RNAV (GPS) PRM Approaches (Independent) and Simultaneous Offset Instrument Approaches (SOIA) (See FIG 5-4-22.) .....	5-4-42
5-4-17. Simultaneous Converging Instrument Approaches .....	5-4-48
5-4-18. RNP AR Instrument Approach Procedures .....	5-4-48
5-4-19. Side-step Maneuver .....	5-4-51
5-4-20. Approach and Landing Minimums .....	5-4-51
5-4-21. Missed Approach .....	5-4-54
5-4-22. Use of Enhanced Flight Vision Systems (EFVS) on Instrument Approaches .....	5-4-57
5-4-23. Visual Approach .....	5-4-59
5-4-24. Charted Visual Flight Procedure (CVFP) .....	5-4-60
5-4-25. Contact Approach .....	5-4-61
5-4-26. Landing Priority .....	5-4-61
5-4-27. Overhead Approach Maneuver .....	5-4-61

### Section 5. Pilot/Controller Roles and Responsibilities

5-5-1. General .....	5-5-1
5-5-2. Air Traffic Clearance .....	5-5-1
5-5-3. Contact Approach .....	5-5-2
5-5-4. Instrument Approach .....	5-5-2
5-5-5. Missed Approach .....	5-5-2
5-5-6. Radar Vectors .....	5-5-3

<b>Paragraph</b>	<b>Page</b>
5-5-7. Safety Alert .....	5-5-3
5-5-8. See and Avoid .....	5-5-4
5-5-9. Speed Adjustments .....	5-5-4
5-5-10. Traffic Advisories (Traffic Information) .....	5-5-4
5-5-11. Visual Approach .....	5-5-5
5-5-12. Visual Separation .....	5-5-5
5-5-13. VFR-on-top .....	5-5-6
5-5-14. Instrument Departures .....	5-5-6
5-5-15. Minimum Fuel Advisory .....	5-5-6
5-5-16. RNAV and RNP Operations .....	5-5-7

## **Section 6. National Security and Interception Procedures**

5-6-1. National Security .....	5-6-1
5-6-2. Interception Procedures .....	5-6-2
5-6-3. Law Enforcement Operations by Civil and Military Organizations .....	5-6-5
5-6-4. Interception Signals .....	5-6-6
5-6-5. ADIZ Boundaries and Designated Mountainous Areas (See FIG 5-6-3.) ...	5-6-8
5-6-6. Visual Warning System (VWS) .....	5-6-9

## **Chapter 6. Emergency Procedures**

### **Section 1. General**

6-1-1. Pilot Responsibility and Authority .....	6-1-1
6-1-2. Emergency Condition— Request Assistance Immediately .....	6-1-1

### **Section 2. Emergency Services Available to Pilots**

6-2-1. Radar Service for VFR Aircraft in Difficulty .....	6-2-1
6-2-2. Transponder Emergency Operation .....	6-2-1
6-2-3. Intercept and Escort .....	6-2-1
6-2-4. Emergency Locator Transmitter (ELT) .....	6-2-2
6-2-5. FAA K-9 Explosives Detection Team Program .....	6-2-3
6-2-6. Search and Rescue .....	6-2-4

### **Section 3. Distress and Urgency Procedures**

6-3-1. Distress and Urgency Communications .....	6-3-1
6-3-2. Obtaining Emergency Assistance .....	6-3-2
6-3-3. Ditching Procedures .....	6-3-3
6-3-4. Special Emergency (Air Piracy) .....	6-3-6
6-3-5. Fuel Dumping .....	6-3-7

### **Section 4. Two-way Radio Communications Failure**

6-4-1. Two-way Radio Communications Failure .....	6-4-1
6-4-2. Transponder Operation During Two-way Communications Failure .....	6-4-2
6-4-3. Reestablishing Radio Contact .....	6-4-2

### **Section 5. Aircraft Rescue and Fire Fighting Communications**

6-5-1. Discrete Emergency Frequency .....	6-5-1
6-5-2. Radio Call Signs .....	6-5-1

<b>Paragraph</b>	<b>Page</b>
6-5-3. ARFF Emergency Hand Signals .....	6-5-1

## **Chapter 7. Safety of Flight**

### **Section 1. Meteorology**

7-1-1. National Weather Service Aviation Products .....	7-1-1
7-1-2. FAA Weather Services .....	7-1-1
7-1-3. Use of Aviation Weather Products .....	7-1-3
7-1-4. Preflight Briefing .....	7-1-6
7-1-5. En Route Flight Advisory Service (EFAS) .....	7-1-8
7-1-6. Inflight Aviation Weather Advisories .....	7-1-9
7-1-7. Categorical Outlooks .....	7-1-19
7-1-8. Telephone Information Briefing Service (TIBS) .....	7-1-20
7-1-9. Transcribed Weather Broadcast (TWEB) (Alaska Only) .....	7-1-20
7-1-10. Inflight Weather Broadcasts .....	7-1-20
7-1-11. Flight Information Services (FIS) .....	7-1-23
7-1-12. Weather Observing Programs .....	7-1-27
7-1-13. Weather Radar Services .....	7-1-34
7-1-14. ATC Inflight Weather Avoidance Assistance .....	7-1-38
7-1-15. Runway Visual Range (RVR) .....	7-1-40
7-1-16. Reporting of Cloud Heights .....	7-1-42
7-1-17. Reporting Prevailing Visibility .....	7-1-42
7-1-18. Estimating Intensity of Rain and Ice Pellets .....	7-1-42
7-1-19. Estimating Intensity of Snow or Drizzle (Based on Visibility) .....	7-1-43
7-1-20. Pilot Weather Reports (PIREPs) .....	7-1-43
7-1-21. PIREPs Relating to Airframe Icing .....	7-1-44
7-1-22. Definitions of Inflight Icing Terms .....	7-1-45
7-1-23. PIREPs Relating to Turbulence .....	7-1-48
7-1-24. Wind Shear PIREPs .....	7-1-49
7-1-25. Clear Air Turbulence (CAT) PIREPs .....	7-1-49
7-1-26. Microbursts .....	7-1-49
7-1-27. PIREPs Relating to Volcanic Ash Activity .....	7-1-59
7-1-28. Thunderstorms .....	7-1-59
7-1-29. Thunderstorm Flying .....	7-1-60
7-1-30. Key to Aerodrome Forecast (TAF) and Aviation Routine Weather Report (METAR) .....	7-1-62
7-1-31. International Civil Aviation Organization (ICAO) Weather Formats .....	7-1-64

### **Section 2. Altimeter Setting Procedures**

7-2-1. General .....	7-2-1
7-2-2. Procedures .....	7-2-1
7-2-3. Altimeter Errors .....	7-2-3
7-2-4. High Barometric Pressure .....	7-2-4
7-2-5. Low Barometric Pressure .....	7-2-4

### **Section 3. Wake Turbulence**

7-3-1. General .....	7-3-1
7-3-2. Vortex Generation .....	7-3-1
7-3-3. Vortex Strength .....	7-3-1

<b>Paragraph</b>	<b>Page</b>
7-3-4. Vortex Behavior .....	7-3-2
7-3-5. Operations Problem Areas .....	7-3-5
7-3-6. Vortex Avoidance Procedures .....	7-3-5
7-3-7. Helicopters .....	7-3-6
7-3-8. Pilot Responsibility .....	7-3-6
7-3-9. Air Traffic Wake Turbulence Separations .....	7-3-7

#### **Section 4. Bird Hazards and Flight Over National Refuges, Parks, and Forests**

7-4-1. Migratory Bird Activity .....	7-4-1
7-4-2. Reducing Bird Strike Risks .....	7-4-1
7-4-3. Reporting Bird Strikes .....	7-4-1
7-4-4. Reporting Bird and Other Wildlife Activities .....	7-4-1
7-4-5. Pilot Advisories on Bird and Other Wildlife Hazards .....	7-4-2
7-4-6. Flights Over Charted U.S. Wildlife Refuges, Parks, and Forest Service Areas ..	7-4-2

#### **Section 5. Potential Flight Hazards**

7-5-1. Accident Cause Factors .....	7-5-1
7-5-2. VFR in Congested Areas .....	7-5-1
7-5-3. Obstructions To Flight .....	7-5-1
7-5-4. Avoid Flight Beneath Unmanned Balloons .....	7-5-2
7-5-5. Unmanned Aircraft Systems .....	7-5-2
7-5-6. Mountain Flying .....	7-5-3
7-5-7. Use of Runway Half-way Signs at Unimproved Airports .....	7-5-5
7-5-8. Seaplane Safety .....	7-5-6
7-5-9. Flight Operations in Volcanic Ash .....	7-5-7
7-5-10. Emergency Airborne Inspection of Other Aircraft .....	7-5-8
7-5-11. Precipitation Static .....	7-5-9
7-5-12. Light Amplification by Stimulated Emission of Radiation (Laser) Operations and Reporting Illumination of Aircraft .....	7-5-10
7-5-13. Flying in Flat Light and White Out Conditions .....	7-5-11
7-5-14. Operations in Ground Icing Conditions .....	7-5-12
7-5-15. Avoid Flight in the Vicinity of Thermal Plumes (Smoke Stacks and Cooling Towers) .....	7-5-13

#### **Section 6. Safety, Accident, and Hazard Reports**

7-6-1. Aviation Safety Reporting Program .....	7-6-1
7-6-2. Aircraft Accident and Incident Reporting .....	7-6-1
7-6-3. Near Midair Collision Reporting .....	7-6-2
7-6-4. Unidentified Flying Object (UFO) Reports .....	7-6-3
7-6-5. Safety Alerts For Operators (SAFO) and Information For Operators (InFO) ..	7-6-3

### **Chapter 8. Medical Facts for Pilots**

#### **Section 1. Fitness for Flight**

8-1-1. Fitness For Flight .....	8-1-1
8-1-2. Effects of Altitude .....	8-1-3
8-1-3. Hyperventilation in Flight .....	8-1-5
8-1-4. Carbon Monoxide Poisoning in Flight .....	8-1-5

<b>Paragraph</b>	<b>Page</b>
8-1-5. Illusions in Flight .....	8-1-5
8-1-6. Vision in Flight .....	8-1-6
8-1-7. Aerobatic Flight .....	8-1-8
8-1-8. Judgment Aspects of Collision Avoidance .....	8-1-8

## **Chapter 9. Aeronautical Charts and Related Publications**

### **Section 1. Types of Charts Available**

9-1-1. General .....	9-1-1
9-1-2. Obtaining Aeronautical Charts .....	9-1-1
9-1-3. Selected Charts and Products Available .....	9-1-1
9-1-4. General Description of each Chart Series .....	9-1-1
9-1-5. Where and How to Get Charts of Foreign Areas .....	9-1-12

## **Chapter 10. Helicopter Operations**

### **Section 1. Helicopter IFR Operations**

10-1-1. Helicopter Flight Control Systems .....	10-1-1
10-1-2. Helicopter Instrument Approaches .....	10-1-3
10-1-3. Helicopter Approach Procedures to VFR Heliports .....	10-1-5
10-1-4. The Gulf of Mexico Grid System .....	10-1-6

### **Section 2. Special Operations**

10-2-1. Offshore Helicopter Operations .....	10-2-1
10-2-2. Helicopter Night VFR Operations .....	10-2-7
10-2-3. Landing Zone Safety .....	10-2-10
10-2-4. Emergency Medical Service (EMS) Multiple Helicopter Operations .....	10-2-16

## **Appendices**

Appendix 1. Bird/Other Wildlife Strike Report .....	Appendix 1-1
Appendix 2. Volcanic Activity Reporting Form (VAR) .....	Appendix 2-1
Appendix 3. Abbreviations/Acronyms .....	Appendix 3-1
PILOT/CONTROLLER GLOSSARY .....	PCG-1
INDEX .....	I-1





**NOTE–**

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

**1-1-13. NAVAIDs with Voice**

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

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

**1-1-14. User Reports Requested on NAVAID or Global Navigation Satellite System (GNSS) Performance or Interference**

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

b. Reporters should identify the NAVAID (for example, VOR) malfunction or GNSS problem,

location of the aircraft (i.e., latitude, longitude or bearing/distance from a NAVAID), altitude, date and time of the observation, type of aircraft and description of the condition observed, and the type of receivers in use (i.e., make/model/software revision). Reports can be made in any of the following ways:

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

2. By telephone to the nearest FAA facility.

3. By FAA Form 8740-5, Safety Improvement Report, a postage-paid card designed for this purpose. These cards may be obtained at FAA FSSs, Flight Standards District Offices, and General Aviation Fixed Base Operations.

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

**1-1-15. LORAN****NOTE–**

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

**1-1-16. Inertial Reference Unit (IRU), Inertial Navigation System (INS), and Attitude Heading Reference System (AHRS)**

a. IRUs are self-contained systems comprised of gyros and accelerometers that provide aircraft attitude (pitch, roll, and heading), position, and velocity information in response to signals resulting from inertial effects on system components. Once aligned with a known position, IRUs continuously calculate position and velocity. IRU position accuracy decays with time. This degradation is known as “drift.”

**b.** INSs combine the components of an IRU with an internal navigation computer. By programming a series of waypoints, these systems will navigate along a predetermined track.

**c.** AHRs are electronic devices that provide attitude information to aircraft systems such as weather radar and autopilot, but do not directly compute position information.

## ■ 1-1-17. Doppler Radar

Doppler Radar is a semiautomatic self-contained dead reckoning navigation system (radar sensor plus computer) which is not continuously dependent on information derived from ground based or external aids. The system employs radar signals to detect and measure ground speed and drift angle, using the aircraft compass system as its directional reference. Doppler is less accurate than INS, however, and the use of an external reference is required for periodic updates if acceptable position accuracy is to be achieved on long range flights.

## ■ 1-1-18. Global Positioning System (GPS)

### a. System Overview

**1. System Description.** The Global Positioning System is a satellite-based radio navigation system, which broadcasts a signal that is used by receivers to determine precise position anywhere in the world. The receiver tracks multiple satellites and determines a pseudorange measurement that is then used to determine the user location. A minimum of four satellites is necessary to establish an accurate three-dimensional position. The Department of Defense (DOD) is responsible for operating the GPS satellite constellation and monitors the GPS satellites to ensure proper operation. Every satellite's orbital parameters (ephemeris data) are sent to each satellite for broadcast as part of the data message embedded in the GPS signal. The GPS coordinate system is the Cartesian earth-centered earth-fixed coordinates as specified in the World Geodetic System 1984 (WGS-84).

### 2. System Availability and Reliability

**(a)** The status of GPS satellites is broadcast as part of the data message transmitted by the GPS satellites. GPS status information is also available by means of the U.S. Coast Guard navigation

information service: (703) 313-5907, Internet: <http://www.navcen.uscg.gov/>. Additionally, satellite status is available through the Notice to Airmen (NOTAM) system.

**(b)** The operational status of GNSS operations depends upon the type of equipment being used. For GPS-only equipment TSO-C129a, the operational status of nonprecision approach capability for flight planning purposes is provided through a prediction program that is embedded in the receiver or provided separately.

**3. Receiver Autonomous Integrity Monitoring (RAIM).** When GNSS equipment is not using integrity information from WAAS or LAAS, the GPS navigation receiver using RAIM provides GPS signal integrity monitoring. RAIM is necessary since delays of up to two hours can occur before an erroneous satellite transmission can be detected and corrected by the satellite control segment. The RAIM function is also referred to as fault detection. Another capability, fault exclusion, refers to the ability of the receiver to exclude a failed satellite from the position solution and is provided by some GPS receivers and by WAAS receivers.

**4. The GPS receiver verifies the integrity (usability) of the signals received from the GPS constellation through receiver autonomous integrity monitoring (RAIM) to determine if a satellite is providing corrupted information. At least one satellite, in addition to those required for navigation, must be in view for the receiver to perform the RAIM function; thus, RAIM needs a minimum of 5 satellites in view, or 4 satellites and a barometric altimeter (baro-aiding) to detect an integrity anomaly. [Baro-aiding satisfies the RAIM requirement in lieu of a fifth satellite.] For receivers capable of doing so, RAIM needs 6 satellites in view (or 5 satellites with baro-aiding) to isolate the corrupt satellite signal and remove it from the navigation solution. Baro-aiding is a method of augmenting the GPS integrity solution by using a nonsatellite input source. GPS derived altitude should not be relied upon to determine aircraft altitude since the vertical error can be quite large and no integrity is provided. To ensure that baro-aiding is available, the current altimeter setting must be entered into the receiver as described in the operating manual.**

**5. RAIM messages vary somewhat between receivers; however, generally there are two types. One type indicates that there are not enough satellites**

available to provide RAIM integrity monitoring and another type indicates that the RAIM integrity monitor has detected a potential error that exceeds the limit for the current phase of flight. Without RAIM capability, the pilot has no assurance of the accuracy of the GPS position.

**6. Selective Availability.** Selective Availability (SA) is a method by which the accuracy of GPS is intentionally degraded. This feature is designed to deny hostile use of precise GPS positioning data. SA was discontinued on May 1, 2000, but many GPS receivers are designed to assume that SA is still active. New receivers may take advantage of the discontinuance of SA based on the performance values in ICAO Annex 10, and do not need to be designed to operate outside of that performance.

**7.** The GPS constellation of 24 satellites is designed so that a minimum of five is always observable by a user anywhere on earth. The receiver uses data from a minimum of four satellites above the mask angle (the lowest angle above the horizon at which it can use a satellite).

**8.** The DOD declared initial operational capability (IOC) of the U.S. GPS on December 8, 1993. The FAA has granted approval for U.S. civil operators to use properly certified GPS equipment as a primary means of navigation in oceanic airspace and certain remote areas. Properly certified GPS equipment may be used as a supplemental means of IFR navigation for domestic en route, terminal operations, and certain instrument approach procedures (IAPs). This approval permits the use of GPS in a manner that is consistent with current navigation requirements as well as approved air carrier operations specifications.

## **b. VFR Use of GPS**

**1.** GPS navigation has become a great asset to VFR pilots, providing increased navigation capability and enhanced situational awareness, while reducing operating costs due to greater ease in flying direct routes. While GPS has many benefits to the VFR pilot, care must be exercised to ensure that system capabilities are not exceeded.

**2.** Types of receivers used for GPS navigation under VFR are varied, from a full IFR installation being used to support a VFR flight, to a VFR only installation (in either a VFR or IFR capable aircraft) to a hand-held receiver. The limitations of each type of receiver installation or use must be understood by

the pilot to avoid misusing navigation information. (See TBL 1-1-6.) In all cases, VFR pilots should never rely solely on one system of navigation. GPS navigation must be integrated with other forms of electronic navigation (when possible), as well as pilotage and dead reckoning. Only through the integration of these techniques can the VFR pilot ensure accuracy in navigation.

**3.** Some critical concerns in VFR use of GPS include RAIM capability, database currency and antenna location.

**(a) RAIM Capability.** Many VFR GPS receivers and all hand-held units have no RAIM alerting capability. Loss of the required number of satellites in view, or the detection of a position error, cannot be displayed to the pilot by such receivers. In receivers with no RAIM capability, no alert would be provided to the pilot that the navigation solution had deteriorated, and an undetected navigation error could occur. A systematic cross-check with other navigation techniques would identify this failure, and prevent a serious deviation. See subparagraphs a4 and a5 for more information on RAIM.

## **(b) Database Currency**

**(1)** In many receivers, an up-datable database is used for navigation fixes, airports, and instrument procedures. These databases must be maintained to the current update for IFR operation, but no such requirement exists for VFR use.

**(2)** However, in many cases, the database drives a moving map display which indicates Special Use Airspace and the various classes of airspace, in addition to other operational information. Without a current database the moving map display may be outdated and offer erroneous information to VFR pilots wishing to fly around critical airspace areas, such as a Restricted Area or a Class B airspace segment. Numerous pilots have ventured into airspace they were trying to avoid by using an outdated database. If you don't have a current database in the receiver, disregard the moving map display for critical navigation decisions.

**(3)** In addition, waypoints are added, removed, relocated, or re-named as required to meet operational needs. When using GPS to navigate relative to a named fix, a current database must be used to properly locate a named waypoint. Without the update, it is the pilot's responsibility to verify the waypoint location referencing to an official current

source, such as the Airport/Facility Directory, Sectional Chart, or En Route Chart.

**(c) Antenna Location**

**(1)** In many VFR installations of GPS receivers, antenna location is more a matter of convenience than performance. In IFR installations, care is exercised to ensure that an adequate clear view is provided for the antenna to see satellites. If an alternate location is used, some portion of the aircraft may block the view of the antenna, causing a greater opportunity to lose navigation signal.

**(2)** This is especially true in the case of hand-helds. The use of hand-held receivers for VFR operations is a growing trend, especially among rental pilots. Typically, suction cups are used to place the GPS antennas on the inside of cockpit windows. While this method has great utility, the antenna location is limited to the cockpit or cabin only and is rarely optimized to provide a clear view of available satellites. Consequently, signal losses may occur in certain situations of aircraft-satellite geometry, causing a loss of navigation signal. These losses, coupled with a lack of RAIM capability, could present erroneous position and navigation information with no warning to the pilot.

**(3)** While the use of a hand-held GPS for VFR operations is not limited by regulation, modification of the aircraft, such as installing a panel- or yoke-mounted holder, is governed by 14 CFR Part 43. Consult with your mechanic to ensure compliance with the regulation, and a safe installation.

**4.** As a result of these and other concerns, here are some tips for using GPS for VFR operations:

**(a)** Always check to see if your unit has RAIM capability. If no RAIM capability exists, be suspicious of your GPS position when any disagreement exists with the position derived from other radio navigation systems, pilotage, or dead reckoning.

**(b)** Check the currency of the database, if any. If expired, update the database using the current revision. If an update of an expired database is not possible, disregard any moving map display of airspace for critical navigation decisions. Be aware that named waypoints may no longer exist or may have been relocated since the database expired. At a

minimum, the waypoints planned to be used should be checked against a current official source, such as the Airport/Facility Directory, or a Sectional Aeronautical Chart.

**(c)** While hand-helds can provide excellent navigation capability to VFR pilots, be prepared for intermittent loss of navigation signal, possibly with no RAIM warning to the pilot. If mounting the receiver in the aircraft, be sure to comply with 14 CFR Part 43.

**(d)** Plan flights carefully before taking off. If you wish to navigate to user-defined waypoints, enter them before flight, not on-the-fly. Verify your planned flight against a current source, such as a current sectional chart. There have been cases in which one pilot used waypoints created by another pilot that were not where the pilot flying was expecting. This generally resulted in a navigation error. Minimize head-down time in the aircraft and keep a sharp lookout for traffic, terrain, and obstacles. Just a few minutes of preparation and planning on the ground will make a great difference in the air.

**(e)** Another way to minimize head-down time is to become very familiar with your receiver's operation. Most receivers are not intuitive. The pilot must take the time to learn the various keystrokes, knob functions, and displays that are used in the operation of the receiver. Some manufacturers provide computer-based tutorials or simulations of their receivers. Take the time to learn about your particular unit before you try to use it in flight.

**5.** In summary, be careful not to rely on GPS to solve all your VFR navigational problems. Unless an IFR receiver is installed in accordance with IFR requirements, no standard of accuracy or integrity has been assured. While the practicality of GPS is compelling, the fact remains that only the pilot can navigate the aircraft, and GPS is just one of the pilot's tools to do the job.

**c. VFR Waypoints**

**1.** VFR waypoints provide VFR pilots with a supplementary tool to assist with position awareness while navigating visually in aircraft equipped with area navigation receivers. VFR waypoints should be used as a tool to supplement current navigation procedures. The uses of VFR waypoints include providing navigational aids for pilots unfamiliar with an area, waypoint definition of existing reporting points, enhanced navigation in and around Class B

and Class C airspace, and enhanced navigation around Special Use Airspace. VFR pilots should rely on appropriate and current aeronautical charts published specifically for visual navigation. If operating in a terminal area, pilots should take advantage of the Terminal Area Chart available for that area, if published. The use of VFR waypoints does not relieve the pilot of any responsibility to comply with the operational requirements of 14 CFR Part 91.

**2.** VFR waypoint names (for computer-entry and flight plans) consist of five letters beginning with the letters “VP” and are retrievable from navigation databases. The VFR waypoint names are not intended to be pronounceable, and they are not for use in ATC communications. On VFR charts, stand-alone VFR waypoints will be portrayed using the same four-point star symbol used for IFR waypoints. VFR waypoints collocated with visual check points on the chart will be identified by small magenta flag symbols. VFR waypoints collocated with visual check points will be pronounceable based on the name of the visual check point and may be used for ATC communications. Each VFR waypoint name will appear in parentheses adjacent to the geographic location on the chart. Latitude/longitude data for all established VFR waypoints may be found in the appropriate regional Airport/Facility Directory (A/FD).

**3.** VFR waypoints must not be used to plan flights under IFR. VFR waypoints will not be recognized by the IFR system and will be rejected for IFR routing purposes.

**4.** When filing VFR flight plans, pilots may use the five letter identifier as a waypoint in the route of flight section if there is an intended course change at that point or if used to describe the planned route of flight. This VFR filing would be similar to how a VOR would be used in a route of flight. Pilots must use the VFR waypoints only when operating under VFR conditions.

**5.** Any VFR waypoints intended for use during a flight should be loaded into the receiver while on the ground and prior to departure. Once airborne, pilots should avoid programming routes or VFR waypoint chains into their receivers.

**6.** Pilots should be especially vigilant for other traffic while operating near VFR waypoints. The

same effort to see and avoid other aircraft near VFR waypoints will be necessary, as was the case with VORs and NDBs in the past. In fact, the increased accuracy of navigation through the use of GPS will demand even greater vigilance, as off-course deviations among different pilots and receivers will be less. When operating near a VFR waypoint, use whatever ATC services are available, even if outside a class of airspace where communications are required. Regardless of the class of airspace, monitor the available ATC frequency closely for information on other aircraft operating in the vicinity. It is also a good idea to turn on your landing light(s) when operating near a VFR waypoint to make your aircraft more conspicuous to other pilots, especially when visibility is reduced. See paragraph 7-5-2, VFR in Congested Areas, for more information.

#### **d. General Requirements**

**1.** Authorization to conduct any GPS operation under IFR requires that:

**(a)** GPS navigation equipment used must be approved in accordance with the requirements specified in Technical Standard Order (TSO) TSO-C129 (as revised), TSO-C196 (as revised), TSO-C145 (as revised), or TSO-C146 (as revised), and the installation must be done in accordance with Advisory Circular AC 20-138, Airworthiness Approval of Positioning and Navigation Systems. Equipment approved in accordance with TSO-C115a does not meet the requirements of TSO-C129. Visual flight rules (VFR) and hand-held GPS systems are not authorized for IFR navigation, instrument approaches, or as a principal instrument flight reference. During IFR operations they may be considered only as an aid to situational awareness.

**(b)** Aircraft using GPS (TSO-C129 (as revised) or TSO-C196 (as revised)) navigation equipment under IFR must be equipped with an approved and operational alternate means of navigation appropriate to the flight. Active monitoring of alternative navigation equipment is not required if the GPS receiver uses RAIM for integrity monitoring. Active monitoring of an alternate means of navigation is required when the RAIM capability of the GPS equipment is lost.

**(c)** Procedures must be established for use in the event that the loss of RAIM capability is predicted to occur. In situations where this is encountered, the

flight must rely on other approved equipment, delay departure, or cancel the flight.

(d) The GPS operation must be conducted in accordance with the FAA-approved aircraft flight manual (AFM) or flight manual supplement. Flight crew members must be thoroughly familiar with the particular GPS equipment installed in the aircraft, the receiver operation manual, and the AFM or flight manual supplement. Unlike ILS and VOR, the basic operation, receiver presentation to the pilot and some capabilities of the equipment can vary greatly. Due to these differences, operation of different brands, or even models of the same brand of GPS receiver, under IFR should not be attempted without thorough study of the operation of that particular receiver and installation. Most receivers have a built-in simulator mode which will allow the pilot to become familiar with operation prior to attempting operation in the aircraft. Using the equipment in flight under VFR conditions prior to attempting IFR operation will allow further familiarization.

(e) Aircraft navigating by IFR approved GPS are considered to be area navigation (RNAV) aircraft and have special equipment suffixes. File the appropriate equipment suffix in accordance with TBL 5-1-3, on the ATC flight plan. If GPS avionics become inoperative, the pilot should advise ATC and amend the equipment suffix.

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

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

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

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

#### **NOTE-**

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

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

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

#### **e. Use of GPS for IFR Oceanic, Domestic En Route, Terminal Area, and Approach Operations**

1. GPS IFR operations in oceanic areas can be conducted as soon as the proper avionics systems are installed, provided all general requirements are met. A GPS installation with TSO-C129 (as revised) authorization in class A1, A2, B1, B2, C1, or C2 or TSO-C196 (as revised) may be used to replace one of the other approved means of long-range navigation, such as dual INS. (See TBL 1-1-5 and TBL 1-1-6.) A single TSO-C129 GPS installation meeting the

certification requirements in AC 20-138C, Appendix 1 may be used on oceanic routes as the only means of long range navigation. TSO-C196 (as revised) equipment is inherently capable of supporting oceanic operation if the operator obtains a Fault Detection and Exclusion (FDE) Prediction Program as outlined in AC 20-138C, Appendix 1. A single GPS/WAAS receiver (TSO-C145 (as revised) or TSO-C146 (as revised)) is inherently capable of supporting oceanic operation if the operator obtains a FDE Prediction Program as outlined in AC 20-138C, Appendix 1.

**2.** GPS (TSO-C129 (as revised) or TSO-C196 (as revised)) domestic en route and terminal IFR operations can be conducted as soon as proper avionics systems are installed, provided all general requirements are met. For required backup navigation, the avionics necessary to receive all of the ground-based facilities appropriate for the flight to the destination airport and any required alternate airport must be installed and operational. Ground-based facilities necessary for en route and terminal operations must also be in service.

**(a)** A single GPS/WAAS receiver (TSO-C145 (as revised) or TSO-C146 (as revised)) may also be used for these domestic en route and terminal IFR operations. Though not required, operators may consider retaining backup navigation equipment in their aircraft to guard against potential outages or interference.

**(b)** In Alaska, GPS en route IFR RNAV operations may be conducted outside the operational service volume of ground-based navigation aids when a GPS/WAAS (TSO-C145 (as revised) or TSO-C146 (as revised)) system is installed and operating. Ground-based navigation equipment is not required to be installed and operating. Though not required, operators may consider retaining backup navigation equipment in their aircraft to guard against potential outages or interference.

**(1)** Aircraft may operate on GNSS Q-routes with GPS (TSO-C129 (as revised) or TSO-C196 (as revised)) or GPS/WAAS equipment while the aircraft remains in Air Traffic Control radar surveillance.

**(2)** Aircraft may operate on GNSS T-routes with GPS/WAAS (TSO-C145 (as revised) or TSO-C146 (as revised)) equipment.

**3.** Authorization to fly approaches under IFR using GPS or GPS/WAAS avionics systems requires that a pilot use avionics with:

**(a)** GPS, TSO-C129, (as revised) authorization in class A1, B1, B3, C1, or C3;

**(b)** GPS, TSO-C196 (as revised) authorization; or

**(c)** GPS/WAAS, TSO-C145 (as revised) or TSO-C146 (as revised) authorization.

**TBL 1-1-5**  
**GPS IFR Equipment Classes/Categories**

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

**TBL 1-1-6**  
**GPS Approval Required/Authorized Use**

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

**NOTE–**

<sup>1</sup>To determine equipment approvals and limitations, refer to the AFM, AFM supplements, or pilot guides.

<sup>2</sup>Requires verification of data for correctness if database is expired.

<sup>3</sup>Requires current database or verification that the procedure has not been amended since the expiration of the database.

<sup>4</sup>VFR and hand-held GPS systems are not authorized for IFR navigation, instrument approaches, or as a primary instrument flight reference. During IFR operations they may be considered only an aid to situational awareness.

<sup>5</sup>Hand-held receivers require no approval. However, any aircraft modification to support the hand-held receiver; i.e., installation of an external antenna or a permanent mounting bracket, does require approval.

4. As the production of stand-alone GPS approaches has progressed, many of the original overlay approaches have been replaced with stand-alone procedures specifically designed for use

by GPS systems. A GPS approach overlay allows pilots to use GPS avionics under IFR for flying designated nonprecision instrument approach procedures, except LOC, LDA, and simplified



directional facility (SDF) procedures. These procedures are identified by the name of the procedure and “or GPS” (for example, VOR/DME or GPS RWY15). Other previous types of overlays have either been converted to this format or replaced with stand-alone procedures. Only approaches contained in the current onboard navigation database are authorized. The navigation database may contain information about non-overlay approach procedures that is intended to be used to enhance position orientation, generally by providing a map, while flying these approaches using conventional NAVAIDs. This approach information should not be confused with a GPS overlay approach. (See the receiver operating manual, AFM, or AFM Supplement for details on how to identify these approaches in the navigation database.)

#### **f. General Database Requirements**

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

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

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

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

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

#### **(1) Preflight:**

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

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

#### **(2) Inflight:**

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

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

#### **NOTE—**

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

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

#### **g. GPS Approach Procedures**

As the production of stand-alone GPS approaches has progressed, many of the original overlay approaches have been replaced with stand-alone procedures specifically designed for use by GPS systems. The title of the remaining GPS overlay procedures has been revised on the approach chart to “or GPS” (e.g., VOR or GPS RWY 24). Therefore, all the approaches that can be used by GPS now contain “GPS” in the title (e.g., “VOR or GPS RWY 24,” “GPS RWY 24,” or “RNAV (GPS) RWY 24”). During these GPS approaches, underlying ground-based NAVAIDs are not required to be operational and associated aircraft avionics need not be installed, operational, turned on or monitored (monitoring of the underlying approach is suggested when equipment is available and functional). Existing overlay approaches may be requested using the GPS title,

such as “GPS RWY 24” for the VOR or GPS RWY 24.

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

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

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

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

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

#### **h. GPS NOTAMs/Aeronautical Information**

1. GPS satellite outages are issued as GPS NOTAMs both domestically and internationally. However, the effect of an outage on the intended operation cannot be determined unless the pilot has a RAIM availability prediction program which allows excluding a satellite which is predicted to be out of service based on the NOTAM information.

2. The term UNRELIABLE is used in conjunction with GPS NOTAMs. The term UNRELIABLE is an advisory to pilots indicating the expected level of service may not be available. UNRELIABLE does not mean there is a problem with GPS signal integrity. If GPS service is available, pilots may continue operations. If the LNAV or LNAV/VNAV service is available, pilots may use the displayed level of

service to fly the approach. GPS operation may be NOTAMed UNRELIABLE due to testing or anomalies. (Pilots are encouraged to report GPS anomalies, including degraded operation and/or loss of service, as soon as possible, reference paragraph 1–1–14.) Air Traffic Control will advise pilots requesting a GPS or RNAV (GPS) approach of GPS UNRELIABLE for:

(a) NOTAMs not contained in the ATIS broadcast.

(b) Pilot reports of GPS anomalies received within the preceding 15 minutes.

3. Civilian pilots may obtain GPS RAIM availability information for nonprecision approach procedures by specifically requesting GPS aeronautical information from a Flight Service Station during preflight briefings. GPS RAIM aeronautical information can be obtained for a period of 3 hours (for example, if you are scheduled to arrive at 1215 hours, then the GPS RAIM information is available from 1100 to 1400 hours) or a 24 hour time frame at a particular airport. FAA briefers will provide RAIM information for a period of 1 hour before to 1 hour after the ETA hour, unless a specific time frame is requested by the pilot. If flying a published GPS departure, a RAIM prediction should also be requested for the departure airport.

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

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

#### **i. Receiver Autonomous Integrity Monitoring (RAIM)**

1. RAIM outages may occur due to an insufficient number of satellites or due to unsuitable satellite geometry which causes the error in the position solution to become too large. Loss of satellite reception and RAIM warnings may occur due to aircraft dynamics (changes in pitch or bank angle). Antenna location on the aircraft, satellite position relative to the horizon, and aircraft attitude may affect

reception of one or more satellites. Since the relative positions of the satellites are constantly changing, prior experience with the airport does not guarantee reception at all times, and RAIM availability should always be checked.

2. If RAIM is not available, another type of navigation and approach system must be used, another destination selected, or the trip delayed until RAIM is predicted to be available on arrival. On longer flights, pilots should consider rechecking the RAIM prediction for the destination during the flight. This may provide early indications that an unscheduled satellite outage has occurred since takeoff.

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

4. If the receiver does not sequence into the approach mode or a RAIM failure/status annunciation occurs prior to the FAWP, the pilot should not descend to Minimum Descent Altitude (MDA), but should proceed to the missed approach waypoint (MAWP) via the FAWP, perform a missed approach, and contact ATC as soon as practical. Refer to the receiver operating manual for specific indications and instructions associated with loss of RAIM prior to the FAF.

5. If a RAIM failure occurs after the FAWP, the receiver is allowed to continue operating without an annunciation for up to 5 minutes to allow completion of the approach (see receiver operating manual). **If the RAIM flag/status annunciation appears after the FAWP, the missed approach should be executed immediately.**

#### j. Waypoints

1. GPS approaches make use of both fly-over and fly-by waypoints. Fly-by waypoints are used

when an aircraft should begin a turn to the next course prior to reaching the waypoint separating the two route segments. This is known as turn anticipation and is compensated for in the airspace and terrain clearances. Approach waypoints, except for the MAWP and the missed approach holding waypoint (MAHWP), are normally fly-by waypoints. Fly-over waypoints are used when the aircraft must fly over the point prior to starting a turn. New approach charts depict fly-over waypoints as a circled waypoint symbol. Overlay approach charts and some early stand alone GPS approach charts may not reflect this convention.

2. Since GPS receivers are basically “To-To” navigators, they must always be navigating to a defined point. On overlay approaches, if no pronounceable five-character name is published for an approach waypoint or fix, it was given a database identifier consisting of letters and numbers. These points will appear in the list of waypoints in the approach procedure database, but may not appear on the approach chart. A point used for the purpose of defining the navigation track for an airborne computer system (i.e., GPS or FMS) is called a Computer Navigation Fix (CNF). CNFs include unnamed DME fixes, beginning and ending points of DME arcs and sensor final approach fixes (FAFs) on some GPS overlay approaches. To aid in the approach chart/database correlation process, the FAA has begun a program to assign five-letter names to CNFs and to chart CNFs on various FAA Aeronautical Navigation Products (AeroNav Products). These CNFs are not to be used for any air traffic control (ATC) application, such as holding for which the fix has not already been assessed. CNFs will be charted to distinguish them from conventional reporting points, fixes, intersections, and waypoints. The CNF name will be enclosed in parenthesis, e.g., (CFBCD), and the name will be placed next to the CNF it defines. If the CNF is not at an existing point defined by means such as crossing radials or radial/DME, the point will be indicated by an “X.” The CNF name will not be used in filing a flight plan or in aircraft/ATC communications. Use current phraseology, e.g., facility name, radial, distance, to describe these fixes.

3. Unnamed waypoints in the database will be uniquely identified for each airport but may be repeated for another airport (e.g., RW36 will be used at each airport with a runway 36 but will be at the same location for all approaches at a given airport).

4. The runway threshold waypoint, which is normally the MAWP, may have a five letter identifier (e.g., SNEEZ) or be coded as RW## (e.g., RW36, RW36L). Those thresholds which are coded as five letter identifiers are being changed to the RW## designation. This may cause the approach chart and database to differ until all changes are complete. The runway threshold waypoint is also used as the center of the Minimum Safe Altitude (MSA) on most GPS approaches. MAWPs not located at the threshold will have a five letter identifier.

#### **k. Position Orientation**

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

#### **l. Conventional Versus GPS Navigation Data**

There may be slight differences between the course information portrayed on navigational charts and a GPS navigation display when flying authorized GPS instrument procedures or along an airway. All magnetic tracks defined by any conventional navigation aids are determined by the application of the station magnetic variation. In contrast, GPS RNAV systems may use an algorithm, which applies the local magnetic variation and may produce small differences in the displayed course. However, both methods of navigation should produce the same desired ground track when using approved, IFR navigation system. Should significant differences between the approach chart and the GPS avionics' application of the navigation database arise, the

published approach chart, supplemented by NOT-AMs, holds precedence.

Due to the GPS avionics' computation of great circle courses, and the variations in magnetic variation, the bearing to the next waypoint and the course from the last waypoint (if available) may not be exactly 180° apart when long distances are involved. Variations in distances will occur since GPS distance-to-waypoint values are along-track distances (ATD) computed to the next waypoint and the DME values published on underlying procedures are slant-range distances measured to the station. This difference increases with aircraft altitude and proximity to the NAVAID.

#### **m. Departures and Instrument Departure Procedures (DPs)**

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

#### **n. Flying GPS Approaches**

1. Determining which area of the TAA the aircraft will enter when flying a "T" with a TAA must be accomplished using the bearing and distance to the IF(IAF). This is most critical when entering the TAA in the vicinity of the extended runway centerline and determining whether you will be entering the right or left base area. Once inside the TAA, all sectors and stepdowns are based on the bearing and distance to the IAF for that area, which the aircraft should be proceeding direct to at that time, unless on vectors. (See FIG 5-4-3 and FIG 5-4-4.)

2. Pilots should fly the full approach from an Initial Approach Waypoint (IAWP) or feeder fix

unless specifically cleared otherwise. Randomly joining an approach at an intermediate fix does not assure terrain clearance.

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

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

**5.** When within 2 NM of the FAWP with the approach mode armed, the approach mode will switch to active, which results in RAIM changing to approach sensitivity and a change in CDI sensitivity. Beginning 2 NM prior to the FAWP, the full scale CDI sensitivity will smoothly change from  $\pm 1$  NM to  $\pm 0.3$  NM at the FAWP. As sensitivity changes from  $\pm 1$  NM to  $\pm 0.3$  NM approaching the FAWP, with the CDI not centered, the corresponding increase in CDI displacement may give the impression that the aircraft is moving further away from the intended course even though it is on an acceptable intercept heading. Referencing the digital track displacement information (cross track error), if it is available in the approach mode, may help the pilot remain position

oriented in this situation. Being established on the final approach course prior to the beginning of the sensitivity change at 2 NM will help prevent problems in interpreting the CDI display during ramp down. Therefore, requesting or accepting vectors which will cause the aircraft to intercept the final approach course within 2 NM of the FAWP is not recommended.

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

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

**8.** Do not attempt to fly an approach unless the procedure in the on-board database is current and identified as “GPS” on the approach chart. The navigation database may contain information about nonoverlay approach procedures that is intended to be used to enhance position orientation, generally by providing a map, while flying these approaches using conventional NAVAIDs. This approach information should not be confused with a GPS overlay approach (see the receiver operating manual, AFM, or AFM Supplement for details on how to identify these procedures in the navigation database). Flying point to point on the approach does not assure compliance with the published approach procedure. The proper RAIM sensitivity will not be available and the CDI sensitivity will not automatically change to  $\pm 0.3$  NM. Manually setting CDI sensitivity does not

automatically change the RAIM sensitivity on some receivers. Some existing nonprecision approach procedures cannot be coded for use with GPS and will not be available as overlays.

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

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

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

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

**13.** Unnamed stepdown fixes in the final approach segment will not be coded in the waypoint sequence of the aircraft's navigation database and must be identified using ATD. Stepdown fixes in the final approach segment of RNAV (GPS) approaches are being named, in addition to being identified by ATD. However, since most GPS avionics do not accommodate waypoints between the FAF and MAP, even when the waypoint is named, the waypoints for

these stepdown fixes may not appear in the sequence of waypoints in the navigation database. Pilots must continue to identify these stepdown fixes using ATD.

#### **o. Missed Approach**

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

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

#### **p. GPS Familiarization**

Pilots should practice GPS approaches under visual meteorological conditions (VMC) until thoroughly proficient with all aspects of their equipment (receiver and installation) prior to attempting flight by IFR in instrument meteorological conditions (IMC). Some of the areas which the pilot should practice are:

**1.** Utilizing the receiver autonomous integrity monitoring (RAIM) prediction function;

**2.** Inserting a DP into the flight plan, including setting terminal CDI sensitivity, if required, and the conditions under which terminal RAIM is available for departure (some receivers are not DP or STAR capable);

**3.** Programming the destination airport;

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

**5.** Changing to another approach after selecting an approach;

6. Programming and flying “direct” missed approaches;

7. Programming and flying “routed” missed approaches;

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

9. Programming and flying a “route” from a holding pattern;

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

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

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

## **1-1-19. Wide Area Augmentation System (WAAS)**

### **a. General**

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

2. The International Civil Aviation Organization (ICAO) has defined Standards and Recommended Practices (SARPs) for satellite-based augmentation systems (SBAS) such as WAAS. Japan and Europe are building similar systems that are planned to be interoperable with WAAS: EGNOS, the European Geostationary Navigation Overlay System, and MSAS, the Japan Multifunctional Transport Satellite (MTSAT) Satellite-based Augmentation System. The merging of these systems will create a worldwide seamless navigation capability similar to GPS but with greater accuracy, availability and integrity.

3. Unlike traditional ground-based navigation aids, WAAS will cover a more extensive service area. Precisely surveyed wide-area ground reference stations (WRS) are linked to form the U.S. WAAS network. Signals from the GPS satellites are

monitored by these WRSs to determine satellite clock and ephemeris corrections and to model the propagation effects of the ionosphere. Each station in the network relays the data to a wide-area master station (WMS) where the correction information is computed. A correction message is prepared and uplinked to a geostationary satellite (GEO) via a ground uplink station (GUS). The message is then broadcast on the same frequency as GPS (L1, 1575.42 MHz) to WAAS receivers within the broadcast coverage area of the WAAS GEO.

4. In addition to providing the correction signal, the WAAS GEO provides an additional pseudorange measurement to the aircraft receiver, improving the availability of GPS by providing, in effect, an additional GPS satellite in view. The integrity of GPS is improved through real-time monitoring, and the accuracy is improved by providing differential corrections to reduce errors. The performance improvement is sufficient to enable approach procedures with GPS/WAAS glide paths (vertical guidance).

5. The FAA has completed installation of 25 WRSs, 2 WMSs, 4 GUSs, and the required terrestrial communications to support the WAAS network. Prior to the commissioning of the WAAS for public use, the FAA has been conducting a series of test and validation activities. Enhancements to the initial phase of WAAS will include additional master and reference stations, communication satellites, and transmission frequencies as needed.

6. GNSS navigation, including GPS and WAAS, is referenced to the WGS-84 coordinate system. It should only be used where the Aeronautical Information Publications (including electronic data and aeronautical charts) conform to WGS-84 or equivalent. Other countries civil aviation authorities may impose additional limitations on the use of their SBAS systems.

### **b. Instrument Approach Capabilities**

1. A new class of approach procedures which provide vertical guidance, but which do not meet the ICAO Annex 10 requirements for precision approaches has been developed to support satellite navigation use for aviation applications worldwide. These new procedures called Approach with Vertical Guidance (APV), are defined in ICAO Annex 6, and include approaches such as the LNAV/VNAV procedures presently being flown with barometric

vertical navigation (Baro-VNAV). These approaches provide vertical guidance, but do not meet the more stringent standards of a precision approach. Properly certified WAAS receivers will be able to fly these LNAV/VNAV procedures using a WAAS electronic glide path, which eliminates the errors that can be introduced by using Barometric altimetry.

2. A new type of APV approach procedure, in addition to LNAV/VNAV, is being implemented to take advantage of the high accuracy guidance and increased integrity provided by WAAS. This WAAS generated angular guidance allows the use of the same TERPS approach criteria used for ILS approaches. The resulting approach procedure minima, titled LPV (localizer performance with vertical guidance), may have a decision altitude as low as 200 feet height above touchdown with visibility minimums as low as  $\frac{1}{2}$  mile, when the terrain and airport infrastructure support the lowest minima. LPV minima is published on the RNAV (GPS) approach charts (see paragraph 5-4-5, Instrument Approach Procedure Charts).

3. A new nonprecision WAAS approach, called Localizer Performance (LP) is being added in locations where the terrain or obstructions do not allow publication of vertically guided LPV procedures. This new approach takes advantage of the angular lateral guidance and smaller position errors provided by WAAS to provide a lateral only procedure similar to an ILS Localizer. LP procedures may provide lower minima than a LNAV procedure due to the narrower obstacle clearance surface.

**NOTE-**

*WAAS receivers certified prior to TSO-C145b and TSO-C146b, even if they have LPV capability, do not contain LP capability unless the receiver has been upgraded. Receivers capable of flying LP procedures must contain a statement in the Flight Manual Supplement or Approved Supplemental Flight Manual stating that the receiver has LP capability, as well as the capability for the other WAAS and GPS approach procedure types.*

4. WAAS provides a level of service that supports all phases of flight, including RNAV (GPS) approaches to LNAV, LP, LNAV/VNAV and LPV lines of minima, within system coverage. Some locations close to the edge of the coverage may have a lower availability of vertical guidance.

### c. General Requirements

1. WAAS avionics must be certified in accordance with Technical Standard Order (TSO) TSO-C145a, Airborne Navigation Sensors Using the (GPS) Augmented by the Wide Area Augmentation System (WAAS); or TSO-C146a, Stand-Alone Airborne Navigation Equipment Using the Global Positioning System (GPS) Augmented by the Wide Area Augmentation System (WAAS), and installed in accordance with Advisory Circular (AC) 20-130A, Airworthiness Approval of Navigation or Flight Management Systems Integrating Multiple Navigation Sensors, or AC 20-138A, Airworthiness Approval of Global Positioning System (GPS) Navigation Equipment for Use as a VFR and IFR Navigation System.

2. GPS/WAAS operation must be conducted in accordance with the FAA-approved aircraft flight manual (AFM) and flight manual supplements. Flight manual supplements will state the level of approach procedure that the receiver supports. IFR approved WAAS receivers support all GPS only operations as long as lateral capability at the appropriate level is functional. WAAS monitors both GPS and WAAS satellites and provides integrity.

3. GPS/WAAS equipment is inherently capable of supporting oceanic and remote operations if the operator obtains a fault detection and exclusion (FDE) prediction program.

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

5. Prior to GPS/WAAS IFR operation, the pilot must review appropriate Notices to Airmen (NOT-AMs) and aeronautical information. This information is available on request from a Flight Service Station. The FAA will provide NOTAMs to advise pilots of the status of the WAAS and level of service available.

(a) The term UNRELIABLE is used in conjunction with GPS and WAAS NOTAMs. The term UNRELIABLE is an advisory to pilots indicating the expected level of WAAS service (LNAV/VNAV, LPV) may not be available; e.g., **!BOS BOS WAAS LPV AND LNAV/VNAV MNM UNREL WEF 0305231700 - 0305231815**. WAAS UNRELIABLE NOTAMs are predictive in nature and published for flight planning purposes. Upon commencing an approach at locations



NOTAMed WAAS UNRELIABLE, if the WAAS avionics indicate LNAV/VNAV or LPV service is available, then vertical guidance may be used to complete the approach using the displayed level of service. Should an outage occur during the approach, reversion to LNAV minima may be required.

(1) Area-wide WAAS UNAVAILABLE NOTAMs indicate loss or malfunction of the WAAS system. In flight, Air Traffic Control will advise pilots requesting a GPS or RNAV (GPS) approach of WAAS UNAVAILABLE NOTAMs if not contained in the ATIS broadcast.

(2) Site-specific WAAS UNRELIABLE NOTAMs indicate an expected level of service, e.g., LNAV/VNAV or LPV may not be available. Pilots must request site-specific WAAS NOTAMs during flight planning. In flight, Air Traffic Control will not advise pilots of WAAS UNRELIABLE NOTAMs.

(3) When the approach chart is annotated with the **W** symbol, site-specific WAAS UNRELIABLE NOTAMs or Air Traffic advisories are not provided for outages in WAAS LNAV/VNAV and LPV vertical service. Vertical outages may occur daily at these locations due to being close to the edge of WAAS system coverage. Use LNAV or circling minima for flight planning at these locations, whether as a destination or alternate. For flight operations at these locations, when the WAAS avionics indicate that LNAV/VNAV or LPV service is available, then the vertical guidance may be used to complete the approach using the displayed level of service. Should an outage occur during the procedure, reversion to LNAV minima may be required.

**NOTE—**

Area-wide WAAS UNAVAILABLE NOTAMs apply to all airports in the WAAS UNAVAILABLE area designated in the NOTAM, including approaches at airports where an approach chart is annotated with the **W** symbol.

6. GPS/WAAS was developed to be used within SBAS GEO coverage (WAAS or other interoperable system) without the need for other radio navigation equipment appropriate to the route of flight to be flown. Outside the SBAS coverage or in the event of a WAAS failure, GPS/WAAS equipment reverts to GPS-only operation and satisfies the requirements for basic GPS equipment.

7. Unlike TSO-C129 avionics, which were certified as a supplement to other means of navigation, WAAS avionics are evaluated without reliance on other navigation systems. As such, installation of WAAS avionics does not require the aircraft to have other equipment appropriate to the route to be flown.

(a) Pilots with WAAS receivers may flight plan to use any instrument approach procedure authorized for use with their WAAS avionics as the planned approach at a required alternate, with the following restrictions. When using WAAS at an alternate airport, flight planning must be based on flying the RNAV (GPS) LNAV or circling minima line, or minima on a GPS approach procedure, or conventional approach procedure with “or GPS” in the title. Code of Federal Regulation (CFR) Part 91 nonprecision weather requirements must be used for planning. Upon arrival at an alternate, when the WAAS navigation system indicates that LNAV/VNAV or LPV service is available, then vertical guidance may be used to complete the approach using the displayed level of service. The FAA has begun removing the **△ NA** (Alternate Minimums Not Authorized) symbol from select RNAV (GPS) and GPS approach procedures so they may be used by approach approved WAAS receivers at alternate airports. Some approach procedures will still require the **△ NA** for other reasons, such as no weather reporting, so it cannot be removed from all procedures. Since every procedure must be individually evaluated, removal of the **△ NA** from RNAV (GPS) and GPS procedures will take some time.

**NOTE—**

Properly trained and approved, as required, TSO-C145() and TSO-C146() equipped users (WAAS users) with and using approved baro-VNAV equipment may plan for LNAV/VNAV DA at an alternate airport. Specifically authorized WAAS users with and using approved baro-VNAV equipment may also plan for RNP 0.3 DA at the alternate airport as long as the pilot has verified RNP availability through an approved prediction program.

**d. Flying Procedures with WAAS**

1. WAAS receivers support all basic GPS approach functions and provide additional capabilities. One of the major improvements is the ability to generate glide path guidance, independent of ground equipment or barometric aiding. This eliminates several problems such as hot and cold temperature effects, incorrect altimeter setting or lack of a local

altimeter source. It also allows approach procedures to be built without the cost of installing ground stations at each airport or runway. Some approach certified receivers may only generate a glide path with performance similar to Baro-VNAV and are only approved to fly the LNAV/VNAV line of minima on the RNAV (GPS) approach charts. Receivers with additional capability (including faster update rates and smaller integrity limits) are approved to fly the LPV line of minima. The lateral integrity changes dramatically from the 0.3 NM (556 meter) limit for GPS, LNAV and LNAV/VNAV approach mode, to 40 meters for LPV. It also provides vertical integrity monitoring, which bounds the vertical error to 50 meters for LNAV/VNAV and LPVs with minima of 250' or above, and bounds the vertical error to 35 meters for LPVs with minima below 250'.

2. When an approach procedure is selected and active, the receiver will notify the pilot of the most accurate level of service supported by the combination of the WAAS signal, the receiver, and the selected approach, using the naming conventions on the minima lines of the selected approach procedure. For example, if an approach is published with LPV minima and the receiver is only certified for LNAV/VNAV, the equipment would indicate "LNAV/VNAV available," even though the WAAS signal would support LPV. If flying an existing LNAV/VNAV procedure with no LPV minima, the receiver will notify the pilot "LNAV/VNAV available," even if the receiver is certified for LPV and the signal supports LPV. If the signal does not support vertical guidance on procedures with LPV and/or LNAV/VNAV minima, the receiver annunciation will read "LNAV available." On lateral only procedures with LP and LNAV minima the receiver will indicate "LP available" or "LNAV available" based on the level of lateral service available. Once the level of service notification has been given, the receiver will operate in this mode for the duration of the approach procedure, unless that level of service becomes unavailable. The receiver cannot change back to a more accurate level of service until the next time an approach is activated.

**NOTE—**

*Receivers do not "fail down" to lower levels of service once the approach has been activated. If only the vertical off flag appears, the pilot may elect to use the LNAV minima if the rules under which the flight is operating allow changing the type of approach being flown*

*after commencing the procedure. If the lateral integrity limit is exceeded on an LP approach, a missed approach will be necessary since there is no way to reset the lateral alarm limit while the approach is active.*

3. Another additional feature of WAAS receivers is the ability to exclude a bad GPS signal and continue operating normally. This is normally accomplished by the WAAS correction information. Outside WAAS coverage or when WAAS is not available, it is accomplished through a receiver algorithm called FDE. In most cases this operation will be invisible to the pilot since the receiver will continue to operate with other available satellites after excluding the "bad" signal. This capability increases the reliability of navigation.

4. Both lateral and vertical scaling for the LNAV/VNAV and LPV approach procedures are different than the linear scaling of basic GPS. When the complete published procedure is flown,  $\pm 1$  NM linear scaling is provided until two (2) NM prior to the FAF, where the sensitivity increases to be similar to the angular scaling of an ILS. There are two differences in the WAAS scaling and ILS: 1) on long final approach segments, the initial scaling will be  $\pm 0.3$  NM to achieve equivalent performance to GPS (and better than ILS, which is less sensitive far from the runway); 2) close to the runway threshold, the scaling changes to linear instead of continuing to become more sensitive. The width of the final approach course is tailored so that the total width is usually 700 feet at the runway threshold. Since the origin point of the lateral splay for the angular portion of the final is not fixed due to antenna placement like localizer, the splay angle can remain fixed, making a consistent width of final for aircraft being vectored onto the final approach course on different length runways. When the complete published procedure is not flown, and instead the aircraft needs to capture the extended final approach course similar to ILS, the vector to final (VTF) mode is used. Under VTF the scaling is linear at  $\pm 1$  NM until the point where the ILS angular splay reaches a width of  $\pm 1$  NM regardless of the distance from the FAWP.

5. The WAAS scaling is also different than GPS TSO-C129 in the initial portion of the missed approach. Two differences occur here. First, the scaling abruptly changes from the approach scaling to the missed approach scaling, at approximately the departure end of the runway or when the pilot requests missed approach guidance rather than

ramping as GPS does. Second, when the first leg of the missed approach is a Track to Fix (TF) leg aligned within 3 degrees of the inbound course, the receiver will change to 0.3 NM linear sensitivity until the turn initiation point for the first waypoint in the missed approach procedure, at which time it will abruptly change to terminal (+/-1 NM) sensitivity. This allows the elimination of close in obstacles in the early part of the missed approach that may cause the DA to be raised.

6. A new method has been added for selecting the final approach segment of an instrument approach. Along with the current method used by most receivers using menus where the pilot selects the airport, the runway, the specific approach procedure and finally the IAF, there is also a channel number selection method. The pilot enters a unique 5-digit number provided on the approach chart, and the receiver recalls the matching final approach segment from the aircraft database. A list of information including the available IAFs is displayed and the pilot selects the appropriate IAF. The pilot should confirm that the correct final approach segment was loaded by cross checking the Approach ID, which is also provided on the approach chart.

7. The Along-Track Distance (ATD) during the final approach segment of an LNAV procedure (with a minimum descent altitude) will be to the MAWP. On LNAV/VNAV and LPV approaches to a decision altitude, there is no missed approach waypoint so the along-track distance is displayed to a point normally located at the runway threshold. In most cases the MAWP for the LNAV approach is located on the runway threshold at the centerline, so these distances will be the same. This distance will always vary slightly from any ILS DME that may be present, since the ILS DME is located further down the runway. Initiation of the missed approach on the LNAV/VNAV and LPV approaches is still based on reaching the decision altitude without any of the items listed in 14 CFR Section 91.175 being visible, and must not be delayed until the ATD reaches zero. The WAAS receiver, unlike a GPS receiver, will automatically sequence past the MAWP if the missed approach procedure has been designed for RNAV. The pilot may also select missed approach prior to the MAWP, however, navigation will continue to the MAWP prior to waypoint sequencing taking place.

## 1-1-20. Ground Based Augmentation System (GBAS) Landing System (GLS)

### a. General

1. The GLS provides precision navigation guidance for exact alignment and descent of aircraft on approach to a runway. It provides differential augmentation to the Global Navigation Satellite System (GNSS).

#### NOTE-

*GBAS is the ICAO term for Local Area Augmentation System (LAAS).*

2. LAAS was developed as an “ILS look-alike” system from the pilot perspective. LAAS is based on GPS signals augmented by ground equipment and has been developed to provide GLS precision approaches similar to ILS at airfields.

3. GLS provides guidance similar to ILS approaches for the final approach segment; portions of the GLS approach prior to and after the final approach segment will be based on Area Navigation (RNAV) or Required Navigation Performance (RNP).

4. The equipment consists of a GBAS Ground Facility (GGF), four reference stations, a VHF Data Broadcast (VDB) uplink antenna, and an aircraft GBAS receiver.

### b. Procedure

1. Pilots will select the five digit GBAS channel number of the associated approach within the Flight Management System (FMS) menu or manually select the five digits (system dependent). Selection of the GBAS channel number also tunes the VDB.

2. Following procedure selection, confirmation that the correct LAAS procedure is loaded can be accomplished by cross checking the charted Reference Path Indicator (RPI) or approach ID with the cockpit displayed RPI or audio identification of the RPI with Morse Code (for some systems).

3. The pilot will fly the GLS approach using the same techniques as an ILS, once selected and identified.

## 1-1-21. Precision Approach Systems other than ILS, GLS, and MLS

### a. General

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

### b. Special Instrument Approach Procedure

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

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

### c. Transponder Landing System (TLS)

1. The TLS is designed to provide approach guidance utilizing existing airborne ILS localizer, glide slope, and transponder equipment.

2. Ground equipment consists of a transponder interrogator, sensor arrays to detect lateral and vertical position, and ILS frequency transmitters. The TLS detects the aircraft's position by interrogating its transponder. It then broadcasts ILS frequency signals to guide the aircraft along the desired approach path.

3. TLS instrument approach procedures are designated Special Instrument Approach Procedures. Special aircrew training is required. TLS ground

equipment provides approach guidance for only one aircraft at a time. Even though the TLS signal is received using the ILS receiver, no fixed course or glidepath is generated. The concept of operation is very similar to an air traffic controller providing radar vectors, and just as with radar vectors, the guidance is valid only for the intended aircraft. The TLS ground equipment tracks one aircraft, based on its transponder code, and provides correction signals to course and glidepath based on the position of the tracked aircraft. Flying the TLS corrections computed for another aircraft will not provide guidance relative to the approach; therefore, aircrews must not use the TLS signal for navigation unless they have received approach clearance and completed the required coordination with the TLS ground equipment operator. Navigation fixes based on conventional NAVAIDs or GPS are provided in the special instrument approach procedure to allow aircrews to verify the TLS guidance.

### d. Special Category I Differential GPS (SCAT-I DGPS)

1. The SCAT-I DGPS is designed to provide approach guidance by broadcasting differential correction to GPS.

2. SCAT-I DGPS procedures require aircraft equipment and pilot training.

3. Ground equipment consists of GPS receivers and a VHF digital radio transmitter. The SCAT-I DGPS detects the position of GPS satellites relative to GPS receiver equipment and broadcasts differential corrections over the VHF digital radio.

4. Category I Ground Based Augmentation System (GBAS) will displace SCAT-I DGPS as the public use service.

#### REFERENCE—

AIM, Para 5-4-7, Instrument Approach Procedures.

**d. Alternate Airport Considerations.** For the purposes of flight planning, any required alternate airport must have an available instrument approach procedure that does not require the use of GPS. This restriction includes conducting a conventional approach at the alternate airport using a substitute means of navigation that is based upon the use of GPS. For example, these restrictions would apply when planning to use GPS equipment as a substitute means of navigation for an out-of-service VOR that supports an ILS missed approach procedure at an alternate airport. In this case, some other approach not reliant upon the use of GPS must be available. This restriction does not apply to RNAV systems using TSO-C145/-C146 WAAS equipment. For further WAAS guidance see AIM 1-1-19.

**1.** For flight planning purposes, TSO-C129() and TSO-C196() equipped users (GPS users) whose navigation systems have fault detection and exclusion (FDE) capability, who perform a preflight RAIM prediction at the airport where the RNAV (GPS) approach will be flown, and have proper knowledge and any required training and/or approval to conduct a GPS-based IAP, may file based on a GPS-based IAP at either the destination or the

alternate airport, but not at both locations. At the alternate airport, pilots may plan for applicable alternate airport weather minimums using:

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

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

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

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

**3.** This restriction does not apply to TSO-C145() and TSO-C146() equipped users (WAAS users). For further WAAS guidance see AIM 1-1-19.



arriving aircraft should contact the Class C airspace ATC facility on the publicized frequency and give their position, altitude, radar beacon code, destination, and request Class C service. Radio contact should be initiated far enough from the Class C airspace boundary to preclude entering Class C airspace before two-way radio communications are established.

**NOTE—**

1. *If the controller responds to a radio call with, “(aircraft callsign) standby,” radio communications have been established and the pilot can enter the Class C airspace.*
2. *If workload or traffic conditions prevent immediate provision of Class C services, the controller will inform the pilot to remain outside the Class C airspace until conditions permit the services to be provided.*
3. *It is important to understand that if the controller responds to the initial radio call without using the aircraft identification, radio communications have not been established and the pilot may not enter the Class C airspace.*
4. *Though not requiring regulatory action, Class C airspace areas have a procedural Outer Area. Normally this area is 20 NM from the primary Class C airspace airport. Its vertical limit extends from the lower limits of radio/radar coverage up to the ceiling of the approach control’s delegated airspace, excluding the Class C airspace itself, and other airspace as appropriate. (This outer area is not charted.)*
5. *Pilots approaching an airport with Class C service should be aware that if they descend below the base altitude of the 5 to 10 mile shelf during an instrument or visual approach, they may encounter nontransponder, VFR aircraft.*

**EXAMPLE—**

1. *[Aircraft callsign] “remain outside the Class Charlie airspace and standby.”*
2. *“Aircraft calling Dulles approach control, standby.”*

**4. Departures from:**

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

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

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

**d. Air Traffic Services.** When two-way radio communications and radar contact are established, all participating VFR aircraft are:

1. Sequenced to the primary airport.
2. Provided Class C services within the Class C airspace and the outer area.
3. Provided basic radar services beyond the outer area on a workload permitting basis. This can be terminated by the controller if workload dictates.

**e. Aircraft Separation.** Separation is provided within the Class C airspace and the outer area after two-way radio communications and radar contact are established. VFR aircraft are separated from IFR aircraft within the Class C airspace by any of the following:

1. Visual separation.
2. 500 feet vertical; except when operating beneath a heavy jet.
3. Target resolution.

**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 CENRAP is in use.*
3. *Pilot participation is voluntary within the outer area and can be discontinued, within the outer area, at the pilot’s request. Class C services will be provided in the outer area unless the pilot requests termination of the service.*
4. *Some facilities provide Class C services only during published hours. At other times, terminal IFR radar service will be provided. It is important to note that the communications and transponder requirements are dependent of the class of airspace established outside of the published hours.*

## f. Secondary Airports

1. In some locations Class C airspace may overlies the Class D surface area of a secondary airport. In order to allow that control tower to provide service to aircraft, portions of the overlapping Class C airspace may be procedurally excluded when the secondary airport tower is in operation. Aircraft operating in these procedurally excluded areas will only be provided airport traffic control services when in communication with the secondary airport tower.

2. Aircraft proceeding inbound to a satellite airport will be terminated at a sufficient distance to allow time to change to the appropriate tower or advisory frequency. Class C services to these aircraft will be discontinued when the aircraft is instructed to contact the tower or change to advisory frequency.

3. Aircraft departing secondary controlled airports will not receive Class C services until they have been radar identified and two-way communications have been established with the Class C airspace facility.

4. 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.

## g. Class C Airspace Areas by State

These states currently have designated Class C airspace areas that are depicted on sectional charts. Pilots should consult current sectional charts and NOTAMs for the latest information on services available. Pilots should be aware that some Class C airspace underlies or is adjacent to Class B airspace. (See TBL 3-2-1.)

*TBL 3-2-1*  
**Class C Airspace Areas by State**

State/City	Airport
<b>ALABAMA</b>	
Birmingham . . . . .	Birmingham–Shuttlesworth International
Huntsville . . . . .	International–Carl T Jones Fld
Mobile . . . . .	Regional
<b>ALASKA</b>	
Anchorage . . . . .	Ted Stevens International
<b>ARIZONA</b>	
Davis–Monthan . . . . .	AFB
Tucson . . . . .	International
<b>ARKANSAS</b>	
Fayetteville (Springdale)	Northwest Arkansas Regional
Little Rock . . . . .	Adams Field
<b>CALIFORNIA</b>	
Beale . . . . .	AFB
Burbank . . . . .	Bob Hope
Fresno . . . . .	Yosemite International
Monterey . . . . .	Peninsula
Oakland . . . . .	Metropolitan Oakland International
Ontario . . . . .	International
Riverside . . . . .	March AFB
Sacramento . . . . .	International
San Jose . . . . .	Norman Y. Mineta International
Santa Ana . . . . .	John Wayne/Orange County
Santa Barbara . . . . .	Municipal
<b>COLORADO</b>	
Colorado Springs . . . . .	Municipal
<b>CONNECTICUT</b>	
Windsor Locks . . . . .	Bradley International
<b>FLORIDA</b>	
Daytona Beach . . . . .	International
Fort Lauderdale . . . . .	Hollywood International
Fort Myers . . . . .	SW Florida Regional
Jacksonville . . . . .	International
Orlando . . . . .	Sanford International
Palm Beach . . . . .	International
Pensacola . . . . .	NAS
Pensacola . . . . .	Regional
Sarasota . . . . .	Bradenton International
Tallahassee . . . . .	Regional
Whiting . . . . .	NAS
<b>GEORGIA</b>	
Savannah . . . . .	Hilton Head International
<b>HAWAII</b>	
Kahului . . . . .	Kahului
<b>IDAHO</b>	
Boise . . . . .	Air Terminal
<b>ILLINOIS</b>	
Champaign . . . . .	Urbana U of Illinois–Willard
Chicago . . . . .	Midway International



## Section 4. Special Use Airspace

### 3-4-1. General

a. Special use airspace 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. Except for controlled firing areas, special use airspace areas are depicted on aeronautical charts.

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, military operations areas (MOAs), alert areas, and controlled firing areas (CFAs) are nonregulatory special use airspace.

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

e. Special use airspace (except CFAs) are charted on IFR or visual charts and include the hours of operation, altitudes, and the controlling agency.

### 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. Restricted airspace is depicted on the en route chart appropriate for use at the altitude or flight level being flown. For joint-use restricted areas, the name of the controlling agency is shown on these charts. For all prohibited areas and nonjoint-use restricted areas, unless otherwise requested by the using agency, the phrase “NO A/G” is shown.

### 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. MOAs are depicted on sectional, VFR Terminal Area, and Enroute Low Altitude charts.

### 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

National Security Areas 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, System Operations Airspace and AIM Office, Airspace and Rules, and disseminated via NOTAM. Inquiries about NSAs should be directed to Airspace and Rules.

*below 2000 feet AGL of N360962/W970515 and the Stillwater/SWO/VOR/DME 176 degree radial 3.8–nautical–mile fix from 1400 local time to 1700 local time June 21, 1996, unless otherwise authorized by ATC.*

**6. 14 CFR Section 91.143:**

*The following NOTAM prohibits any aircraft of U.S. registry, or pilot any aircraft under the authority of an airman certificate issued by the FAA.*

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

### **3–5–4. Parachute Jump Aircraft Operations**

**a.** Procedures relating to parachute jump areas are contained in 14 CFR Part 105. Tabulations of parachute jump areas in the U.S. are contained in the A/FD.

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

**c.** Parachute operations in the vicinity of an airport without an operating control tower – there is no substitute for alertness while in the vicinity of an airport. It is essential that pilots conducting parachute operations be alert, look for other traffic, and

exchange traffic information as recommended in paragraph 4–1–9, Traffic Advisory Practices at Airports Without Operating Control Towers. In addition, pilots should avoid releasing parachutes while in an airport traffic pattern when there are other aircraft in that pattern. Pilots should make appropriate broadcasts on the designated Common Traffic Advisory Frequency (CTAF), and monitor that CTAF until all parachute activity has terminated or the aircraft has left the area. Prior to commencing a jump operation, the pilot should broadcast the aircraft's altitude and position in relation to the airport, the approximate relative time when the jump will commence and terminate, and listen to the position reports of other aircraft in the area.

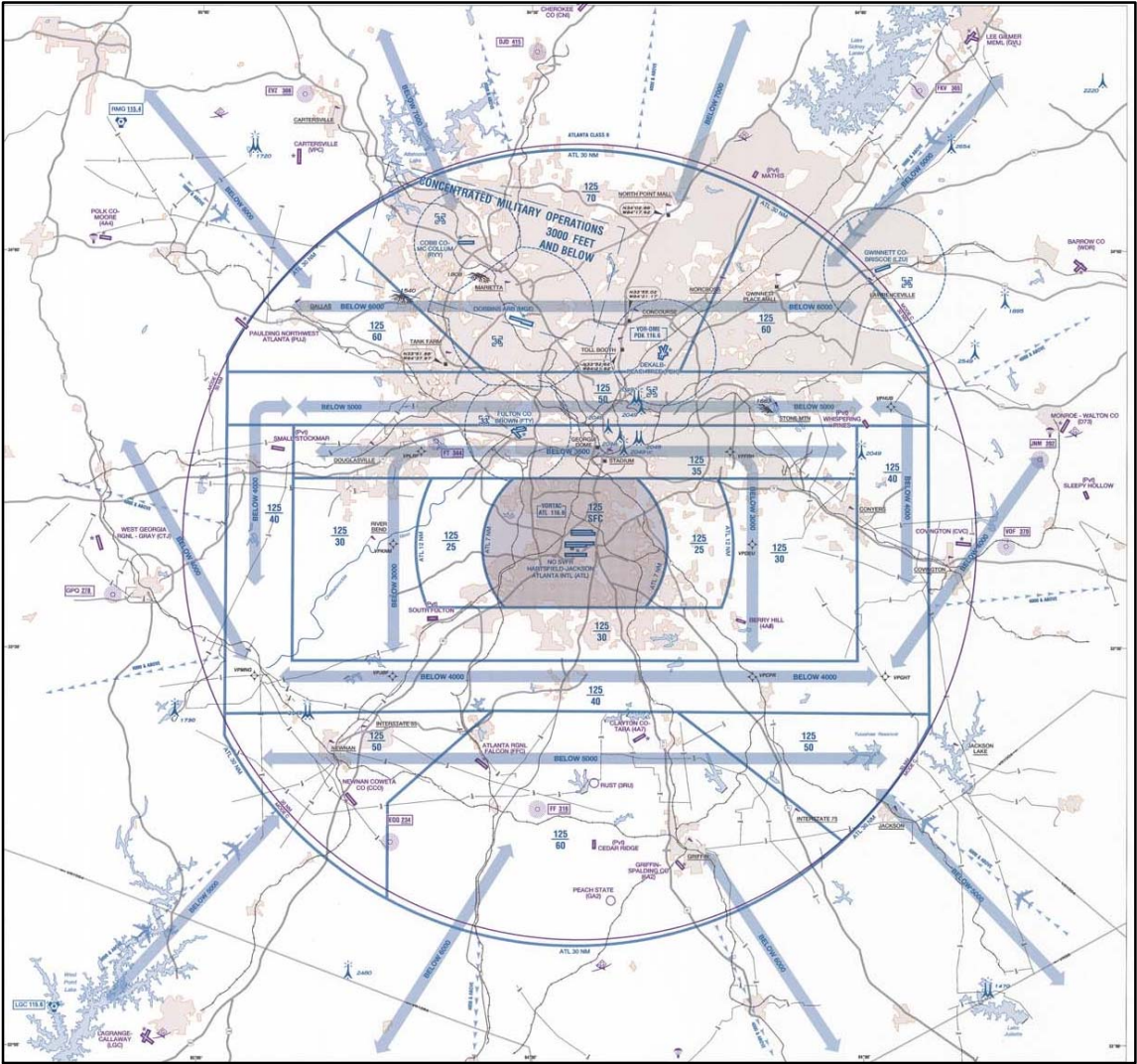
### **3–5–5. Published VFR Routes**

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

#### **a. VFR Flyways.**

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

FIG 3-5-1  
VFR Flyway Planning Chart



### 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. ■



**TBL 4-1-3**  
**Other Frequency Usage Designated by FCC**

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

#### 4-1-12. Use of UNICOM for ATC Purposes

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

- a. Revision to proposed departure time.
- b. Takeoff, arrival, or flight plan cancellation time.
- c. ATC clearance, provided arrangements are made between the ATC facility and the UNICOM licensee to handle such messages.

#### 4-1-13. Automatic Terminal Information Service (ATIS)

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

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

##### **EXAMPLE-**

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

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

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

##### **EXAMPLE-**

*"Information Sierra received."*

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

##### **EXAMPLE-**

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

##### **NOTE-**

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

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

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

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

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

#### **4-1-14. Automatic Flight Information Service (AFIS) – Alaska FSSs Only**

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

conditions exist, the latest ceiling, visibility, altimeter, wind or other conditions may be omitted from the AFIS and will be issued by the Flight Service Specialist on the appropriate radio frequency.

#### **EXAMPLE–**

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

#### **NOTE–**

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

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

#### **NOTE–**

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

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

#### **EXAMPLE–**

*“Information Alpha received.”*

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

#### **4-1-15. Radar Traffic Information Service**

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



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

#### **a. Purpose of the Service**

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

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

#### **b. Provisions of the Service**

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

##### **NOTE—**

*Radar ATC facilities normally display and monitor both primary and secondary radar when it is available, except that secondary radar may be used as the sole display source in Class A airspace, and under some circumstances outside of Class A airspace (beyond primary coverage and in en route areas where only secondary is available). Secondary radar may also be used outside Class A airspace as the sole display source when the primary radar is temporarily unusable or out of service. Pilots in contact with the affected ATC facility are normally advised when a temporary outage occurs; i.e., "primary radar out of*

*service; traffic advisories available on transponder aircraft only." This means simply that only the aircraft which have transponders installed and in use will be depicted on ATC radar indicators when the primary radar is temporarily out of service.*

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

##### **NOTE—**

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

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

#### **1. Radar identified**

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

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

(c) Distance from the aircraft in nautical miles;

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

(e) Type of aircraft and altitude if known.

##### **EXAMPLE—**

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

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

## 2. Not radar identified

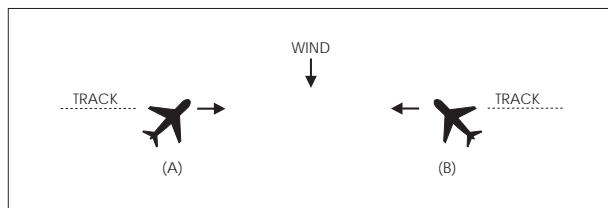
- (a) Distance and direction with respect to a fix;
- (b) Direction in which the target is proceeding; and
- (c) Type of aircraft and altitude if known.

### EXAMPLE–

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

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

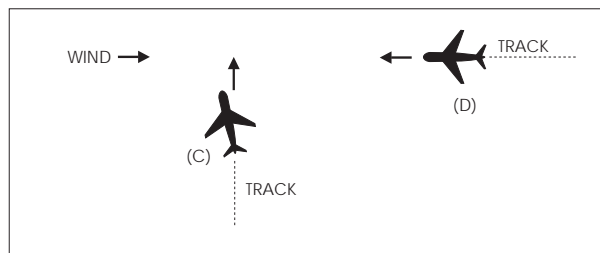
**FIG 4-1-1**  
**Induced Error in Position of Traffic**



### EXAMPLE–

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

**FIG 4-1-2**  
**Induced Error in Position of Traffic**



### EXAMPLE–

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

## 4-1-16. Safety Alert

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

### a. Terrain or Obstruction Alert

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

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, ARTCC Communications, Paragraph 5–3–1

## 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 “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 expeditious handling. When requested by the pilot, necessary notification to expedite ground handling of patients, etc., is provided by ATC; however, when possible, this information should be passed in advance through non-ATC communications systems.

1. Civilian air ambulance flights responding to medical emergencies (first call to an accident scene, carrying patients, organ donors, organs, or other urgently needed lifesaving medical material) will be expedited by ATC when necessary. When expeditious handling is necessary, include the word “MEDEVAC” in the flight plan per paragraphs 5-1-8 and 5-1-9. In radio communications, use the call sign “MEDEVAC,” followed by the aircraft registration letters/numbers.

#### **EXAMPLE–**

*MEDEVAC Two Six Four Six.*

2. Similar provisions have been made for the use of “AIR EVAC” and “HOSP” by air ambulance flights, except that these flights will receive priority handling only when specifically requested.

3. Air carrier and air taxi flights responding to medical emergencies will also be expedited by ATC when necessary. The nature of these medical emergency flights usually concerns the transportation of urgently needed lifesaving medical materials or vital organs. **IT IS IMPERATIVE THAT THE COMPANY/PILOT DETERMINE, BY THE NATURE/URGENCY OF THE SPECIFIC MEDICAL CARGO, IF PRIORITY ATC ASSISTANCE IS REQUIRED.** Pilots must include the word “MEDEVAC” in the flight plan per paragraphs 5-1-8 and 5-1-9, and use the call sign “MEDEVAC,” followed by the company name and flight number for all transmissions when expeditious handling is required. It is important for ATC to be aware of “MEDEVAC” status, and it is the pilot’s responsibility to ensure that this information is provided to ATC.

#### **EXAMPLE–**

*MEDEVAC Delta Thirty–Seven.*

### 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 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.

**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, Surface Movement Guidance and Control System, commonly known as SMGCS (pronounced “SMIGS”) requires a low visibility taxi plan for any airport which has takeoff or landing operations in less than 1,200 feet runway visual range (RVR) visibility conditions. These plans, which affect aircrew and vehicle operators, may incorporate additional lighting, markings, and procedures to control airport surface traffic. They will be addressed at two levels; operations less than 1,200 feet RVR to 600 feet RVR and operations less than 600 feet RVR.

**NOTE–**

*Specific lighting systems and surface markings may be found in paragraph 2–1–1, Taxiway Lights, and paragraph 2–3–4 Taxiway Markings.*

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

#### **4–3–20. Exiting the Runway After Landing**

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

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

**b.** Taxi clear of the runway unless otherwise directed by ATC. An aircraft is considered clear of the runway when all parts of the aircraft are past the runway edge and there are no restrictions to its continued movement beyond the runway holding position markings. In the absence of ATC instructions, the pilot is expected to taxi clear of the landing runway by taxiing beyond the runway holding position markings associated with the landing

runway, even if that requires the aircraft to protrude into or cross another taxiway or ramp area. Once all parts of the aircraft have crossed the runway holding position markings, the pilot must hold unless further instructions have been issued by ATC.

**NOTE–**

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

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

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

**NOTE–**

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

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

#### **4–3–21. Practice Instrument Approaches**

**a.** Various air traffic incidents have indicated the necessity for adoption of measures to achieve more organized and controlled operations where practice instrument approaches are conducted. Practice instrument approaches are considered to be instrument approaches made by either a VFR aircraft not on an IFR flight plan or an aircraft on an IFR flight plan. To achieve this and thereby enhance air safety, it is Air Traffic’s policy to provide for separation of such operations at locations where approach control facilities are located and, as resources permit, at certain other locations served by ARTCCs or parent approach control facilities. Pilot requests to practice instrument approaches may be approved by ATC subject to traffic and workload conditions. Pilots should anticipate that in some instances the controller may find it necessary to deny approval or withdraw previous approval when traffic conditions warrant. It must be clearly understood, however, that even though the controller may be providing separation, pilots on VFR flight plans are required to comply with basic VFR weather minimums (14 CFR Section 91.155). Application of ATC procedures or any action taken by the controller to avoid traffic conflicts does not relieve IFR and VFR pilots of

their responsibility to see-and-avoid other traffic while operating in VFR conditions (14 CFR Section 91.113). In addition to the normal IFR separation minimums (which includes visual separation) during VFR conditions, 500 feet vertical separation may be applied between VFR aircraft and between a VFR aircraft and the IFR aircraft. Pilots not on IFR flight plans desiring practice instrument approaches should always state 'practice' when making requests to ATC. Controllers will instruct VFR aircraft requesting an instrument approach to maintain VFR. This is to preclude misunderstandings between the pilot and controller as to the status of the aircraft. If pilots wish to proceed in accordance with instrument flight rules, they must specifically request and obtain, an IFR clearance.

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

**NOTE—**

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

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

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

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

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

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

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

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

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

command must notify ATC as soon as possible and obtain an amended clearance. In an emergency situation which does not result in a deviation from the rules prescribed in 14 CFR Part 91 but which requires ATC to give priority to an aircraft, the pilot of such aircraft must, when requested by ATC, make a report within 48 hours of such emergency situation to the manager of that ATC facility.

**g.** The guiding principle is that the last ATC clearance has precedence over the previous ATC clearance. When the route or altitude in a previously issued clearance is amended, the controller will restate applicable altitude restrictions. If altitude to maintain is changed or restated, whether prior to departure or while airborne, and previously issued altitude restrictions are omitted, those altitude restrictions are canceled, including departure procedures and STAR altitude restrictions.

**EXAMPLE—**

**1.** A departure flight receives a clearance to destination airport to maintain FL 290. The clearance incorporates a DP which has certain altitude crossing restrictions. Shortly after takeoff, the flight receives a new clearance changing the maintaining FL from 290 to 250. If the altitude restrictions are still applicable, the controller restates them.

**2.** A departing aircraft is cleared to cross Fluky Intersection at or above 3,000 feet, Gordonville VOR at or above 12,000 feet, maintain FL 200. Shortly after departure, the altitude to be maintained is changed to FL 240. If the altitude restrictions are still applicable, the controller issues an amended clearance as follows: “cross Fluky Intersection at or above three thousand, cross Gordonville V–O–R at or above one two thousand, maintain Flight Level two four zero.”

**3.** An arriving aircraft is cleared to the destination airport via V45 Delta VOR direct; the aircraft is cleared to cross Delta VOR at 10,000 feet, and then to maintain 6,000 feet. Prior to Delta VOR, the controller issues an amended clearance as follows: “turn right heading one eight zero for vector to runway three six I–L–S approach, maintain six thousand.”

**NOTE—**

Because the altitude restriction “cross Delta V–O–R at 10,000 feet” was omitted from the amended clearance, it is no longer in effect.

**h.** Pilots of turbojet aircraft equipped with afterburner engines should advise ATC prior to takeoff if they intend to use afterburning during their climb to the en route altitude. Often, the controller

may be able to plan traffic to accommodate a high performance climb and allow the aircraft to climb to the planned altitude without restriction.

**i.** If an “expedite” climb or descent clearance is issued by ATC, and the altitude to maintain is subsequently changed or restated without an expedite instruction, the expedite instruction is canceled. Expedite climb/descent normally indicates to the pilot that the approximate best rate of climb/descent should be used without requiring an exceptional change in aircraft handling characteristics. Normally controllers will inform pilots of the reason for an instruction to expedite.

#### **4–4–11. IFR Separation Standards**

**a.** ATC effects separation of aircraft vertically by assigning different altitudes; longitudinally by providing an interval expressed in time or distance between aircraft on the same, converging, or crossing courses, and laterally by assigning different flight paths.

**b.** Separation will be provided between all aircraft operating on IFR flight plans except during that part of the flight (outside Class B airspace or a TRSA) being conducted on a VFR–on–top/VFR conditions clearance. Under these conditions, ATC may issue traffic advisories, but it is the sole responsibility of the pilot to be vigilant so as to see and avoid other aircraft.

**c.** When radar is employed in the separation of aircraft at the same altitude, a minimum of 3 miles separation is provided between aircraft operating within 40 miles of the radar antenna site, and 5 miles between aircraft operating beyond 40 miles from the antenna site. These minima may be increased or decreased in certain specific situations.

**NOTE—**

Certain separation standards are increased in the terminal environment when CENRAP is being utilized.

#### **4–4–12. Speed Adjustments**

**a.** ATC will issue speed adjustments to pilots of radar–controlled aircraft to achieve or maintain required or desired spacing.

**b.** ATC will express all speed adjustments in terms of knots based on indicated airspeed (IAS) in 10 knot increments except that at or above FL 240 speeds may be expressed in terms of Mach numbers in 0.01 increments. The use of Mach numbers is restricted to turbojet aircraft with Mach meters.

c. Pilots complying with speed adjustments are expected to maintain a speed within plus or minus 10 knots or 0.02 Mach number of the specified speed.

d. When ATC assigns speed adjustments, it will be in accordance with the following recommended minimums:

1. To aircraft operating between FL 280 and 10,000 feet, a speed not less than 250 knots or the equivalent Mach number.

**NOTE—**

1. On a standard day the Mach numbers equivalent to 250 knots CAS (subject to minor variations) are:

FL 240–0.6

FL 250–0.61

FL 260–0.62

FL 270–0.64

FL 280–0.65

FL 290–0.66.

2. When an operational advantage will be realized, speeds lower than the recommended minima may be applied.

2. To arriving turbojet aircraft operating below 10,000 feet:

(a) A speed not less than 210 knots, except;

(b) Within 20 flying miles of the airport of intended landing, a speed not less than 170 knots.

3. To arriving reciprocating engine or turboprop aircraft within 20 flying miles of the runway threshold of the airport of intended landing, a speed not less than 150 knots.

4. To departing aircraft:

(a) Turbojet aircraft, a speed not less than 230 knots.

(b) Reciprocating engine aircraft, a speed not less than 150 knots.

e. When ATC combines a speed adjustment with a descent clearance, the sequence of delivery, with the word “then” between, indicates the expected order of execution.

**EXAMPLE—**

1. Descend and maintain (altitude); then, reduce speed to (speed).

2. Reduce speed to (speed); then, descend and maintain (altitude).

**NOTE—**

The maximum speeds below 10,000 feet as established in 14 CFR Section 91.117 still apply. If there is any doubt

concerning the manner in which such a clearance is to be executed, request clarification from ATC.

f. If ATC determines (before an approach clearance is issued) that it is no longer necessary to apply speed adjustment procedures, they will inform the pilot to resume normal speed. Approach clearances supersede any prior speed adjustment assignments, and pilots are expected to make their own speed adjustments, as necessary, to complete the approach. Under certain circumstances, however, it may be necessary for ATC to issue further speed adjustments after approach clearance is issued to maintain separation between successive arrivals. Under such circumstances, previously issued speed adjustments will be restated if that speed is to be maintained or additional speed adjustments are requested. ATC must obtain pilot concurrence for speed adjustments after approach clearances are issued. Speed adjustments should not be assigned inside the final approach fix on final or a point 5 miles from the runway, whichever is closer to the runway.

**NOTE—**

See “RESUME NORMAL SPEED” in the Pilot/Controller Glossary.

g. The pilots retain the prerogative of rejecting the application of speed adjustment by ATC if the minimum safe airspeed for any particular operation is greater than the speed adjustment.

**NOTE—**

In such cases, pilots are expected to advise ATC of the speed that will be used.

h. Pilots are reminded that they are responsible for rejecting the application of speed adjustment by ATC if, in their opinion, it will cause them to exceed the maximum indicated airspeed prescribed by 14 CFR Section 91.117(a), (c) and (d). *IN SUCH CASES, THE PILOT IS EXPECTED TO SO INFORM ATC.* Pilots operating at or above 10,000 feet MSL who are issued speed adjustments which exceed 250 knots IAS and are subsequently cleared below 10,000 feet MSL are expected to comply with 14 CFR Section 91.117(a).

i. Speed restrictions of 250 knots do not apply to U.S. registered aircraft operating beyond 12 nautical miles from the coastline within the U.S. Flight Information Region, in Class E airspace below 10,000 feet MSL. However, in airspace underlying a Class B airspace area designated for an airport, or in a VFR corridor designated through such as a Class B airspace area, pilots are expected to comply with the



200 knot speed limit specified in 14 CFR Section 91.117(c).

**j.** For operations in a Class C and Class D surface area, ATC is authorized to request or approve a speed greater than the maximum indicated airspeeds prescribed for operation within that airspace (14 CFR Section 91.117(b)).

**NOTE—**

*Pilots are expected to comply with the maximum speed of 200 knots when operating beneath Class B airspace or in a Class B VFR corridor (14 CFR Section 91.117(c) and (d)).*

**k.** When in communications with the ARTCC or approach control facility, pilots should, as a good operating practice, state any ATC assigned speed restriction on initial radio contact associated with an ATC communications frequency change.

#### 4-4-13. Runway Separation

Tower controllers establish the sequence of arriving and departing aircraft by requiring them to adjust flight or ground operation as necessary to achieve proper spacing. They may “HOLD” an aircraft short of the runway to achieve spacing between it and an arriving aircraft; the controller may instruct a pilot to “EXTEND DOWNWIND” in order to establish spacing from an arriving or departing aircraft. At times a clearance may include the word “IMMEDIATE.” For example: “CLEARED FOR IMMEDIATE TAKEOFF.” In such cases “IMMEDIATE” is used for purposes of *air traffic separation*. It is up to the pilot to refuse the clearance if, in the pilot’s opinion, compliance would adversely affect the operation.

**REFERENCE—**

*AIM, Gate Holding due to Departure Delays, Paragraph 4-3-15*

#### 4-4-14. Visual Separation

**a.** Visual separation is a means employed by ATC to separate aircraft in terminal areas and en route airspace in the NAS. There are two methods employed to effect this separation:

**1.** The tower controller sees the aircraft involved and issues instructions, as necessary, to ensure that the aircraft avoid each other.

**2.** A pilot sees the other aircraft involved and upon instructions from the controller provides separation by maneuvering the aircraft to avoid it.

When pilots accept responsibility to maintain visual separation, they must maintain constant visual surveillance and not pass the other aircraft until it is no longer a factor.

**NOTE—**

*Traffic is no longer a factor when during approach phase the other aircraft is in the landing phase of flight or executes a missed approach; and during departure or en route, when the other aircraft turns away or is on a diverging course.*

**b.** A pilot’s acceptance of instructions to follow another aircraft or provide visual separation from it is an acknowledgment that the pilot will maneuver the aircraft as necessary to avoid the other aircraft or to maintain in-trail separation. In operations conducted behind heavy jet aircraft, it is also an acknowledgment that the pilot accepts the responsibility for wake turbulence separation.

**NOTE—**

*When a pilot has been told to follow another aircraft or to provide visual separation from it, the pilot should promptly notify the controller if visual contact with the other aircraft is lost or cannot be maintained or if the pilot cannot accept the responsibility for the separation for any reason.*

**c.** Scanning the sky for other aircraft is a key factor in collision avoidance. Pilots and copilots (or the right seat passenger) should continuously scan to cover all areas of the sky visible from the cockpit. Pilots must develop an effective scanning technique which maximizes one’s visual capabilities. Spotting a potential collision threat increases directly as more time is spent looking outside the aircraft. One must use timesharing techniques to effectively scan the surrounding airspace while monitoring instruments as well.

**d.** Since the eye can focus only on a narrow viewing area, effective scanning is accomplished with a series of short, regularly spaced eye movements that bring successive areas of the sky into the central visual field. Each movement should not exceed ten degrees, and each area should be observed for at least one second to enable collision detection. Although many pilots seem to prefer the method of horizontal back-and-forth scanning every pilot should develop a scanning pattern that is not only comfortable but assures optimum effectiveness. Pilots should remember, however, that they have a regulatory responsibility (14 CFR Section 91.113(a)) to see and avoid other aircraft when weather conditions permit.

#### 4-4-15. Use of Visual Clearing Procedures

**a. Before Takeoff.** Prior to taxiing onto a runway or landing area in preparation for takeoff, pilots should scan the approach areas for possible landing traffic and execute the appropriate clearing maneuvers to provide them a clear view of the approach areas.

**b. Climbs and Descents.** During climbs and descents in flight conditions which permit visual detection of other traffic, pilots should execute gentle banks, left and right at a frequency which permits continuous visual scanning of the airspace about them.

**c. Straight and Level.** Sustained periods of straight and level flight in conditions which permit visual detection of other traffic should be broken at intervals with appropriate clearing procedures to provide effective visual scanning.

**d. Traffic Pattern.** Entries into traffic patterns while descending create specific collision hazards and should be avoided.

**e. Traffic at VOR Sites.** All operators should emphasize the need for sustained vigilance in the vicinity of VORs and airway intersections due to the convergence of traffic.

**f. Training Operations.** Operators of pilot training programs are urged to adopt the following practices:

1. Pilots undergoing flight instruction at all levels should be requested to verbalize clearing procedures (call out “clear” left, right, above, or below) to instill and sustain the habit of vigilance during maneuvering.

2. **High-wing airplane.** Momentarily raise the wing in the direction of the intended turn and look.

3. **Low-wing airplane.** Momentarily lower the wing in the direction of the intended turn and look.

4. Appropriate clearing procedures should precede the execution of all turns including chandelles, lazy eights, stalls, slow flight, climbs, straight and level, spins, and other combination maneuvers.

#### 4-4-16. Traffic Alert and Collision Avoidance System (TCAS I & II)

**a. TCAS I** provides proximity warning only, to assist the pilot in the visual acquisition of intruder aircraft. No recommended avoidance maneuvers are provided nor authorized as a direct result of a TCAS I warning. It is intended for use by smaller commuter aircraft holding 10 to 30 passenger seats, and general aviation aircraft.

**b. TCAS II** provides traffic advisories (TAs) and resolution advisories (RAs). Resolution advisories provide recommended maneuvers in a vertical direction (climb or descend only) to avoid conflicting traffic. Airline aircraft, and larger commuter and business aircraft holding 31 passenger seats or more, use TCAS II equipment.

1. Each pilot who deviates from an ATC clearance in response to a TCAS II RA must notify ATC of that deviation as soon as practicable and expeditiously return to the current ATC clearance when the traffic conflict is resolved.

2. Deviations from rules, policies, or clearances should be kept to the minimum necessary to satisfy a TCAS II RA.

3. The serving IFR air traffic facility is not responsible to provide approved standard IFR separation to an aircraft after a TCAS II RA maneuver until one of the following conditions exists:

(a) The aircraft has returned to its assigned altitude and course.

(b) Alternate ATC instructions have been issued.

**c.** TCAS does not alter or diminish the pilot’s basic authority and responsibility to ensure safe flight. Since TCAS does not respond to aircraft which are not transponder equipped or aircraft with a transponder failure, TCAS alone does not ensure safe separation in every case.

**d.** At this time, no air traffic service nor handling is predicated on the availability of TCAS equipment in the aircraft.

#### 4-4-17. Traffic Information Service (TIS)

**a.** TIS provides proximity warning only, to assist the pilot in the visual acquisition of intruder aircraft. No recommended avoidance maneuvers are provided nor authorized as a direct result of a TIS intruder

## Section 6. Operational Policy/Procedures for Reduced Vertical Separation Minimum (RVSM) in the Domestic U.S., Alaska, Offshore Airspace and the San Juan FIR

### 4-6-1. Applicability and RVSM Mandate (Date/Time and Area)

**a. Applicability.** The policies, guidance and direction in this section apply to RVSM operations in the airspace over the lower 48 states, Alaska, Atlantic and Gulf of Mexico High Offshore Airspace and airspace in the San Juan FIR where VHF or UHF voice direct controller-pilot communication (DCPC) is normally available. Policies, guidance and direction for RVSM operations in oceanic airspace where VHF or UHF voice DCPC is not available and the airspace of other countries are posted on the FAA “RVSM Documentation” Webpage described in paragraph 4-6-3, Aircraft and Operator Approval Policy/Procedures, RVSM Monitoring and Databases for Aircraft and Operator Approval.

**b. Mandate.** At 0901 UTC on January 20, 2005, the FAA implemented RVSM between flight level (FL) 290-410 (inclusive) in the following airspace: the airspace of the lower 48 states of the United States, Alaska, Atlantic and Gulf of Mexico High Offshore Airspace and the San Juan FIR. (A chart showing the location of offshore airspace is posted on the Domestic U.S. RVSM (DRVSM) Webpage. See paragraph 4-6-3.) On the same time and date, RVSM was also introduced into the adjoining airspace of Canada and Mexico to provide a seamless environment for aircraft traversing those borders. In addition, RVSM was implemented on the same date in the Caribbean and South American regions.

**c. RVSM Authorization.** In accordance with 14 CFR Section 91.180, with only limited exceptions, prior to operating in RVSM airspace, operators and aircraft must have received RVSM authorization from the responsible civil aviation authority. (See paragraph 4-6-10, Procedures for Accommodation of Non-RVSM Aircraft.) If the operator or aircraft or both have not been authorized for RVSM operations, the aircraft will be referred to as a “non-RVSM” aircraft. Paragraph 4-6-10 discusses ATC policies for accommodation of non-RVSM aircraft flown by the Department of Defense, Air Ambulance

(MEDEVAC) operators, foreign State governments and aircraft flown for certification and development. Paragraph 4-6-11, Non-RVSM Aircraft Requesting Climb to and Descent from Flight Levels Above RVSM Airspace Without Intermediate Level Off, contains policies for non-RVSM aircraft climbing and descending through RVSM airspace to/from flight levels above RVSM airspace.

**d. Benefits.** RVSM enhances ATC flexibility, mitigates conflict points, enhances sector throughput, reduces controller workload and enables crossing traffic. Operators gain fuel savings and operating efficiency benefits by flying at more fuel efficient flight levels and on more user preferred routings.

### 4-6-2. Flight Level Orientation Scheme

Altitude assignments for direction of flight follow a scheme of odd altitude assignment for magnetic courses 000-179 degrees and even altitudes for magnetic courses 180-359 degrees for flights up to and including FL 410, as indicated in FIG 4-6-1.

FIG 4-6-1  
Flight Level Orientation Scheme

Flight Level Orientation Scheme	
FL 430	←
FL 410	→
FL 400	←
FL 390	→
FL 380	←
FL 370	→
FL 360	←
FL 350	→
FL 340	←
FL 330	→
FL 320	←
FL 310	→
FL 300	←
FL 290	→

**NOTE-**

*Odd Flight Levels: Magnetic Course 000-179 Degrees  
Even Flight Levels: Magnetic Course 180-359 Degrees.*

#### **4-6-3. Aircraft and Operator Approval Policy/Procedures, RVSM Monitoring and Databases for Aircraft and Operator Approval**

**a. RVSM Authority.** 14 CFR Section 91.180 applies to RVSM operations within the U.S. 14 CFR Section 91.706 applies to RVSM operations outside the U.S. Both sections require that the operator obtain authorization prior to operating in RVSM airspace. 14 CFR Section 91.180 requires that, prior to conducting RVSM operations within the U.S., the operator obtain authorization from the FAA or from the responsible authority, as appropriate. In addition, it requires that the operator and the operator's aircraft comply with the standards of 14 CFR Part 91 Appendix G (Operations in RVSM Airspace).

**b. Sources of Information.** The FAA RVSM Website Homepage can be accessed at: [http://www.faa.gov/about/office\\_org/headquarters\\_offices/ato/service\\_units/enroute/rvsm/](http://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/enroute/rvsm/). The "RVSM Documentation" and "Domestic RVSM" webpages are linked to the RVSM Homepage. "RVSM Documentation" contains guidance and direction for an operator to obtain aircraft and operator approval to conduct RVSM operations. It provides information for DRVSM and oceanic and international RVSM airspace. It is recommended that operators planning to operate in Domestic U.S. RVSM airspace first review the following documents to orient themselves to the approval process.

1. Under "Area of Operations Specific Information," the document, "Basic Operator Information on DRVSM Programs," provides an overview of the DRVSM program and the related aircraft and operator approval programs.

2. In the "Getting Started" section, review the "RVSM Approval Checklist – U.S. Operators" or "RVSM Approval Checklist – Non-U.S. Operators" (as applicable). These are job aids or checklists that show aircraft/operator approval process events with references to related RVSM documents published on the website.

3. Under "Documents Applicable to All RVSM Approvals," review "RVSM Area New to the Operator." This document provides a guide for operators that are conducting RVSM operations in one or more areas of operation, but are planning to

conduct RVSM operations in an area where they have not previously conducted RVSM operations, such as the U.S.

**c. TCAS Equipage.** TCAS equipage requirements are contained in 14 CFR Sections 121.356, 125.224, 129.18 and 135.189. Part 91 Appendix G does not contain TCAS equipage requirements specific to RVSM, however, Appendix G does require that aircraft equipped with TCAS II and flown in RVSM airspace be modified to incorporate TCAS II Version 7.0 or a later version.

**d. Aircraft Monitoring.** Operators are required to participate in the RVSM aircraft monitoring program. The "Monitoring Requirements and Procedures" section of the RVSM Documentation Webpage contains policies and procedures for participation in the monitoring program. Ground-based and GPS-based monitoring systems are available for the Domestic RVSM program. Monitoring is a quality control program that enables the FAA and other civil aviation authorities to assess the in-service altitude-keeping performance of aircraft and operators.

**e. Registration on RVSM Approvals Databases.** The "Registration on RVSM Approvals Database" section of the RVSM Documentation Webpage provides policies/procedures for operator and aircraft registration on RVSM approvals databases.

1. **Purpose of RVSM Approvals Databases.** ATC does not use RVSM approvals databases to determine whether or not a clearance can be issued into RVSM airspace. RVSM program managers do regularly review the operators and aircraft that operate in RVSM airspace to identify and investigate those aircraft and operators flying in RVSM airspace, but not listed on the RVSM approvals databases.

2. **Registration of U.S. Operators.** When U.S. operators and aircraft are granted RVSM authority, the FAA Flight Standards office makes an input to the FAA Program Tracking and Reporting Subsystem (PTRS). The Separation Standards Group at the FAA Technical Center obtains PTRS operator and aircraft information to update the FAA maintained U.S. Operator/Aircraft RVSM Approvals Database. Basic database operator and aircraft information can be viewed on the RVSM Documentation Webpage by clicking on the appropriate database icon.

### 3. Registration of Non-U.S. Operators.

Non-U.S. operators can find policy/procedures for registration on the North American Approvals Registry and Monitoring Organization (NAARMO) database in the “Registration on RVSM Approvals Database” section of RVSM Documentation.

#### 4-6-4. Flight Planning into RVSM Airspace

a. Operators that do not file the correct aircraft equipment suffix on the FAA or ICAO Flight Plan may be denied clearance into RVSM airspace. Policies for the FAA Flight Plan are detailed in subparagraph c below. Policies for the ICAO Flight Plan are detailed in subparagraph d.

b. The operator will annotate the equipment block of the FAA or ICAO Flight Plan with an aircraft equipment suffix indicating RVSM capability only after the responsible civil aviation authority has determined that both the operator and its aircraft are RVSM-compliant and has issued RVSM authorization to the operator.

c. General Policies for FAA Flight Plan Equipment Suffix. TBL 5-1-3, Aircraft Suffixes, allows operators to indicate that the aircraft has both RVSM and Advanced Area Navigation (RNAV) capabilities or has only RVSM capability.

1. The operator will annotate the equipment block of the FAA Flight Plan with the appropriate aircraft equipment suffix from TBL 5-1-3.

2. Operators can only file one equipment suffix in block 3 of the FAA Flight Plan. Only this equipment suffix is displayed directly to the controller.

3. Aircraft with RNAV Capability. For flight in RVSM airspace, aircraft with RNAV capability, but not Advanced RNAV capability, will file “/W”. Filing “/W” will not preclude such aircraft from filing and flying direct routes in en route airspace.

d. Policy for ICAO Flight Plan Equipment Suffixes.

1. Operators/aircraft that are RVSM-compliant and that file ICAO flight plans will file “/W” in block 10 (Equipment) to indicate RVSM authorization and will also file the appropriate ICAO Flight Plan suffixes to indicate navigation and communication capabilities. The equipment suffixes in

TBL 5-1-3 are for use only in an FAA Flight Plan (FAA Form 7233-1).

2. Operators/aircraft that file ICAO flight plans that include flight in Domestic U.S. RVSM airspace must file “/W” in block 10 to indicate RVSM authorization.

e. Importance of Flight Plan Equipment Suffixes. The operator must file the appropriate equipment suffix in the equipment block of the FAA Flight Plan (FAA Form 7233-1) or the ICAO Flight Plan. The equipment suffix informs ATC:

1. Whether or not the operator and aircraft are authorized to fly in RVSM airspace.

2. The navigation and/or transponder capability of the aircraft (e.g., advanced RNAV, transponder with Mode C).

f. Significant ATC uses of the flight plan equipment suffix information are:

1. To issue or deny clearance into RVSM airspace.

2. To apply a 2,000 foot vertical separation minimum in RVSM airspace to aircraft that are not authorized for RVSM, but are in one of the limited categories that the FAA has agreed to accommodate. (See paragraphs 4-6-10, Procedures for Accommodation of Non-RVSM Aircraft, and 4-6-11, Non-RVSM Aircraft Requesting Climb to and Descent from Flight Levels Above RVSM Airspace Without Intermediate Level Off, for policy on limited operation of unapproved aircraft in RVSM airspace).

3. To determine if the aircraft has “Advanced RNAV” capabilities and can be cleared to fly procedures for which that capability is required.

#### 4-6-5. Pilot RVSM Operating Practices and Procedures

a. **RVSM Mandate.** If either the operator or the aircraft or both have not received RVSM authorization (non-RVSM aircraft), the pilot will neither request nor accept a clearance into RVSM airspace unless:

1. The flight is conducted by a non-RVSM DOD, MEDEVAC, certification/development or foreign State (government) aircraft in accordance with paragraph 4-6-10, Procedures for Accommodation of Non-RVSM Aircraft.

2. The pilot intends to climb to or descend from FL 430 or above in accordance with paragraph 4-6-11, Non-RVSM Aircraft Requesting Climb to and Descent from Flight Levels Above RVSM Airspace Without Intermediate Level Off.

3. An emergency situation exists.

**b. Basic RVSM Operating Practices and Procedures.** Appendix 4 of AC 91-85, Authorization of Aircraft and Operators for Flight in Reduced Vertical Separation Minimum Airspace contains pilot practices and procedures for RVSM. Operators must incorporate Appendix 4 practices and procedures, as supplemented by the applicable paragraphs of this section, into operator training or pilot knowledge programs and operator documents containing RVSM operational policies.

c. Appendix 4 contains practices and procedures for flight planning, preflight procedures at the aircraft, procedures prior to RVSM airspace entry, inflight (en route) procedures, contingency procedures and post flight.

d. The following paragraphs either clarify or supplement Appendix 4 practices and procedures.

#### **4-6-6. Guidance on Severe Turbulence and Mountain Wave Activity (MWA)**

##### **a. Introduction/Explanation**

1. The information and practices in this paragraph are provided to emphasize to pilots and controllers the importance of taking appropriate action in RVSM airspace when aircraft experience severe turbulence and/or MWA that is of sufficient magnitude to significantly affect altitude-keeping.

**2. Severe Turbulence.** Severe turbulence causes large, abrupt changes in altitude and/or attitude usually accompanied by large variations in indicated airspeed. Aircraft may be momentarily out of control. Encounters with severe turbulence must be remedied immediately in any phase of flight. Severe turbulence may be associated with MWA.

##### **3. Mountain Wave Activity (MWA)**

(a) Significant MWA occurs both below and above the floor of RVSM airspace, FL 290. MWA often occurs in western states in the vicinity of mountain ranges. It may occur when strong winds blow perpendicular to mountain ranges resulting in

up and down or wave motions in the atmosphere. Wave action can produce altitude excursions and airspeed fluctuations accompanied by only light turbulence. With sufficient amplitude, however, wave action can induce altitude and airspeed fluctuations accompanied by severe turbulence. MWA is difficult to forecast and can be highly localized and short lived.

(b) Wave activity is not necessarily limited to the vicinity of mountain ranges. Pilots experiencing wave activity anywhere that significantly affects altitude-keeping can follow the guidance provided below.

(c) Inflight MWA Indicators (Including Turbulence). Indicators that the aircraft is being subjected to MWA are:

(1) Altitude excursions and/or airspeed fluctuations with or without associated turbulence.

(2) Pitch and trim changes required to maintain altitude with accompanying airspeed fluctuations.

(3) Light to severe turbulence depending on the magnitude of the MWA.

#### **4. Priority for Controller Application of Merging Target Procedures**

(a) **Explanation of Merging Target Procedures.** As described in subparagraph c3 below, ATC will use “merging target procedures” to mitigate the effects of both severe turbulence and MWA. The procedures in subparagraph c3 have been adapted from existing procedures published in FAA Order JO 7110.65, Air Traffic Control, paragraph 5-1-8, Merging Target Procedures. Paragraph 5-1-8 calls for en route controllers to advise pilots of potential traffic that they perceive may fly directly above or below his/her aircraft at minimum vertical separation. In response, pilots are given the option of requesting a radar vector to ensure their radar target will not merge or overlap with the traffic’s radar target.

(b) The provision of “merging target procedures” to mitigate the effects of severe turbulence and/or MWA is not optional for the controller, but rather is a priority responsibility. Pilot requests for vectors for traffic avoidance when encountering MWA or pilot reports of “Unable RVSM due turbulence or MWA” are considered first priority aircraft separation and sequencing responsibilities.

<b>Mountain Wave Activity (MWA) Encounters – General</b>	
<b>Pilot actions:</b> <ul style="list-style-type: none"> <li>•Contact ATC and report experiencing MWA</li> <li>•If so desired, pilot may request a FL change or re-route</li> <li>•Report location and magnitude of MWA to ATC</li> </ul> <p>See paragraph 4–6–6 for guidance on MWA.</p>	<b>Controller actions:</b> <ul style="list-style-type: none"> <li>•Advise pilot of conflicting traffic at adjacent FL</li> <li>•If pilot requests, vector aircraft to avoid merging target with traffic at adjacent RVSM flight levels, traffic permitting</li> <li>•Issue FL change or re-route, traffic permitting</li> <li>•Issue PIREP to other aircraft</li> </ul> <p>Paragraph 4–6–6 explains “traffic permitting.”</p>
<p><b>NOTE–</b>  <i>MWA encounters do not necessarily result in altitude deviations on the order of 200 feet. The guidance below is intended to address less significant MWA encounters.</i></p>	
<b>Wake Turbulence Encounters</b>	
<b>Pilot should:</b> <ul style="list-style-type: none"> <li>•Contact ATC and request vector, FL change or, if capable, a lateral offset</li> </ul> <p>See paragraph 4–6–7, Guidance on Wake Turbulence.</p>	<b>Controller should:</b> <ul style="list-style-type: none"> <li>•Issue vector, FL change or lateral offset clearance, traffic permitting</li> </ul> <p>Paragraph 4–6–6 explains “traffic permitting.”</p>
<b>“Unable RVSM Due Equipment” Failure of Automatic Altitude Control System, Altitude Alerter or All Primary Altimeters</b>	
<b>Pilot will:</b> <ul style="list-style-type: none"> <li>•Contact ATC and state “Unable RVSM Due Equipment”</li> <li>•Request clearance out of RVSM airspace unless operational situation dictates otherwise</li> </ul>	<b>Controller will:</b> <ul style="list-style-type: none"> <li>•Provide 2,000 feet vertical separation or appropriate horizontal separation</li> <li>•Clear aircraft out of RVSM airspace unless operational situation dictates otherwise</li> </ul>
<b>One Primary Altimeter Remains Operational</b>	
<b>Pilot will:</b> <ul style="list-style-type: none"> <li>•Cross check stand-by altimeter</li> <li>•Notify ATC of operation with single primary altimeter</li> <li>•If unable to confirm primary altimeter accuracy, follow actions for failure of all primary altimeters</li> </ul>	<b>Controller will:</b> <ul style="list-style-type: none"> <li>•Acknowledge operation with single primary altimeter</li> </ul>

Transponder Failure	
<b>Pilot will:</b> <ul style="list-style-type: none"> <li>•Contact ATC and request authority to continue to operate at cleared flight level</li> <li>•Comply with revised ATC clearance, if issued</li> </ul> <b>NOTE–</b> <i>14 CFR Section 91.215 (ATC transponder and altitude reporting equipment and use) regulates operation with the transponder inoperative.</i>	<b>Controller will:</b> <ul style="list-style-type: none"> <li>•Consider request to continue to operate at cleared flight level</li> <li>•Issue revised clearance, if necessary</li> </ul>

#### 4–6–10. Procedures for Accommodation of Non–RVSM Aircraft

##### a. General Policies for Accommodation of Non–RVSM Aircraft

1. The RVSM mandate calls for only RVSM authorized aircraft/operators to fly in designated RVSM airspace with limited exceptions. The policies detailed below are intended exclusively for use by aircraft that the FAA has agreed to accommodate. They are not intended to provide other operators a means to circumvent the normal RVSM approval process.

2. If either the operator or aircraft or both have not been authorized to conduct RVSM operations, the aircraft will be referred to as a “non–RVSM” aircraft. 14 CFR Section 91.180 and Part 91 Appendix G enable the FAA to authorize a deviation to operate a non–RVSM aircraft in RVSM airspace.

3. Non–RVSM aircraft flights will be handled on a workload permitting basis. The vertical separation standard applied between aircraft not approved for RVSM and all other aircraft must be 2,000 feet.

4. **Required Pilot Calls.** The pilot of non–RVSM aircraft will inform the controller of the lack of RVSM approval in accordance with the direction provided in paragraph 4–6–8, Pilot/Controller Phraseology.

##### b. Categories of Non–RVSM Aircraft that may be Accommodated

Subject to FAA approval and clearance, the following categories of non–RVSM aircraft may operate in domestic U.S. RVSM airspace provided they have an operational transponder.

1. Department of Defense (DOD) aircraft.
2. Flights conducted for aircraft certification and development purposes.
3. Active air ambulance flights utilizing a “MEDEVAC” call sign.
4. Aircraft climbing/descending through RVSM flight levels (without intermediate level off) to/from FLs above RVSM airspace (Policies for these flights are detailed in paragraph 4–6–11, Non–RVSM Aircraft Requesting Climb to and Descent from Flight Levels Above RVSM Airspace Without Intermediate Level Off.
5. Foreign State (government) aircraft.

c. Methods for operators of non–RVSM aircraft to request access to RVSM Airspace. Operators may:

1. **LOA/MOU.** Enter into a Letter of Agreement (LOA)/Memorandum of Understanding (MOU) with the RVSM facility (the Air Traffic facility that provides air traffic services in RVSM airspace). Operators must comply with LOA/MOU.



Data Center (FDC) NOTAMs, Pointer NOTAMs, Special Activity Airspace (SAA) NOTAMs, and Military NOTAMs.

**1. NOTAM (D) information** is disseminated for all navigational facilities that are part of the National Airspace System (NAS), all public use airports, seaplane bases, and heliports listed in the Airport/Facility Directory (A/FD). The complete file of all NOTAM (D) information is maintained in a computer database at the Weather Message Switching Center (WMSC), located in Atlanta, Georgia. This category of information is distributed automatically via Service A telecommunications system. Air traffic facilities, primarily FSSs, with Service A capability have access to the entire WMSC database of NOTAMs. These NOTAMs remain available via Service A for the duration of their validity or until published. Once published, the NOTAM data is deleted from the system. NOTAM (D) information includes such data as taxiway closures, personnel and equipment near or crossing runways, and airport lighting aids that do not affect instrument approach criteria, such as VASI.

All NOTAM Ds must have one of the keywords listed in TBL 5-1-1 as the first part of the text after the location identifier.

**2. FDC NOTAMs.** On those occasions when it becomes necessary to disseminate information which is regulatory in nature, the National Flight Data Center (NFDC), in Washington, DC, will issue an FDC NOTAM. FDC NOTAMs contain such things as amendments to published IAPs and other current aeronautical charts. They are also used to advertise temporary flight restrictions caused by such things as natural disasters or large-scale public events that may generate a congestion of air traffic over a site.

**NOTE—**

**1.** *DUATS vendors will provide FDC NOTAMs only upon site-specific requests using a location identifier.*

**2.** *NOTAM data may not always be current due to the changeable nature of national airspace system components, delays inherent in processing information, and occasional temporary outages of the U.S. NOTAM system. While en route, pilots should contact FSSs and obtain updated information for their route of flight and destination.*

**3. Pointer NOTAMs.** NOTAMs issued by a flight service station to highlight or point out another

NOTAM, such as an FDC or NOTAM (D) NOTAM. This type of NOTAM will assist users in cross-referencing important information that may not be found under an airport or NAVAID identifier. Keywords in pointer NOTAMs must match the keywords in the NOTAM that is being pointed out. The keyword in pointer NOTAMs related to Temporary Flight Restrictions (TFR) must be AIRSPACE.

**4. SAA NOTAMs.** These NOTAMs are issued when Special Activity Airspace will be active outside the published schedule times and when required by the published schedule. Pilots and other users are still responsible to check published schedule times for Special Activity Airspace as well as any NOTAMs for that airspace.

**5. Military NOTAMs.** NOTAMs pertaining to U.S. Air Force, Army, Marine, and Navy navigational aids/airports that are part of the NAS.

**c. Notices to Airmen Publication (NTAP).** The NTAP is published by Mission Support Services, ATC Products and Publications, every 28 days. Data of a permanent nature can be published in the NTAP as an interim step between publication cycles of the A/FD and aeronautical charts. The NTAP is divided into four parts:

**1.** Notices in part 1 are provided by ATC Products and Publications. This part contains selected FDC NOTAMs that are expected to be in effect on the effective date of the publication. This part is divided into three sections:

**(a)** Section 1, Airway NOTAMs, reflects airway changes that fall within an ARTCC's airspace.

**(b)** Section 2, Procedural NOTAMs.

**(c)** Section 3, General NOTAMs, contains NOTAMs that are general in nature and not tied to a specific airport/facility (for example, flight advisories and restrictions, open duration special security instructions, and special flight rules area).

**2.** Part 2, provided by NFDC, contains Part 95 Revisions, Revisions to Minimum En Route IFR Altitudes and Changeover Points.

**3.** Part 3, International NOTAMs, is divided into two sections:

(a) Section 1, International Flight Prohibitions, Potential Hostile Situations, and Foreign Notices.

(b) Section 2, International Oceanic Airspace Notices.

4. Part 4, Graphic Notices, compiled by ATC Products and Publications from data provided by FAA service area offices and other lines of business,

contains special notices and graphics pertaining to almost every aspect of aviation such as: military training areas, large scale sporting events, air show information, Special Traffic Management Programs (STMP), and airport-specific information. This part is comprised of 6 sections: General, Special Military Operations, Airport and Facility Notices, Major Sporting and Entertainment Events, Airshows, and Special Notices.

*TBL 5-1-1*  
**NOTAM Keywords**

<b>Keyword</b>	<b>Definition</b>
<b>RWY</b> ..... <i>Example</i>	<b>Runway</b> !BNA BNA RWY 36 CLSD 1309131300-1309132000EST
<b>TWY</b> ..... <i>Example</i>	<b>Taxiway</b> !BTW BTW TWY C EDGE LGT OBSC 1310131300-1310141300EST
<b>APRON</b> ..... <i>Example</i>	<b>Apron/Ramp</b> !BNA BNA APRON NORTH APRON EAST SIDE CLSD 13111221500-1312220700
<b>AD</b> ..... <i>Example</i>	<b>Aerodrome</b> !BET BET AD ELK NEAR MVMT AREAS 1309251300-1309262200EST
<b>OBST</b> ..... <i>Example</i>	<b>Obstruction</b> !SJT SJT OBST MOORED BALLOON WITHIN AREA DEFINED AS 1NM RADIUS OF SJT 2430FT (510FT AGL) FLAGGED 1309251400-1309261400EST
<b>NAV</b> ..... <i>Example</i>	<b>Navigation Aids</b> !SHV SHV NAV ILS RWY 32 110.3 COMMISSIONED 1311251600-PERM
<b>COM</b> ..... <i>Example</i>	<b>Communications</b> !INW INW COM REMOTE COM OUTLET 122.6 OUT OF SERVICE 1307121330-1307151930EST
<b>SVC</b> ..... <i>Example</i>	<b>Services</b> !ROA ROA SVC TWR COMMISSIONED 1301050001-PERM
<b>AIRSPACE</b> .. <i>Example</i>	<b>Airspace</b> !MIV MIV AIRSPACE AIRSHOW ACFT WITHIN AREA DEFINED AS 5NM RADIUS OF MIV SFC-10000FT AVOIDANCE ADVISED 1308122100-1308122300
<b>OPD</b> ..... <i>Example</i>	<b>Obstacle Departure Procedure</b> !FDC 2/9700 DIK ODP DICKINSON - THEODORE ROOSEVELT RGNL, DICKINSON, ND. TAKEOFF MINIMUMS AND (OBSTACLE) DEPARTURE PROCEDURES AMDT 1... DEPARTURE PROCEDURE: RWY 25, CLIMB HEADING 250 TO 3500 BEFORE TURNING LEFT. ALL OTHER DATA REMAINS AS PUBLISHED. THIS IS TAKEOFF MINIMUMS AND (OBSTACLE) DEPARTURE PROCEDURES, AMDT 1A. 1305011200-PERM
<b>SID</b> ..... <i>Example</i>	<b>Standard Instrument Departure</b> !FDC x/xxxx DFW SID DALLAS/FORT WORTH INTL, DALLAS, TX. PODDE THREE DEPARTURE... CHANGE NOTES TO READ: RWYS 17C/R, 18L/R: DO NOT EXCEED 240KT UNTIL LARRN. RWYS 35L/C, 36L/R: DONOT EXCEED 240KT UNTIL KMART 1305011200-1312111200EST
<b>STAR</b> ..... <i>Example</i>	<b>Standard Terminal Arrival</b> !FDC x/xxxx DCA STAR RONALD REAGAN WASHINGTON NATIONAL, WASHINGTON, DC. WZRRD TWO ARRIVAL... SHAAR TRANSITION: ROUTE FROM DRUZZ INT TO WZRRD INT NOT AUTHORIZED. AFTER DRUZZ INT EXPECT RADAR VECTORS TO AML VORTAC 1305011200-1312111200ES

Keyword	Definition
<b>CHART</b> ..... <i>Example</i>	<b>Chart</b> !FDC 2/9997 DAL IAP DALLAS LOVE FIELD, DALLAS, TX. ILS OR LOC RWY 31R, AMDT 5... CHART NOTE: SIMULTANEOUS APPROACH AUTHORIZED WITH RWY 31L. MISSED APPROACH: CLIMB TO 1000 THEN CLIMBING RIGHT TURN TO 5000 ON HEADING 330 AND CVE R-046 TO FINGR INT/CVE 36.4 DME AND HOLD. CHART LOC RWY 31L. THIS IS ILS OR LOC RWY 31R, AMDT 5A. 1305011200-PERM
<b>DATA</b> ..... <i>Example</i>	<b>Data</b> !FDC 2/9700 DIK ODP DICKINSON - THEODORE ROOSEVELT RGNL, DICKINSON, ND. TAKEOFF MINIMUMS AND (OBSTACLE) DEPARTURE PROCEDURES AMDT 1... DEPARTURE PROCEDURE: RWY 25, CLIMB HEADING 250 TO 3500 BEFORE TURNING LEFT. ALL OTHER DATA REMAINS AS PUBLISHED. THIS IS TAKEOFF MINIMUMS AND (OBSTACLE) DEPARTURE PROCEDURES, AMDT 1A. 1305011200-PERM
<b>IAP</b> ..... <i>Example</i>	<b>Instrument Approach Procedure</b> !FDC 2/9997 DAL IAP DALLAS LOVE FIELD, DALLAS, TX. ILS OR LOC RWY 31R, AMDT 5... CHART NOTE: SIMULTANEOUS APPROACH AUTHORIZED WITH RWY 31L. MISSED APPROACH: CLIMB TO 1000 THEN CLIMBING RIGHT TURN TO 5000 ON HEADING 330 AND CVE R-046 TO FINGR INT/CVE 36.4 DME AND HOLD. CHART LOC RWY 31L. THIS IS ILS OR LOC RWY 31R, AMDT 5A. 1305011200-PERM
<b>VFP</b> ..... <i>Example</i>	<b>Visual Flight Procedures</b> !FDC X/XXXX JFK VFP JOHN F KENNEDY INTL, NEW YORK, NY. PARKWAY VISUAL RWY 13L/R, ORIG...WEATHER MINIMUMS 3000 FOOT CEILING AND 3 MILES VISIBILITY. 1303011200-1308011400EST
<b>ROUTE</b> ..... <i>Example</i>	<b>Route</b> !FDC x/xxxx ZFW OK..ROUTE ZFW ZKC. V140 SAYRE (SYO) VORTAC, OK TO TULSA (TUL) VORTAC, OK MEA 4300. 1305041000-1306302359EST
<b>SPECIAL</b> .... <i>Example</i>	<b>Special</b> !FDC x/xxxx PAJN SPECIAL JUNEAU INTERNATIONAL, JUNEAU, AK. LDA-2 RWY 8 AMDT 9 PROCEDURE TURN NA. 1305011200-1312111200EST
<b>SECURITY</b> .. <i>Example</i>	<b>Security</b> !FDC ZZZ SECURITY..SPECIAL NOTICE..THIS NOTICE IS TO EMPHASIZE THAT BEFORE OPERATING IN OR ADJACENT TO IRANIAN AIRSPACE ALL U.S. AIRMEN AND OPERATORS SHOULD BE FAMILIAR WITH CURRENT CONDITIONS IN THE MIDDLE EAST. THE U.S. DEPARTMENT OF STATE HAS ISSUED A TRAVEL WARNING FOR IRAN ADVISING, IN PART, THAT THE U.S. GOVERNMENT DOES NOT CURRENTLY MAINTAIN DIPLOMATIC OR CONSULAR RELATIONS WITH THE ISLAMIC REPUBLIC OF IRAN. ANY U.S. OPERATOR PLANNING A FLIGHT THROUGH IRANIAN AIRSPACE SHOULD PLAN IN ADVANCE AND HAVE ALL CURRENT NOTAMS AND AERONAUTICAL INFORMATION FOR ANY PLANNED FLIGHT 1311011200-1403301800EST
<b>U</b> .....	Unverified Aeronautical Information (for use only where authorized by Letter of Agreement)*
<b>O</b> .....	Other Aeronautical Information**

**NOTE—**

1. \* **Unverified Aeronautical Information** can be movement area or other information received that meets NOTAM criteria and has not been confirmed by the Airport Manager (AMGR) or their designee. If Flight Service is unable to contact airport management, Flight Service must forward (U) NOTAM information to the United States NOTAM System (USNS). Subsequent to USNS distribution of a (U) NOTAM, Flight Service will inform airport management of the action taken as soon as practical. Any such NOTAM will be prefaced with “(U)” as the keyword and followed by the appropriate keyword contraction, following the location identifier.

2. \*\* **Other Aeronautical Information** is that which is received from any authorized source that may be beneficial to aircraft operations and does not meet defined NOTAM criteria. Any such NOTAM will be prefaced with “(O)” as the keyword following the location identifier.

*TBL 5-1-2***Contractions Commonly Found in NOTAMS**

	<b>A</b>
ABN .....	Aerodrome Beacon
ABV .....	Above
ACFT .....	Aircraft
ACT .....	Active
ADJ .....	Adjacent
AGL .....	Above Ground Level
ALS .....	Approach Light System
ALT .....	Altitude
ALTN/ALTNLY .	Alternate/Alternately
AMDT .....	Amendment
APCH .....	Approach
ARFF .....	Aircraft Rescue & Fire Fighting
ASDA .....	Accelerate Stop Distance Available
ASOS .....	Automated Surface Observing System
ASPH .....	Asphalt
ATC .....	Air Traffic Control
ATIS .....	Automated Terminal Information Service
AVBL .....	Available
AWOS .....	Automatic Weather Observing System
AWSS .....	Automated Weather Sensor System
AZM .....	Azimuth
	<b>B</b>
BTN .....	Between
	<b>C</b>
CAT .....	Category
CH .....	Channel
CL .....	Centerline
CLSD .....	Closed
COM .....	Communication
CONC .....	Concrete
CONT .....	Continue/Continuously
CTL .....	Control
	<b>D</b>
DCT .....	Direct
DEP .....	Depart/Departure
DH .....	Decision Height
DLA/DLAD ....	Delay/Delayed
DME .....	Distance Measuring Equipment
DWPNT .....	Dew Point Temperature
	<b>E</b>
E .....	East
EB .....	Eastbound
ELEV .....	Elevate/Elevation
ENG .....	Engine
EST .....	Estimated
EXC .....	Except
	<b>F</b>
FAC .....	Facility
FAF .....	Final Approach Fix
FDC .....	Flight Data Center
FICON .....	Field Condition
FREQ .....	Frequency

FSS .....	Flight Service Station
FT .....	Feet
	<b>G</b>
GCA .....	Ground Controlled Approach
GP .....	Glide Path
GPS .....	Global Positioning System
GRVL .....	Gravel
	<b>H</b>
HEL .....	Helicopter
HIRL .....	High Intensity Runway Lights
HR .....	Hour
	<b>I</b>
ID .....	Identify/Identifier
IFR .....	Instrument Flight Rules
ILS .....	Instrument Landing System
IM .....	Inner Marker
IN .....	Inch/Inches
INOP .....	Inoperative
INST .....	Instrument
INT .....	Intersection
INTST .....	Intensity
	<b>L</b>
L .....	Left
LB .....	Pound/Pounds
LDA .....	Landing Distance Available
LDG .....	Landing
LGT/LGTD ....	Light/Lighted
LIRL .....	Low Intensity Runway Edge Lights
LNDG .....	Landing
LOC .....	Localizer
	<b>M</b>
MALS .....	Medium Intensity Approach Lighting System
MALSF .....	Medium Intensity Approach Lighting System with Sequenced Flashers
MALSR .....	Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights
MCA .....	Minimum Crossing Altitude
MDA .....	Minimum Descent Altitude
MEA .....	Minimum En Route Altitude
MIRL .....	Medium Intensity Runway Edge Lights
MKR .....	Marker
MM .....	Middle Marker
MNM .....	Minimum
MOA .....	Military Operations Area
MOCA .....	Minimum Obstruction Clearance Altitude
MSG .....	Message
MSL .....	Mean Sea Level
MU .....	Designate a Friction Value Representing Runway Surface Conditions
	<b>N</b>
N .....	North
NDB .....	Nondirectional Radio Beacon
NE .....	Northeast
NM .....	Nautical Mile/s

NTAP .....	Notice To Airmen Publication
NW .....	Northwest
<b>O</b>	
OBSC .....	Obscured
OM .....	Outer Marker
OPR .....	Operate
ORIG .....	Original
<b>P</b>	
PAPI .....	Precision Approach Path Indicator
PARL .....	Parallel
PAX .....	Passenger/s
PCL .....	Pilot Controlled Lighting
PERM .....	Permanent
PJE .....	Parachute Jumping Activities
PLA .....	Practice Low Approach
PN .....	Prior Notice Required
PPR .....	Prior Permission Required
PT .....	Procedure Turn
<b>R</b>	
RAI .....	Runway Alignment Indicator
RCL .....	Runway Centerline
RCLL .....	Runway Centerline Light
REC .....	Receive/Receiver
RLLS .....	Runway Lead-in Light System
RNAV .....	Area Navigation
RVR .....	Runway Visual Range
RVRM .....	RVR Midpoint
RVRR .....	RVR Rollout
RVRT .....	RVR Touchdown
RWY .....	Runway
<b>S</b>	
S .....	South
SAA .....	Special Activity Airspace
SE .....	Southeast
SFC .....	Surface
SKED .....	Scheduled
SN .....	Snow
SR .....	Sunrise
SS .....	Sunset
SSALF .....	Simplified Short Approach Lighting System with Sequenced Flashers
SSALR .....	Simplified Short Approach Lighting System with Runway Alignment Indicator Lights
SSALS .....	Simplified Short Approach Lighting System
STAR .....	Standard Terminal Arrival
STD .....	Standard
SW .....	Southwest
<b>T</b>	
TACAN .....	Tactical Air Navigational Aid
TDZ .....	Touchdown Zone
TEMPO .....	Temporary
TFC .....	Traffic
TFR .....	Temporary Flight Restriction
TGL .....	Touch and Go Landings

THR .....	Threshold
TKOF .....	Takeoff
TODA .....	Take-off Distance Available
TORA .....	Take-off Run Available
TWR .....	Aerodrome Control Tower
TWY .....	Taxiway
<b>U</b>	
UNL .....	Unlimited
UNREL .....	Unreliable
<b>V</b>	
VASI .....	Visual Approach Slope Indicator
VFR .....	Visual Flight Rules
VHF .....	Very High Frequency
VIS .....	Visibility
VMC .....	Visual Meteorological Conditions
VOLMET .....	Meteorological Information for Aircraft in Flight
VOR .....	VHF Omni-Directional Radio Range
VORTAC .....	VOR and TACAN (collocated)
VOT .....	VOR Test Facility
<b>W</b>	
W .....	West
WAAS .....	Wide Area Augmentation System
WDI .....	Wind Direction Indicator
WPT .....	Waypoint
WX .....	Weather

#### 5-1-4. Flight Plan – VFR Flights

a. Except for operations in or penetrating a Coastal or Domestic ADIZ or DEWIZ a flight plan is not required for VFR flight.

##### REFERENCE–

AIM, National Security, Paragraph 5-6-1

b. It is strongly recommended that a flight plan (for a VFR flight) be filed with an FAA FSS. This will ensure that you receive VFR Search and Rescue Protection.

##### REFERENCE–

AIM, Search and Rescue, Paragraph 6-2-6 gives the proper method of filing a VFR flight plan.

c. To obtain maximum benefits from the flight plan program, flight plans should be filed directly with the nearest FSS. For your convenience, FSSs provide aeronautical and meteorological briefings while accepting flight plans. Radio may be used to file if no other means are available.

##### NOTE–

Some states operate aeronautical communications facilities which will accept and forward flight plans to the FSS for further handling.

d. When a “stopover” flight is anticipated, it is recommended that a separate flight plan be filed for

each “leg” when the stop is expected to be more than 1 hour duration.

**e.** Pilots are encouraged to give their departure times directly to the FSS serving the departure airport or as otherwise indicated by the FSS when the flight plan is filed. This will ensure more efficient flight plan service and permit the FSS to advise you of significant changes in aeronautical facilities or meteorological conditions. When a VFR flight plan is filed, it will be held by the FSS until 1 hour after the proposed departure time unless:

- 1.** The actual departure time is received.
- 2.** A revised proposed departure time is received.
- 3.** At a time of filing, the FSS is informed that the proposed departure time will be met, but actual time cannot be given because of inadequate communications (assumed departures).

**f.** On pilot’s request, at a location having an active tower, the aircraft identification will be forwarded by the tower to the FSS for reporting the actual departure time. This procedure should be avoided at busy airports.

**g.** Although position reports are not required for VFR flight plans, periodic reports to FAA FSSs along

the route are good practice. Such contacts permit significant information to be passed to the transiting aircraft and also serve to check the progress of the flight should it be necessary for any reason to locate the aircraft.

**EXAMPLE–**

- 1.** *Bonanza 314K, over Kingfisher at (time), VFR flight plan, Tulsa to Amarillo.*
- 2.** *Cherokee 5133J, over Oklahoma City at (time), Shreveport to Denver, no flight plan.*

**h.** Pilots not operating on an IFR flight plan and when in level cruising flight, are cautioned to conform with VFR cruising altitudes appropriate to the direction of flight.

**i.** When filing VFR flight plans, indicate aircraft equipment capabilities by appending the appropriate suffix to aircraft type in the same manner as that prescribed for IFR flight.

**REFERENCE–**

*AIM, Flight Plan– Domestic IFR Flights, Paragraph 5–1–8*

**j.** Under some circumstances, ATC computer tapes can be useful in constructing the radar history of a downed or crashed aircraft. In each case, knowledge of the aircraft’s transponder equipment is necessary in determining whether or not such computer tapes might prove effective.

**FIG 5-1-1**  
**FAA Flight Plan**  
**Form 7233-1 (8-82)**

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION <b>FLIGHT PLAN</b>		(FAA USE ONLY) <input type="checkbox"/> PILOT BRIEFING <input type="checkbox"/> VNR <input type="checkbox"/> STOPOVER			TIME STARTED		SPECIALIST INITIALS	
1. TYPE	2. AIRCRAFT IDENTIFICATION	3. AIRCRAFT TYPE/SPECIAL EQUIPMENT	4. TRUE AIRSPEED	5. DEPARTURE POINT	6. DEPARTURE TIME		7. CRUISING ALTITUDE	
<input type="checkbox"/> VFR <input type="checkbox"/> IFR <input type="checkbox"/> DVFR			KTS		PROPOSED (Z)	ACTUAL (Z)		
<b>8. ROUTE OF FLIGHT</b>								
9. DESTINATION (Name of airport and city)			10. EST. TIME ENROUTE HOURS    MINUTES		11. REMARKS			
12. FUEL ON BOARD		13. ALTERNATE AIRPORT(S)		14. PILOT'S NAME, ADDRESS & TELEPHONE NUMBER & AIRCRAFT HOME BASE			15. NUMBER ABOARD	
HOURS	MINUTES			17. DESTINATION CONTACT/TELEPHONE (OPTIONAL)				
16. COLOR OF AIRCRAFT			CIVIL AIRCRAFT PILOTS, FAR 91 requires you file an IFR flight plan to operate under instrument flight rules in controlled airspace. Failure to file could result in a civil penalty not to exceed \$1,000 for each violation (Section 901 of the Federal Aviation Act of 1958, as amended). Filing of a VFR flight plan is recommended as a good operating practice. See also Part 99 for requirements concerning DVFR flight plans.					

FAA Form 7233-1 (8-82)      CLOSE VFR FLIGHT PLAN WITH \_\_\_\_\_ FSS ON ARRIVAL

k. Flight Plan Form – (See FIG 5-1-1).

**1. Explanation of VFR Flight Plan Items.**

**1. Block 1.** Check the type flight plan. Check both the VFR and IFR blocks if composite VFR/IFR.

**2. Block 2.** Enter your complete aircraft identification including the prefix “N” if applicable.

**3. Block 3.** Enter the designator for the aircraft, or if unknown, consult an FSS briefer.

**4. Block 4.** Enter your true airspeed (TAS).

**5. Block 5.** Enter the departure airport identifier code, or if unknown, the name of the airport.

**6. Block 6.** Enter the proposed departure time in Coordinated Universal Time (UTC) (Z). If airborne, specify the actual or proposed departure time as appropriate.

**7. Block 7.** Enter the appropriate VFR altitude (to assist the briefer in providing weather and wind information).

**8. Block 8.** Define the route of flight by using NAVAID identifier codes and airways.

**9. Block 9.** Enter the destination airport identifier code, or if unknown, the airport name.

**NOTE–**

*Include the city name (or even the state name) if needed for clarity.*

**10. Block 10.** Enter your estimated time en route in hours and minutes.

**11. Block 11.** Enter only those remarks that may aid in VFR search and rescue, such as planned stops en route or student cross country, or remarks pertinent to the clarification of other flight plan information, such as the radiotelephony (call sign) associated with a designator filed in Block 2, if the radiotelephony is new, has changed within the last 60 days, or is a special FAA-assigned temporary

radiotelephony. Items of a personal nature are not accepted.

**12. Block 12.** Specify the fuel on board in hours and minutes.

**13. Block 13.** Specify an alternate airport if desired.

**14. Block 14.** Enter your complete name, address, and telephone number. Enter sufficient information to identify home base, airport, or operator.

**NOTE—**

*This information is essential in the event of search and rescue operations.*

**15. Block 15.** Enter total number of persons on board (POB) including crew.

**16. Block 16.** Enter the predominant colors.

**17. Block 17.** Record the FSS name for closing the flight plan. If the flight plan is closed with a different FSS or facility, state the recorded FSS name that would normally have closed your flight plan.

**NOTE—**

**1. Optional—** record a destination telephone number to assist search and rescue contact should you fail to report or cancel your flight plan within 1/2 hour after your estimated time of arrival (ETA).

**2.** The information transmitted to the destination FSS will consist only of flight plan blocks 2, 3, 9, and 10. Estimated time en route (ETE) will be converted to the correct ETA.

## 5-1-5. Operational Information System (OIS)

**a.** The FAA's Air Traffic Control System Command Center (ATCSCC) maintains a web site with near real-time National Airspace System (NAS) status information. NAS operators are encouraged to access the web site at <http://www.fly.faa.gov> prior to filing their flight plan.

**b.** The web site consolidates information from advisories. An advisory is a message that is disseminated electronically by the ATCSCC that contains information pertinent to the NAS.

**1.** Advisories are normally issued for the following items:

(a) Ground Stops.

(b) Ground Delay Programs.

(c) Route Information.

(d) Plan of Operations.

(e) Facility Outages and Scheduled Facility Outages.

(f) Volcanic Ash Activity Bulletins.

(g) Special Traffic Management Programs.

**2.** This list is not all-inclusive. Any time there is information that may be beneficial to a large number of people, an advisory may be sent. Additionally, there may be times when an advisory is not sent due to workload or the short length of time of the activity.

**3.** Route information is available on the web site and in specific advisories. Some route information, subject to the 56-day publishing cycle, is located on the "OIS" under "Products," Route Management Tool (RMT), and "What's New" Playbook. The RMT and Playbook contain routings for use by Air Traffic and NAS operators when they are coordinated "real-time" and are then published in an ATCSCC advisory.

**4.** Route advisories are identified by the word "Route" in the header; the associated action is required (RQD), recommended (RMD), planned (PLN), or for your information (FYI). Operators are expected to file flight plans consistent with the Route RQD advisories.

**5.** Electronic System Impact Reports are on the intranet at <http://www.atcsc.faa.gov/ois/> under "System Impact Reports." This page lists scheduled outages/events/projects that significantly impact the NAS; for example, runway closures, air shows, and construction projects. Information includes anticipated delays and traffic management initiatives (TMI) that may be implemented.

## 5-1-6. Flight Plan— Defense VFR (DVFR) Flights

VFR flights (except DOD or law enforcement flights) into a Coastal or Domestic ADIZ/DEWIZ are required to file DVFR flight plans for security purposes. Detailed ADIZ procedures are found in Section 6, National Security and Interception Procedures, of this chapter. (See 14 CFR Part 99.)



### 5-1-7. Composite Flight Plan (VFR/IFR Flights)

a. Flight plans which specify VFR operation for one portion of a flight, and IFR for another portion, will be accepted by the FSS at the point of departure. If VFR flight is conducted for the first portion of the flight, pilots should report their departure time to the FSS with whom the VFR/IFR flight plan was filed; and, subsequently, close the VFR portion and request ATC clearance from the FSS nearest the point at which change from VFR to IFR is proposed. Regardless of the type facility you are communicating with (FSS, center, or tower), it is the pilot's responsibility to request that facility to "CLOSE VFR FLIGHT PLAN." The pilot must remain in VFR weather conditions until operating in accordance with the IFR clearance.

b. When a flight plan indicates IFR for the first portion of flight and VFR for the latter portion, the pilot will normally be cleared to the point at which the change is proposed. After reporting over the clearance limit and not desiring further IFR clearance, the pilot should advise ATC to cancel the IFR portion of the flight plan. Then, the pilot should contact the nearest FSS to activate the VFR portion of the flight plan. If the pilot desires to continue the IFR flight plan beyond the clearance limit, the pilot should contact ATC at least 5 minutes prior to the clearance limit and request further IFR clearance. If the requested clearance is not received prior to reaching the clearance limit fix, the pilot will be expected to enter into a standard holding pattern on the radial or course to the fix unless a holding pattern for the clearance limit fix is depicted on a U.S. Government or commercially produced (meeting FAA requirements) low or high altitude enroute, area or STAR chart. In this case the pilot will hold according to the depicted pattern.

### 5-1-8. Flight Plan (FAA Form 7233-1)– Domestic IFR Flights

#### NOTE–

1. Procedures outlined in this section apply to operators filing FAA Form 7233-1 (Flight Plan) and to flights that will be conducted entirely within U.S. domestic airspace.

2. Filers utilizing FAA Form 7233-1 may not be eligible for assignment of RNAV SIDs and STARs. Filers desiring assignment of these procedures should file using FAA Form

7233-4 (International Flight Plan), as described in paragraph 5-1-9.

#### a. General

1. Prior to departure from within, or prior to entering controlled airspace, a pilot must submit a complete flight plan and receive an air traffic clearance, if weather conditions are below VFR minimums. Instrument flight plans may be submitted to the nearest FSS or ATCT either in person or by telephone (or by radio if no other means are available). Pilots should file IFR flight plans at least 30 minutes prior to estimated time of departure to preclude possible delay in receiving a departure clearance from ATC. In order to provide FAA traffic management units strategic route planning capabilities, nonscheduled operators conducting IFR operations above FL 230 are requested to voluntarily file IFR flight plans at least 4 hours prior to estimated time of departure (ETD). To minimize your delay in entering Class B, Class C, Class D, and Class E surface areas at destination when IFR weather conditions exist or are forecast at that airport, an IFR flight plan should be filed before departure. Otherwise, a 30 minute delay is not unusual in receiving an ATC clearance because of time spent in processing flight plan data. Traffic saturation frequently prevents control personnel from accepting flight plans by radio. In such cases, the pilot is advised to contact the nearest FSS for the purpose of filing the flight plan.

#### NOTE–

1. There are several methods of obtaining IFR clearances at nontower, non-FSS, and outlying airports. The procedure may vary due to geographical features, weather conditions, and the complexity of the ATC system. To determine the most effective means of receiving an IFR clearance, pilots should ask the nearest FSS the most appropriate means of obtaining the IFR clearance.

2. When requesting an IFR clearance, it is highly recommended that the departure airport be identified by stating the city name and state and/or the airport location identifier in order to clarify to ATC the exact location of the intended airport of departure.

2. When filing an IFR flight plan, include as a prefix to the aircraft type, the number of aircraft when more than one and/or heavy aircraft indicator "H/" if appropriate.

#### EXAMPLE–

H/DC10/A  
2/F15/A

**3.** When filing an IFR flight plan, identify the equipment capability by adding a suffix, preceded by a slant, to the AIRCRAFT TYPE, as shown in TBL 5-1-3, Aircraft Suffixes.

**NOTE-**

**1.** *ATC issues clearances based on filed suffixes. Pilots should determine the appropriate suffix based upon desired services and/or routing. For example, if a desired route/procedure requires GPS, a pilot should file /G even if the aircraft also qualifies for other suffixes.*

**2.** *For procedures requiring GPS, if the navigation system does not automatically alert the flight crew of a loss of GPS, the operator must develop procedures to verify correct GPS operation.*

**3.** *The suffix is not to be added to the aircraft identification or be transmitted by radio as part of the aircraft*

*identification.*

**4.** It is recommended that pilots file the maximum transponder or navigation capability of their aircraft in the equipment suffix. This will provide ATC with the necessary information to utilize all facets of navigational equipment and transponder capabilities available.

**5.** When filing an IFR flight plan via telephone or radio, it is highly recommended that the departure airport be clearly identified by stating the city name and state and/or airport location identifier. With cell phone use and flight service specialists covering larger areas of the country, clearly identifying the departure airport can prevent confusing your airport of departure with those of identical or similar names in other states.

**TBL 5-1-3**  
**Aircraft Suffixes**

<b>Suffix</b>	<b>Equipment Capability</b>
	<b>NO DME</b>
/X	No transponder
/T	Transponder with no Mode C
/U	Transponder with Mode C
	<b>DME</b>
/D	No transponder
/B	Transponder with no Mode C
/A	Transponder with Mode C
	<b>TACAN ONLY</b>
/M	No transponder
/N	Transponder with no Mode C
/P	Transponder with Mode C
	<b>AREA NAVIGATION (RNAV)</b>
/Y	VOR/DME, or INS with no transponder
/C	VOR/DME, or INS, transponder with no Mode C
/I	VOR/DME, or INS, transponder with Mode C
	<b>ADVANCED RNAV WITH TRANSPONDER AND MODE C</b> (If an aircraft is unable to operate with a transponder and/or Mode C, it will revert to the appropriate code listed above under Area Navigation.)
/E	Flight Management System (FMS) with DME/DME and IRU position updating
/F	FMS with DME/DME position updating
/G	Global Navigation Satellite System (GNSS), including GPS or Wide Area Augmentation System (WAAS), with en route and terminal capability.
/R	Required Navigational Performance (RNP). The aircraft meets the RNP type prescribed for the route segment(s), route(s) and/or area concerned.
	<b>REDUCED VERTICAL SEPARATION MINIMUM (RVSM).</b> Prior to conducting RVSM operations within the U.S., the operator must obtain authorization from the FAA or from the responsible authority, as appropriate.
/J	/E with RVSM
/K	/F with RVSM
/L	/G with RVSM
/Q	/R with RVSM
/W	RVSM

## **b. Airways and Jet Routes Depiction on Flight Plan**

1. It is vitally important that the route of flight be accurately and completely described in the flight plan. To simplify definition of the proposed route, and to facilitate ATC, pilots are requested to file via airways or jet routes established for use at the altitude or flight level planned.

2. If flight is to be conducted via designated airways or jet routes, describe the route by indicating the type and number designators of the airway(s) or jet route(s) requested. If more than one airway or jet route is to be used, clearly indicate points of transition. If the transition is made at an unnamed intersection, show the next succeeding NAVAID or named intersection on the intended route and the complete route from that point. Reporting points may be identified by using authorized name/code as depicted on appropriate aeronautical charts. The following two examples illustrate the need to specify the transition point when two routes share more than one transition fix.

### **EXAMPLE–**

#### **1. ALB J37 BUMPY J14 BHM**

*Spelled out: from Albany, New York, via Jet Route 37 transitioning to Jet Route 14 at BUMPY intersection, thence via Jet Route 14 to Birmingham, Alabama.*

#### **2. ALB J37 ENO J14 BHM**

*Spelled out: from Albany, New York, via Jet Route 37 transitioning to Jet Route 14 at Smyrna VORTAC (ENO) thence via Jet Route 14 to Birmingham, Alabama.*

3. The route of flight may also be described by naming the reporting points or NAVAIDs over which the flight will pass, provided the points named are established for use at the altitude or flight level planned.

### **EXAMPLE–**

#### **BWI V44 SWANN V433 DQO**

*Spelled out: from Baltimore-Washington International, via Victor 44 to Swann intersection, transitioning to Victor 433 at Swann, thence via Victor 433 to Dupont.*

4. When the route of flight is defined by named reporting points, whether alone or in combination with airways or jet routes, and the navigational aids (VOR, VORTAC, TACAN, NDB) to be used for the flight are a combination of different types of aids, enough information should be included to clearly indicate the route requested.

### **EXAMPLE–**

*LAX J5 LKV J3 GEG YXC FL 330 J500 VLR J515 YWG  
Spelled out: from Los Angeles International via Jet Route 5 Lakeview, Jet Route 3 Spokane, direct Cranbrook, British Columbia VOR/DME, Flight Level 330 Jet Route 500 to Langruth, Manitoba VORTAC, Jet Route 515 to Winnipeg, Manitoba.*

5. When filing IFR, it is to the pilot's advantage to file a preferred route.

### **REFERENCE–**

*Preferred IFR Routes are described and tabulated in the Airport/Facility Directory.*

6. ATC may issue a SID or a STAR, as appropriate.

### **REFERENCE–**

*AIM, Instrument Departure Procedures (DP) – Obstacle Departure Procedures (ODP) and Standard Instrument Departures (SID), Paragraph 5–2–8*

*AIM, Standard Terminal Arrival (STAR), Area Navigation (RNAV) STAR, and Flight Management System Procedures (FMSP) for Arrivals, Paragraph 5–4–1*

### **NOTE–**

*Pilots not desiring a SID or STAR should so indicate in the remarks section of the flight plan as “no SID” or “no STAR.”*

## **c. Direct Flights**

1. All or any portions of the route which will not be flown on the radials or courses of established airways or routes, such as direct route flights, must be defined by indicating the radio fixes over which the flight will pass. Fixes selected to define the route must be those over which the position of the aircraft can be accurately determined. Such fixes automatically become compulsory reporting points for the flight, unless advised otherwise by ATC. Only those navigational aids established for use in a particular structure; i.e., in the low or high structures, may be used to define the en route phase of a direct flight within that altitude structure.

2. The azimuth feature of VOR aids and that azimuth and distance (DME) features of VORTAC and TACAN aids are assigned certain frequency protected areas of airspace which are intended for application to established airway and route use, and to provide guidance for planning flights outside of established airways or routes. These areas of airspace are expressed in terms of cylindrical service volumes of specified dimensions called “class limits” or “categories.”

### **REFERENCE–**

*AIM, Navigational Aid (NAVAID) Service Volumes, Paragraph 1–1–8*

3. An operational service volume has been established for each class in which adequate signal

coverage and frequency protection can be assured. To facilitate use of VOR, VORTAC, or TACAN aids, consistent with their operational service volume limits, pilot use of such aids for defining a direct route of flight in controlled airspace should not exceed the following:

(a) Operations above FL 450 – Use aids not more than 200 NM apart. These aids are depicted on enroute high altitude charts.

(b) Operation off established routes from 18,000 feet MSL to FL 450 – Use aids not more than 260 NM apart. These aids are depicted on enroute high altitude charts.

(c) Operation off established airways below 18,000 feet MSL – Use aids not more than 80 NM apart. These aids are depicted on enroute low altitude charts.

(d) Operation off established airways between 14,500 feet MSL and 17,999 feet MSL in the conterminous U.S. – (H) facilities not more than 200 NM apart may be used.

4. Increasing use of self-contained airborne navigational systems which do not rely on the VOR/VORTAC/TACAN system has resulted in pilot requests for direct routes which exceed NAVAID service volume limits. These direct route requests will be approved only in a radar environment, with approval based on pilot responsibility for navigation on the authorized direct route. Radar flight following will be provided by ATC for ATC purposes.

5. At times, ATC will initiate a direct route in a radar environment which exceeds NAVAID service volume limits. In such cases ATC will provide radar monitoring and navigational assistance as necessary.

6. Airway or jet route numbers, appropriate to the stratum in which operation will be conducted, may also be included to describe portions of the route to be flown.

#### **EXAMPLE–**

*MDW V262 BDF V10 BRL STJ SLN GCK*

*Spelled out: from Chicago Midway Airport via Victor 262 to Bradford, Victor 10 to Burlington, Iowa, direct St. Joseph, Missouri, direct Salina, Kansas, direct Garden City, Kansas.*

#### **NOTE–**

*When route of flight is described by radio fixes, the pilot*

*will be expected to fly a direct course between the points named.*

7. Pilots are reminded that they are responsible for adhering to obstruction clearance requirements on those segments of direct routes that are outside of controlled airspace. The MEAs and other altitudes shown on low altitude IFR enroute charts pertain to those route segments within controlled airspace, and those altitudes may not meet obstruction clearance criteria when operating off those routes.

#### **d. Area Navigation (RNAV)**

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

2. Pilots of aircraft equipped with approved area navigation equipment may file for RNAV routes throughout the National Airspace System and may be filed for in accordance with the following procedures.

(a) File airport-to-airport flight plans.

(b) File the appropriate RNAV capability certification suffix in the flight plan.

(c) Plan the random route portion of the flight plan to begin and end over appropriate arrival and departure transition fixes or appropriate navigation aids for the altitude stratum within which the flight will be conducted. The use of normal preferred departure and arrival routes (DP/STAR), where established, is recommended.

(d) File route structure transitions to and from the random route portion of the flight.

(e) Define the random route by waypoints. File route description waypoints by using degree-distance fixes based on navigational aids which are appropriate for the altitude stratum.

(f) File a minimum of one route description waypoint for each ARTCC through whose area the random route will be flown. These waypoints must be located within 200 NM of the preceding center's boundary.

(g) File an additional route description waypoint for each turnpoint in the route.

(h) Plan additional route description waypoints as required to ensure accurate navigation via the filed route of flight. Navigation is the pilot's responsibility unless ATC assistance is requested.

(i) Plan the route of flight so as to avoid prohibited and restricted airspace by 3 NM unless permission has been obtained to operate in that airspace and the appropriate ATC facilities are advised.

**NOTE—**

*To be approved for use in the National Airspace System, RNAV equipment must meet the appropriate system availability, accuracy, and airworthiness standards. For additional guidance on equipment requirements see AC 20–130, Airworthiness Approval of Vertical Navigation (VNAV) Systems for use in the U.S. NAS and Alaska, or AC 20–138, Airworthiness Approval of Global Positioning System (GPS) Navigation Equipment for Use as a VFR and IFR Supplemental Navigation System. For airborne navigation database, see AC 90–94, Guidelines for Using GPS Equipment for IFR En Route and Terminal Operations and for Nonprecision Instrument Approaches in the U.S. National Airspace System, Section 2.*

**3.** Pilots of aircraft equipped with latitude/longitude coordinate navigation capability, independent of VOR/TACAN references, may file for random RNAV routes at and above FL 390 within the conterminous U.S. using the following procedures.

(a) File airport-to-airport flight plans prior to departure.

(b) File the appropriate RNAV capability certification suffix in the flight plan.

(c) Plan the random route portion of the flight to begin and end over published departure/arrival transition fixes or appropriate navigation aids for airports without published transition procedures. The use of preferred departure and arrival routes, such as DP and STAR where established, is recommended.

(d) Plan the route of flight so as to avoid prohibited and restricted airspace by 3 NM unless permission has been obtained to operate in that airspace and the appropriate ATC facility is advised.

(e) Define the route of flight after the departure fix, including each intermediate fix (turnpoint) and the arrival fix for the destination airport in terms of latitude/longitude coordinates plotted to the nearest minute or in terms of Navigation

Reference System (NRS) waypoints. For latitude/longitude filing the arrival fix must be identified by both the latitude/longitude coordinates and a fix identifier.

**EXAMPLE—**

*MIA<sup>1</sup> SRQ<sup>2</sup> 3407/10615<sup>3</sup> 3407/11546 TNP<sup>4</sup> LAX<sup>5</sup>*

<sup>1</sup> *Departure airport.*

<sup>2</sup> *Departure fix.*

<sup>3</sup> *Intermediate fix (turning point).*

<sup>4</sup> *Arrival fix.*

<sup>5</sup> *Destination airport.*

*or*

*ORD<sup>1</sup> IOW<sup>2</sup> KP49G<sup>3</sup> KD34U<sup>4</sup> KL16O<sup>5</sup> OAL<sup>6</sup> MOD2<sup>7</sup> SFO<sup>8</sup>*

<sup>1</sup> *Departure airport.*

<sup>2</sup> *Transition fix (pitch point).*

<sup>3</sup> *Minneapolis ARTCC waypoint.*

<sup>4</sup> *Denver ARTCC Waypoint.*

<sup>5</sup> *Los Angeles ARTCC waypoint (catch point).*

<sup>6</sup> *Transition fix.*

<sup>7</sup> *Arrival.*

<sup>8</sup> *Destination airport.*

(f) Record latitude/longitude coordinates by four figures describing latitude in degrees and minutes followed by a solidus and five figures describing longitude in degrees and minutes.

(g) File at FL 390 or above for the random RNAV portion of the flight.

(h) Fly all routes/route segments on Great Circle tracks.

(i) Make any inflight requests for random RNAV clearances or route amendments to an en route ATC facility.

**e. Flight Plan Form— See FIG 5–1–2.**

**f. Explanation of IFR Flight Plan Items.**

**1. Block 1.** Check the type flight plan. Check both the VFR and IFR blocks if composite VFR/IFR.

**2. Block 2.** Enter your complete aircraft identification including the prefix “N” if applicable.

**3. Block 3.** Enter the designator for the aircraft, followed by a slant(/), and the transponder or DME equipment code letter; e.g., C–182/U. Heavy aircraft, add prefix “H” to aircraft type; example: H/DC10/U. Consult an FSS briefer for any unknown elements.

FIG 5-1-2  
**FAA Flight Plan**  
**Form 7233-1 (8-82)**

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION		(FAA USE ONLY) <input type="checkbox"/> PILOT BRIEFING <input type="checkbox"/> VNR <input type="checkbox"/> STOPOVER			TIME STARTED	SPECIALIST INITIALS	
<b>FLIGHT PLAN</b>							
1. TYPE	2. AIRCRAFT IDENTIFICATION	3. AIRCRAFT TYPE/ SPECIAL EQUIPMENT	4. TRUE AIRSPEED	5. DEPARTURE POINT	6. DEPARTURE TIME		7. CRUISING ALTITUDE
VFR			KTS		PROPOSED (Z)	ACTUAL (Z)	
IFR							
DVR							
8. ROUTE OF FLIGHT							
9. DESTINATION (Name of airport and city)		10. EST. TIME ENROUTE		11. REMARKS			
		HOURS	MINUTES				
12. FUEL ON BOARD		13. ALTERNATE AIRPORT(S)		14. PILOT'S NAME, ADDRESS & TELEPHONE NUMBER & AIRCRAFT HOME BASE		15. NUMBER ABOARD	
HOURS	MINUTES						
				17. DESTINATION CONTACT/TELEPHONE (OPTIONAL)			
16. COLOR OF AIRCRAFT		CIVIL AIRCRAFT PILOTS, FAR 91 requires you file an IFR flight plan to operate under instrument flight rules in controlled airspace. Failure to file could result in a civil penalty not to exceed \$1,000 for each violation (Section 901 of the Federal Aviation Act of 1958, as amended). Filing of a VFR flight plan is recommended as a good operating practice. See also Part 99 for requirements concerning DVR flight plans.					

FAA Form 7233-1 (8-82)      CLOSE VFR FLIGHT PLAN WITH \_\_\_\_\_ FSS ON ARRIVAL

**4. Block 4.** Enter your computed true airspeed (TAS).

**NOTE-**

If the average TAS changes plus or minus 5 percent or 10 knots, whichever is greater, advise ATC.

**5. Block 5.** Enter the departure airport identifier code (or the airport name, city and state, if the identifier is unknown).

**NOTE-**

Use of identifier codes will expedite the processing of your flight plan.

**6. Block 6.** Enter the proposed departure time in Coordinated Universal Time (UTC) (Z). If airborne, specify the actual or proposed departure time as appropriate.

**7. Block 7.** Enter the requested en route altitude or flight level.

**NOTE-**

Enter only the initial requested altitude in this block. When more than one IFR altitude or flight level is desired along the route of flight, it is best to make a subsequent request direct to the controller.

**8. Block 8.** Define the route of flight by using NAVAID identifier codes (or names if the code is unknown), airways, jet routes, and waypoints (for RNAV).

**NOTE-**

Use NAVAIDs or waypoints to define direct routes and radials/bearings to define other unpublished routes.

**9. Block 9.** Enter the destination airport identifier code (or name if the identifier is unknown).

**10. Block 10.** Enter your estimated time en route based on latest forecast winds.

**11. Block 11.** Enter only those remarks pertinent to ATC or to the clarification of other flight plan information, such as the appropriate radiotelephony (call sign) associated with the FAA-assigned three-letter company designator filed in Block 2, if the radiotelephony is new or has changed within the last 60 days. In cases where there is no three-letter designator but only an assigned radiotelephony or an assigned three-letter designator is used in a medical emergency, the radiotelephony must be included in the remarks field. Items of a personal nature are not accepted.

**NOTE—**

**1.** *The pilot is responsible for knowing when it is appropriate to file the radiotelephony in remarks under the 60-day rule or when using FAA special radiotelephony assignments.*

**2.** *“DVRSN” should be placed in Block 11 only if the pilot/company is requesting priority handling to their original destination from ATC as a result of a diversion as defined in the Pilot/Controller Glossary.*

**3.** *Do not assume that remarks will be automatically transmitted to every controller. Specific ATC or en route requests should be made directly to the appropriate controller.*

**12. Block 12.** Specify the fuel on board, computed from the departure point.

**13. Block 13.** Specify an alternate airport if desired or required, but do not include routing to the alternate airport.

**14. Block 14.** Enter the complete name, address, and telephone number of pilot-in-command, or in the case of a formation flight, the formation commander. Enter sufficient information to identify home base, airport, or operator.

**NOTE—**

*This information would be essential in the event of search and rescue operation.*

**15. Block 15.** Enter the total number of persons on board including crew.

**16. Block 16.** Enter the predominant colors.

**NOTE—**

*Close IFR flight plans with tower, approach control, or ARTCC, or if unable, with FSS. When landing at an airport with a functioning control tower, IFR flight plans are automatically canceled.*

**g.** The information transmitted to the ARTCC for IFR flight plans will consist of only flight plan blocks 2, 3, 4, 5, 6, 7, 8, 9, 10, and 11.

**h.** A description of the International Flight Plan Form is contained in the International Flight Information Manual (IFIM).

## **5–1–9. International Flight Plan (FAA Form 7233–4)– IFR Flights (For Domestic or International Flights)**

### **a. General**

Use of FAA Form 7233–4 is recommended for domestic IFR flights and is mandatory for all IFR flights that will depart U.S. domestic airspace.

**NOTE—**

**1.** *An abbreviated description of FAA Form 7233–4 (International Flight Plan) may be found in this section. A detailed description of FAA Form 7233–4 may be found on the FAA website at:*

*[http://www.faa.gov/about/office\\_org/headquarters\\_offices/ato/service\\_units/enroute/flight\\_plan\\_filing/](http://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/enroute/flight_plan_filing/)*

**2.** *Filers utilizing FAA Form 7233–1 (Flight Plan) may not be eligible for assignment of RNAV SIDs and STARs. Filers desiring assignment of these procedures should file using FAA Form 7233–4, as described in this section.*

**3.** *When filing an IFR flight plan using FAA Form 7233–4, it is recommended that filers include all operable navigation, communication, and surveillance equipment capabilities by adding appropriate equipment qualifiers as shown in Tables 5–1–3 and 5–1–4. These equipment qualifiers should be filed in Item 10 of FAA Form 7233–4.*

**4.** *ATC issues clearances based on equipment qualifiers filed in Items 10 and aircraft capabilities filed in Item 18 (NAV/) of FAA Form 7233–4. Operators should file all equipment qualifiers for which the aircraft is certified and capable. They should also file aircraft capabilities in Item 18 as described below.*

### **b. Explanation of Items Filed in FAA Form 7233–4**

Procedures and other information provided in this section are designed to assist operators using FAA Form 7233–4 to file IFR flight plans for flights that will be conducted entirely within U.S. domestic airspace. Requirements and procedures for operating outside U.S. domestic airspace may vary significantly from country to country. It is, therefore, recommended that operators planning flights outside U.S. domestic airspace become familiar with



applicable international documents, including Aeronautical Information Publications (AIP); International Flight Information Manuals (IFIM); and ICAO Document 4444, Procedures for Air Navigation Services/Air Traffic Management, Appendix 2.

**NOTE—**

FAA Form 7233-4 is shown in FIG 5-1-3. The filer is normally responsible for providing the information required in Items 3 through 19.

**1. Item 7. Aircraft Identification.** Insert the full registration number of the aircraft, or the approved FAA/ICAO company or organizational designator, followed by the flight number.

**EXAMPLE—**

N235RA, AAL3342, BONGO33

**NOTE—**

Callsigns filed in this item must begin with a letter followed by 1-6 additional alphanumeric characters.

**2. Item 8. Flight Rules and Type of Flight.**

**(a) Flight Rules.** Insert the character “I” to indicate IFR

**(b) Type of Flight.** Insert one of the following letters to denote the type of flight:

- (1) **S** if scheduled air service
- (2) **N** if non-scheduled air transport operation
- (3) **G** if general aviation
- (4) **M** if military
- (5) **X** if other than any of the defined categories above.

**NOTE—**

Type of flight is optional for flights that will be conducted entirely within U.S. domestic airspace.

**3. Item 9. Number, Type of Aircraft, and Wake Turbulence Category.**

**(a) Number.** Insert the number of aircraft, if more than 1 (maximum 99).

**(b) Type of Aircraft.**

(1) Insert the appropriate designator as specified in ICAO Doc 8643, Aircraft Type Designators;

(2) Or, if no such designator has been assigned, or in the case of formation flights consisting of more than one type;

(3) Insert ZZZZ, and specify in Item 18, the (numbers and) type(s) of aircraft preceded by TYP/.

**(c) Wake Turbulence Category.** Insert an oblique stroke followed by one of the following letters to indicate the wake turbulence category of the aircraft:

(1) **H — HEAVY**, to indicate an aircraft type with a maximum certificated takeoff weight of 300,000 pounds (136 000 kg), or more;

(2) **M — MEDIUM**, to indicate an aircraft type with a maximum certificated takeoff weight of less than 300,000 pounds (136,000 kg), but more than 15,500 pounds (7,000 kg);

(3) **L — LIGHT**, to indicate an aircraft type with a maximum certificated takeoff weight of 15,500 pounds (7,000 kg) or less.

**4. Item 10. Equipment**



## Pre-Flight Pilot Checklist

Aircraft Identification			Time of Briefing			
Weather (Destination) (Alternate)	<input type="checkbox"/> Present	Remarks	<b>Report Weather Conditions Aloft</b>  Report immediately weather conditions encountered---particularly cloud tops, upper cloud layers, thunderstorms, ice, turbulence, winds and temperature			
	<input type="checkbox"/> Forecast					
Weather (En Route)	<input type="checkbox"/> Present		Position	Altitude	Time	Weather Conditions
	<input type="checkbox"/> Forecast					
	<input type="checkbox"/> Pireps					
Winds Aloft	Best Crzg. Alt.					
Nav. Aid & Comm. Status.	<input type="checkbox"/> Destination					
	<input type="checkbox"/> En Route					
Airport Conditions	<input type="checkbox"/> Destination					
	<input type="checkbox"/> Alternate					
ADIZ	<input type="checkbox"/> Airspace Restrictions					
<p align="center"><b>Civil Aircraft Pilots</b></p> <p>FAR Part 91 states that each person operating a civil aircraft of U.S. registry over the high seas shall comply with Annex 2 to the Convention of International Civil Aviation, International Standards - Rules of the Air. Annex 2 requires the submission of a flight plan containing items 1-19 prior to operating any flight across international waters. Failure to file could result in a civil penalty not to exceed \$1,000 for each violation (Section 901 of the Federal Aviation Act of 1958, as amended).</p> <p><i>International briefing information may not be current or complete. Data should be secured, at the first opportunity, from the country in whose airspace the flight will be conducted.</i></p> <p><b>Paperwork Reduction Act Statement:</b> Flight Plan information is collected for the protection and identification of aircraft and property and persons on the ground. Air Traffic uses the information to provide control services and search and rescue services. An individual respondent would require about 2.5 minutes to provide the information. FAR Part 91 requires an Instrument Flight Rules (IFR) flight plan to operate under IFR in controlled airspace. Filing a Visual Flight Rules flight plan is recommended but not mandatory. It is FAA policy to make factual information available to persons properly and directly concerned except information held confidential for good cause, i.e., pilot's address/telephone number. All flight plan data is destroyed when 15 days old except for data retained due to an accident/incident investigation. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control number associated with this collection is 2120-0026. Comments concerning the accuracy of this burden and suggestions for reducing the burden should be directed to the FAA at: 800 Independence Ave SW, Washington, DC 20591, Attn: Information Collection Clearance Officer, ABA-20</p>						

**TBL 5-1-4**  
**Aircraft COM, NAV, and Approach Equipment Qualifiers**

INSERT one letter as follows:

N if no COM/NAV/approach aid equipment for the route to be flown is carried, or the equipment is unserviceable,

(OR)

S if standard COM/NAV/approach aid equipment for the route to be flown is carried and serviceable (see Note 1),

(AND/OR)

INSERT one or more of the following letters to indicate the COM/NAV/approach aid equipment available and serviceable:

**NOTE-**

*The capabilities described below comprise the following elements:*

- a. Presence of relevant serviceable equipment on board the aircraft.*
- b. Equipment and capabilities commensurate with flight crew qualifications.*
- c. Where applicable, authorization from the appropriate authority.*

A	GBAS landing system	J7	CPDLC FANS 1/A SATCOM (Iridium)
B	LPV (APV with SBAS)	K	MLS
C	LORAN C	L	ILS
D	DME	M1	ATC RTF SATCOM (INMARSAT)
E1	FMC WPR ACARS	M2	ATC RTF (MTSAT)
E2	D-FIS ACARS	M3	ATC RTF (Iridium)
E3	PDC ACARS	O	VOR
F	ADF	P1–P9	Reserved for RCP
G	(GNSS) – <i>see Note 2</i>	R	PBN approved - <i>see Note 4</i>
H	HF RTF	T	TACAN
I	Inertial navigation	U	UHF RTF
J1	CPDLC ATN VDL Mode 2 – <i>see Note 3</i>	V	VHF RTF
J2	CPDLC FANS 1/A HFDL	W	RVSM approved
J3	CPDLC FANS 1/A VDL Mode 4	X	MNPS approved
J4	CPDLC FANS 1/A VDL Mode 2	Y	VHF with 8.33 kHz channel spacing capability
J5	CPDLC FANS 1/A SATCOM (INMARSAT)	Z	Other equipment carried or other capabilities - <i>see Note 5</i>
J6	CPDLC FANS 1/A SATCOM (MTSAT)		

**NOTE-**

- 1.** *If the letter S is used, standard equipment is considered to be VHF RTF, VOR, and ILS within U.S. domestic airspace.*
- 2.** *If the letter G is used, the types of external GNSS augmentation, if any, are specified in Item 18 following the indicator NAV/ and separated by a space.*
- 3.** *See RTCA/EUROCAE Interoperability Requirements Standard For ATN Baseline 1 (ATN B1 INTEROP Standard – DO-280B/ED-110B) for data link services air traffic control clearance and information/air traffic control communications management/air traffic control microphone check.*
- 4.** *If the letter R is used, the performance based navigation levels that can be met are specified in Item 18 following the indicator PBN/. Guidance material on the application of performance based navigation to a specific route segment, route, or area is contained in the Performance Based Navigation Manual (Doc 9613). Note that FAA instructions for inclusion of*

RNAV capability per Advisory Circular 90-100A in NAV/ also apply (additionally, see the Aeronautical Information Publication (AIP) ENR 1.10-12).

5. If the letter Z is used, specify in Item 18 the other equipment carried, preceded by COM/ and/or NAV/, as appropriate.
6. Information on navigation capability is provided to ATC for clearance and routing purposes.

**TBL 5-1-5**

**Aircraft Surveillance Equipment, Including Designators for Transponder, ADS-B, ADS-C, and Capabilities**

INSERT N if no surveillance equipment for the route to be flown is carried, or the equipment is unserviceable, OR INSERT one or more of the following descriptors, to a maximum of 20 characters, to describe the serviceable surveillance equipment and/or capabilities on board:	
<b>SSR Modes A and C</b>	
A	Transponder - Mode A (4 digits – 4096 codes)
C	Transponder - Mode A (4 digits – 4096 codes) and Mode C
<b>SSR Mode S</b>	
E	Transponder - Mode S, including aircraft identification, pressure-altitude and extended squitter (ADS-B) capability
H	Transponder - Mode S, including aircraft identification, pressure-altitude and enhanced surveillance capability
I	Transponder - Mode S, including aircraft identification, but no pressure-altitude capability
L	Transponder - Mode S, including aircraft identification, pressure-altitude, extended squitter (ADS B) and enhanced surveillance capability
P	Transponder - Mode S, including pressure-altitude, but no aircraft identification capability
S	Transponder - Mode S, including both pressure-altitude and aircraft identification capability
X	Transponder - Mode S with neither aircraft identification nor pressure-altitude capability
<b>NOTE–</b> Enhanced surveillance capability is the ability of the aircraft to down-link aircraft derived data via a Mode S transponder.	
<b>Followed by one or more of the following codes if the aircraft has ADS-B capability:</b>	
B1	ADS-B with dedicated 1090 MHz ADS-B “out” capability
B2	ADS-B with dedicated 1090 MHz ADS-B “out” and “in” capability
U1	ADS-B “out” capability using UAT
U2	ADS-B “out” and “in” capability using UAT
V1	ADS-B “out” capability using VDL Mode 4
V2	ADS-B “out” and “in” capability using VDL Mode 4
<b>NOTE–</b> File no more than one code for each type of capability; for example, file B1 or B2, but not both.	
<b>Followed by one or more of the following codes if the aircraft has ADS-C capability:</b>	
D1	ADS-C with FANS 1/A capabilities
G1	ADS-C with ATN capabilities

**EXAMPLE–**

1. SDGW/SB1U1 {VOR, ILS, VHF, DME, GNSS, RVSM, Mode S transponder, ADS-B 1090 Extended Squitter out, ADS-B UAT out}
2. S/C {VOR, ILS, VHF, Mode C transponder}

**NOTE–**

The equipment qualifier Z indicates that additional equipment or capability information can be found in Item 18, following the NAV/ indicator. Operators requesting assignment of RNAV SIDs and/or STARs are required to include a Z in Item 10 and associated RNAV capabilities in Item 18 following the NAV/ indicator.

### 5. Item 13. Departure Aerodrome/Time

(a) Insert the ICAO four-letter location indicator of the departure aerodrome, or

**NOTE–**

*ICAO location indicators must consist of 4 letters. Airport identifiers such as 5IA7, 39LL and Z40 are not in ICAO standard format.*

(b) If no four-letter location indicator has been assigned to the departure aerodrome, insert ZZZZ and specify the non-ICAO location identifier, or fix/radial/distance from a nearby navaid, followed by the name of the aerodrome, in Item 18, following characters DEP/,

(c) Then, without a space, insert the estimated off-block time.

**EXAMPLE–**

1. KSMF2215

2. ZZZZ0330

### 6. Item 15. Cruise Speed, Level and Route

(a) Cruise Speed (maximum 5 characters). Insert the true airspeed for the first or the whole cruising portion of the flight, in terms of knots, expressed as N followed by 4 digits (e.g. N0485), or Mach number to the nearest hundredth of unit Mach, expressed as M followed by 3 digits (for example, M082).

(b) Cruising level (maximum 5 characters). Insert the planned cruising level for the first or the whole portion of the route to be flown, in terms of flight level, expressed as F followed by 3 figures (for example, F180; F330), or altitude in hundreds of feet, expressed as A followed by 3 figures (for example, A040; A170).

(c) Route. Insert the requested route of flight in accordance with guidance below.

**NOTE–**

*Speed and/or altitude changes en route will be accepted by FAA computer systems, but will not be processed or forwarded to controllers. Pilots are expected to maintain the last assigned altitude and request revised altitude clearances directly from ATC.*

(d) Insert the desired route of flight using a combination of published routes and/or fixes in the following formats:

(1) Consecutive fixes, navaids and waypoints should be separated by the characters “DCT”, meaning direct.

**EXAMPLE–**

FLACK DCT IRW DCT IRW125023

**NOTE–**

*IRW125023 identifies the fix located on the Will Rogers VORTAC 125 radial at 23 DME.*

(2) Combinations of published routes, and fixes, navaids or waypoints should be separated by a single space.

**EXAMPLE–**

WORTH5 MQP V66 ABI V385

(3) Although it is recommended that filed airway junctions be identified using a named junction fix when possible, there may be cases where it is necessary to file junctioning airways without a named fix. In these cases, separate consecutive airways with a space.

**EXAMPLE–**

V325 V49

**NOTE–**

*This method of filing an airway junction may result in a processing ambiguity. This might cause the flight plan to be rejected in some cases.*

### 7. Item 16. Destination Aerodrome, Total EET, Alternate and 2nd Alternate Aerodrome

(a) Destination Aerodrome and Total Estimated Elapsed Time (EET).

(1) Insert the ICAO four-letter location identifier for the destination aerodrome; or, if no ICAO location identifier has been assigned, (Location identifiers, such as WY66, A08, and 5B1, are not an ICAO standard format),

(2) Insert ZZZZ and specify the non-ICAO location identifier, or fix/radial/distance from a nearby navaid, followed the name of the aerodrome, in Item 18, following characters DEST/,

(3) Then, without a space, insert the total estimated time en route to the destination.

**EXAMPLE–**

1. KOKC0200

2. ZZZZ0330

(b) Alternate and 2nd Alternate Aerodrome (Optional).

(1) Following the intended destination, insert the ICAO four-letter location identifier(s) of

alternate aerodromes; or, if no location identifier(s) have been assigned;

(2) Insert ZZZZ and specify the name of the aerodrome in Item 18, following the characters ALTN/.

**EXAMPLE–**

1. KDFW0234 KPWA

2. KBOS0304 ZZZZ

**NOTE–**

*Although alternate airport information filed in an FPL will be accepted by air traffic computer systems, it will not be presented to controllers. If diversion to an alternate airport becomes necessary, pilots are expected to notify ATC and request an amended clearance.*

**8. Item 18. Other Information**

(a) Insert 0 (zero) if no other information; or, any other necessary information in the sequence shown below, in the form of the appropriate indicator followed by an oblique stroke and the information to be recorded:

**NOTE–**

1. Operators are warned that the use of indicators not included in the provisions may result in data being rejected, processed incorrectly, or lost.

2. Hyphens “-” or oblique strokes “/” should only be used as described.

3. Avoid use of any other special characters in Field 18 information- use only letters and numbers.

4. An indicator without any associated information will result in flight plan rejection.

(b) STS/ Reason for special handling by ATS as follows:

(1) ALTRV: For a flight operated in accordance with an altitude reservation.

(2) ATFMX: For a flight approved for exemption from ATFM measures by the appropriate ATS authority.

(3) FFR: Fire-fighting.

(4) FLTCK: Flight check for calibration of nav aids.

(5) HAZMAT: For a flight carrying hazardous material.

(6) HEAD: A flight with Head of State status.

(7) HOSP: For a medical flight declared by medical authorities.

(8) HUM: For a flight operating on a humanitarian mission.

(9) MARSA: For a flight for which a military entity assumes responsibility for separation of military aircraft.

(10) MEDEVAC: For a life critical medical emergency evacuation.

(11) NONRVSM: For a non-RVSM capable flight intending to operate in RVSM airspace.

(12) SAR: For a flight engaged in a search and rescue mission.

(13) STATE: For a flight engaged in military, customs, or police services.

**NOTE–**

*Other reasons for special handling by ATS are denoted under the designator RMK/.*

(c) PBN/ Indication of RNAV and/or RNP capabilities. Include as many of the descriptors below as apply to the flight, up to a maximum of 8 entries; that is a total of not more than 16 characters.

**TBL 5-1-6  
PBN/RNAV Specifications**

PBN/	RNAV SPECIFICATIONS
A1	<u>RNAV 10 (RNP 10)</u>
B1	RNAV 5 all permitted sensors
B2	RNAV 5 GNSS
B3	RNAV 5 DME/DME
B4	RNAV 5 VOR/DME
B5	RNAV 5 INS or IRS
B6	RNAV 5 LORAN C
C1	RNAV 2 all permitted sensors
C2	RNAV 2 GNSS
C3	RNAV 2 DME/DME
C4	RNAV 2 DME/DME/IRU
D1	RNAV 1 all permitted sensors
D2	RNAV 1 GNSS
D3	RNAV 1 DME/DME
D4	RNAV 1 DME/DME/IRU

	RNP SPECIFICATIONS
L1	RNP 4
O1	Basic RNP 1 all permitted sensors
O2	Basic RNP 1 GNSS
O3	Basic RNP 1 DME/DME
O4	Basic RNP 1 DME/DME/IRU
S1	RNP APCH
S2	RNP APCH with BARO-VNAV
T1	RNP AR APCH with RF (special authorization required)
T2	RNP AR APCH without RF (special authorization required)

**NOTE–**

Combinations of alphanumeric characters not indicated above are reserved.

(d) NAV/ Significant data related to navigation equipment, other than as specified in PBN/.

(1) In addition to filing appropriate equipment qualifiers in Item 10, operators requesting assignment of RNAV departure and/or arrival procedures should file appropriate RNAV capabilities for each segment of flight, following the NAV/ indicator.

(2) Operators should file their maximum capabilities in order to qualify for the most advanced procedures.

**EXAMPLE–**  
NAV/RNVD1A1

(3) Explanation: NAV/ Indicates the beginning of additional navigation information. This includes:

[a] RNV precedes RNAV capability for each phase of flight.

[b] D# – Departure segment RNAV capability.

[c] E# – En route segment RNAV capability.

[d] A# – Arrival segment RNAV capability.

**NOTE–**

1. In the examples above, “#” indicates the numeric RNAV accuracy values, based on aircraft certification and capabilities.

2. Operators filing FAA Form 7233–4 may suppress application of RNAV procedures by omitting, or filing a 0 (zero) value in Item 18 data for any or all segments of flight.

3. Aircraft certification requirements for RNAV operations within U.S. airspace are defined in AC 90–45A, Approval of Area Navigation Systems for Use in the U.S. National Airspace System, and AC 90–100A, U.S. Terminal and En Route Area Navigation (RNAV) Operations, as amended.

(e) COM/ Indicate communications capabilities not specified in Item 10a, when requested by an air navigation service provider.

(f) DAT/ Indicate data applications or capabilities not specified in Item 10a, when requested by an Air Navigation Service Provider.

(g) SUR/ Indicate surveillance capabilities not specified in Item 10b, when requested by an Air Navigation Service Provider. If ADS-B capability filed in Item 10 is compliant with RTCA DO-260B, include the item “260B” in SUR/. If ADS-B capability filed in Item 10 is compliant with RTCA DO-282B, include the item “282B” in SUR/.

**EXAMPLE–**

1. SUR/260B

2. SUR/260B 282B

(h) DEP/ Insert the non-ICAO identifier, or fix/radial/distance from navaid, or latitude/longitude, if ZZZZ is inserted in Item 13. Optionally, append the name of the departure point.

**EXAMPLE–**

1. DEP/T23 ALBANY MUNI

2. DEP/T23

3. DEP/UKW197011 TICK HOLLER RANCH

4. DEP/4620N07805W

(i) DEST/ Insert the non-ICAO identifier, or fix/radial/distance from navaid, or latitude/longitude, if ZZZZ is inserted in Item 16. Optionally, append the name of the destination point.

**EXAMPLE–**

1. DEST/T23 ALBANY MUNI

2. DEST/PIE335033 LEXI DUNES

3. DEST/4620N07805W



(j) DOF/ The date of flight departure in a six figure format (YYMMDD, where YY equals the year, MM equals the month, and DD equals the day). The FAA will not accept flight plans filed with Date of Flight resulting in more than a day in advance.

(k) REG/ The registration markings of the aircraft, if different from the aircraft identification in Item 7. Note that the FAA uses this information in monitoring of RVSM and ADS-B performance.

(l) EET/ Significant points or FIR boundary designators and accumulated estimated elapsed times to such points or FIR boundaries.

**EXAMPLE–**

EET/KZLA0745 KZAB0830

(m) SEL/ SELCAL code.

(n) TYP/ Insert the type of aircraft if ZZZZ was entered in Item 9. If necessary, insert the number and type(s) of aircraft in a formation.

**EXAMPLE–**

1. TYP/Homebuilt

2. TYP/2 P51 B17 B24

(o) CODE/ Aircraft address (expressed in the form of an alphanumerical code of six hexadecimal characters) when required by the appropriate ATS authority. Include CODE/ when ADS-B capability is filed in Item 10.

**EXAMPLE–**

“F00001” is the lowest aircraft address contained in the specific block administered by ICAO.

(p) DLE/ En route delay or holding, insert the significant point(s) on the route where a delay is planned to occur, followed by the length of delay using four figure time in hours and minutes (hhmm).

**EXAMPLE–**

DLE/MDG0030

(q) OPR/ Name of the operator, if not obvious from the aircraft identification in Item 7.

(r) ORGN/ The originator’s 8-letter AFTN address or other appropriate contact details, in cases where the originator of the flight plan may not be readily identified, as required by the appropriate ATS authority. The FAA does not require ORGN/ information.

**NOTE–**

*In some areas, flight plan reception centers may insert the ORGN/ identifier and originator’s AFTN address automatically.*

(s) PER/ Aircraft performance data, indicated by a single letter as specified in the Procedures for Air Navigation Services - Aircraft Operations (PANS-OPS, Doc 8168), Volume I - Flight Procedures, if so prescribed by the appropriate ATS authority. Note that the FAA does not require PER/ information.

(t) ALTN/ Name of destination alternate aerodrome(s), if ZZZZ is inserted in Item 16.

**EXAMPLE–**

1. ALTN/F35 POSSUM KINGDOM

2. ALTN/TCC233016 LAZY S RANCH

(u) RALT/ ICAO 4-letter indicator(s) for en-route alternate(s), as specified in Doc 7910, Location Indicators, or name(s) of en-route alternate aerodrome(s), if no indicator is allocated. For aerodromes not listed in the relevant Aeronautical Information Publication, indicate location in LAT/ LONG or bearing and distance from the nearest significant point, as described in DEP/ above.

(v) TALT/ ICAO 4-letter indicator(s) for take-off alternate, as specified in Doc 7910, Location Indicators, or name of take-off alternate aerodrome, if no indicator is allocated. For aerodromes not listed in the relevant Aeronautical Information Publication, indicate location in LAT/LONG or bearing and distance from the nearest significant point, as described in DEP/ above.

(w) RIF/ The route details to the revised destination aerodrome, followed by the ICAO four-letter location indicator of the aerodrome. The revised route is subject to reclearance in flight.

**EXAMPLE–**

1. RIF/DTA HEC KLAX

2. RIF/ESP G94 CLA YPPH

(x) RMK/ Any other plain-language remarks when required by the ATC or deemed necessary.

**EXAMPLE–**

1. RMK/NRP

2. RMK/DRVSN

(y) RVR/ The minimum RVR requirement of the flight in meters. This item is defined by

Eurocontrol, not ICAO. The FAA does not require or use this item, but will accept it in a flight plan.

**NOTE–**

*This provision is detailed in the European Regional Supplementary Procedures (EUR SUPPs, Doc 7030), Chapter 2.*

(z) RFP/ Q followed by a digit to indicate the sequence of the replacement flight plan being submitted. This item is defined by Eurocontrol, not ICAO. The FAA will not use this item, but will accept it in a flight plan.

**NOTE–**

*This provision is detailed in the European Regional Supplementary Procedures (EUR SUPPs, Doc 7030), chapter 2.*

## 9. Item 19. Supplementary Information

**NOTE–**

*Item 19 data must be included when completing FAA Form 7233–4. This information will be retained by the facility/organization that transmits the flight plan to Air Traffic Control (ATC), for Search and Rescue purposes, but it will not be transmitted to ATC as part of the FPL.*

(a) E/ (ENDURANCE). Insert 4–digits group giving the fuel endurance in hours and minutes.

(b) P/ (PERSONS ON BOARD). Insert the total number of persons (passengers and crew) on board.

(c) Emergency and survival equipment

(1) R/ (RADIO).

[a] Cross out “UHF” if frequency 243.0 MHz is not available.

[b] Cross out “VHF” frequency 121.5 MHz is not available.

[c] Cross out “ELBA” if emergency locator transmitter (ELT) is not available.

(2) S/ (SURVIVAL EQUIPMENT).

[a] Cross out “POLAR” if polar survival equipment is not carried.

[b] Cross out “DESERT” if desert survival equipment is not carried.

[c] Cross out “MARITIME” if maritime survival equipment is not carried.

[d] Cross out J if “JUNGLE” survival equipment is not carried.

(3) J/ (JACKETS).

[a] Cross out “LIGHT” if life jackets are not equipped with lights.

[b] Cross out “FLUORES” if life jackets are not equipped with fluorescein.

[c] Cross out “UHF” or “VHF” or both as in R/ above to indicate radio capability of jackets, if any.

(4) D/ (DINGHIES).

[a] NUMBER. Cross out indicators “NUMBER” and “CAPACITY” if no dinghies are carried, or insert number of dinghies carried; and

[b] CAPACITY. Insert total capacity, in persons, of all dinghies carried; and

[c] COVER. Cross out indicator “COVER” if dinghies are not covered; and

[d] COLOR. Insert color of dinghies if carried.

(5) A/ (AIRCRAFT COLOR AND MARKINGS). Insert color of aircraft and significant markings.

(6) N/ (REMARKS). Cross out indicator N if no remarks, or indicate any other survival equipment carried and any other remarks regarding survival equipment.

(7) C/ (PILOT). Insert name of pilot–in–command.

## 5–1–10. IFR Operations to High Altitude Destinations

a. Pilots planning IFR flights to airports located in mountainous terrain are cautioned to consider the necessity for an alternate airport even when the forecast weather conditions would technically relieve them from the requirement to file one.

**REFERENCE–**

*14 CFR Section 91.167.*

*AIM, Tower En Route Control (TEC), Paragraph 4–1–19*

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 the U.S. and U.S. Territories**

**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 Mexico are not accepted.

**d.** All pilots should review the foreign airspace and entry restrictions published in the IFIM 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. The publication Notices to Airmen, Domestic/International, published biweekly, contains considerable information pertinent to foreign flight. Current foreign NOTAMs are also available from the U.S. International NOTAM Office in Washington, D.C., through any local FSS.

**f.** When customs notification is required, it is the responsibility of the pilot to arrange for customs notification in a timely manner. The following guidelines are applicable:

1. When customs notification is required on flights to Canada and Mexico and a predeparture flight plan cannot be filed or an advise customs message (ADCUS) cannot be included in a predeparture flight plan, call the nearest en route domestic or International FSS as soon as radio communication can be established and file a VFR or DVFR flight plan, as required, and include as the last item the advise customs information. The station with which such a flight plan is filed will forward it to the appropriate FSS who will notify the customs office responsible for the destination airport.

2. If the pilot fails to include ADCUS in the radioed flight plan, it will be assumed that other arrangements have been made and FAA will not advise customs.

3. The FAA assumes no responsibility for any delays in advising customs if the flight plan is given too late for delivery to customs before arrival of the aircraft. **It is still the pilot's responsibility to give timely notice even though a flight plan is given to FAA.**

4. Air Commerce Regulations of the Treasury Department's Customs Service require all private aircraft arriving in the U.S. via:

(a) The U.S./Mexican border or the Pacific Coast from a foreign place in the Western Hemisphere south of 33 degrees north latitude and between 97 degrees and 120 degrees west longitude; or

(b) The Gulf of Mexico and Atlantic Coasts from a foreign place in the Western Hemisphere south of 30 degrees north latitude, must furnish a notice of arrival to the Customs service at the nearest designated airport. This notice may be furnished directly to Customs by:

(1) Radio through the appropriate FAA Flight Service Station.

(2) Normal FAA flight plan notification procedures (a flight plan filed in Mexico does not meet this requirement due to unreliable relay of data); or

(3) Directly to the district Director of Customs or other Customs officer at place of first intended landing but must be furnished at least 1 hour prior to crossing the U.S./Mexican border or the U.S. coastline.

(c) This notice will be valid as long as actual arrival is within 15 minutes of the original ETA, otherwise a new notice must be given to Customs. Notices will be accepted up to 23 hours in advance. Unless an exemption has been granted by Customs, private aircraft are required to make first landing in the U.S. at one of the following designated airports nearest to the point of border of coastline crossing:

### **Designated Airports**

#### **ARIZONA**

Bisbee Douglas Intl Airport  
Douglas Municipal Airport  
Nogales Intl Airport  
Tucson Intl Airport  
Yuma MCAS–Yuma Intl Airport

#### **CALIFORNIA**

Calexico Intl Airport  
Brown Field Municipal Airport (San Diego)

#### **FLORIDA**

Fort Lauderdale Executive Airport  
Fort Lauderdale/Hollywood Intl Airport  
Key West Intl Airport (Miami Intl Airport)  
Opa Locka Airport (Miami)  
Kendall–Tamiami Executive Airport (Miami)  
St. Lucie County Intl Airport (Fort Pierce)  
Tampa Intl Airport  
Palm Beach Intl Airport (West Palm Beach)

#### **LOUISIANA**

New Orleans Intl Airport (Moisant Field)  
New Orleans Lakefront Airport

#### **NEW MEXICO**

Las Cruces Intl Airport

#### **NORTH CAROLINA**

New Hanover Intl Airport (Wilmington)

#### **TEXAS**

Brownsville/South Padre Island Intl Airport  
Corpus Christi Intl Airport  
Del Rio Intl Airport  
Eagle Pass Municipal Airport  
El Paso Intl Airport  
William P. Hobby Airport (Houston)  
Laredo Intl Airport  
McAllen Miller Intl Airport  
Presidio Lely Intl Airport

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

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.

### 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 1 hour after the proposed departure time. To ensure that a flight plan remains active, pilots whose actual departure time will be delayed 1 hour or more beyond their filed departure time, are requested to notify ATC of their departure time.

b. Due to traffic saturation, control personnel frequently will be unable to accept these revisions via radio. It is recommended that you forward these revisions to the nearest 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 (e.g., NOTAMs or NANUs), and compute RAIM availability using model-specific RAIM prediction software;

**2.** Operators may use the FAA en route and terminal RAIM prediction website: [www.raimprediction.net](http://www.raimprediction.net);

**3.** Operators may contact a Flight Service Station (not DUATS) 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 (e.g., 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.*

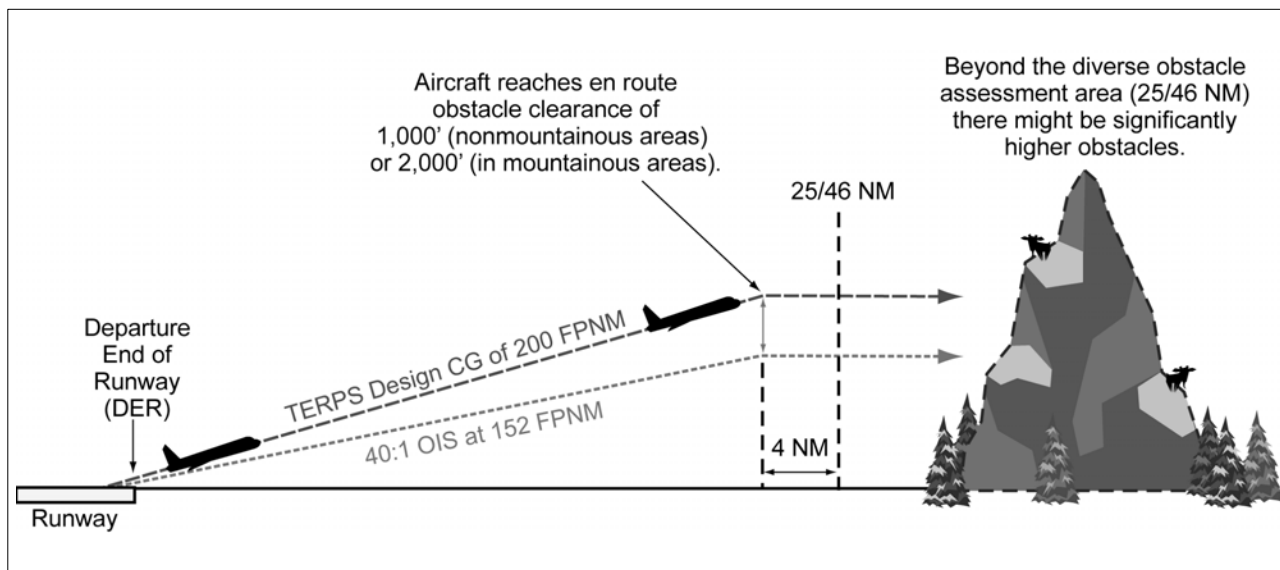
ture. This assessment area is limited to 25 NM from the airport in nonmountainous areas and 46 NM in designated mountainous areas. Beyond this distance, the pilot is responsible for obstacle clearance if not operating on a published route, if below (having not reached) the MEA or MOCA of a published route, or an ATC assigned altitude. See FIG 5-2-1. (Ref 14

CFR 91.177 for further information on en route altitudes.)

**NOTE—**

ODPs are normally designed to terminate within these distance limitations, however, some ODPs will contain routes that may exceed 25/46 NM; these routes will ensure obstacle protection until reaching the end of the ODP.

**FIG 5-2-1  
Diverse Departure Obstacle Assessment to 25/46 NM**



4. Obstacles that are located within 1 NM of the DER and penetrate the 40:1 OCS are referred to as “low, close-in obstacles.” The standard required obstacle clearance (ROC) of 48 feet per NM to clear these obstacles would require a climb gradient greater than 200 feet per NM for a very short distance, only until the aircraft was 200 feet above the DER. To eliminate publishing an excessive climb gradient, the obstacle AGL/MSL height and location relative to the DER is noted in the “Take-off Minimums and (OBSTACLE) Departure Procedures” section of a given Terminal Procedures Publication (TPP) booklet. The purpose of this note is to identify the obstacle(s) and alert the pilot to the height and location of the obstacle(s) so they can be avoided. This can be accomplished in a variety of ways, e.g., the pilot may be able to see the obstruction and maneuver around the obstacle(s) if necessary; early liftoff/climb performance may allow the aircraft to cross well above the obstacle(s); or if the obstacle(s) cannot be visually acquired during departure, preflight planning should take into account what turns or other maneuver may be necessary immediately after takeoff to avoid the obstruction(s).

5. Climb gradients greater than 200 FPNM are specified when required to support procedure design constraints, obstacle clearance, and/or airspace restrictions. Compliance with a climb gradient for these purposes is mandatory when the procedure is part of the ATC clearance, unless increased takeoff minimums are provided and weather conditions allow compliance with these minimums. Additionally, ATC required crossing restrictions may also require climb gradients greater than 200 FPNM. These climb gradients may be amended or canceled at ATC’s discretion. Multiple ATC climb gradients are permitted. An ATC climb gradient will not be used on an ODP.

**EXAMPLE—**

“Cross ALPHA intersection at or below 4000; maintain 6000.” The pilot climbs at least 200 FPNM to 6000. If 4000 is reached before ALPHA, the pilot levels off at 4000 until passing ALPHA; then immediately resumes at least 200 FPNM climb.

**EXAMPLE—**

“TAKEOFF MINIMUMS: RWY 27, Standard with a minimum climb of 280’ per NM to 2500, ATC climb of 310’ per NM to 4000 ft.” A climb of at least 280 FPNM is required to 2500 and is mandatory when the departure procedure is

included in the ATC clearance. ATC requires a climb gradient of 310 FPNM to 4000, however, this ATC climb gradient may be amended or canceled.

6. Climb gradients may be specified only to an altitude/fix, above which the normal gradient applies.

**EXAMPLE–**

*“Minimum climb 340 FPNM to ALPHA.” The pilot climbs at least 340 FPNM to ALPHA, then at least 200 FPNM to MIA.*

7. Some DPs established solely for obstacle avoidance require a climb in visual conditions to cross the airport or an on-airport NAVAID in a specified direction, at or above a specified altitude. These procedures are called Visual Climb Over the Airport (VCOA).

**EXAMPLE–**

*“Climb in visual conditions so as to cross the McElory Airport southbound, at or above 6000, then climb via Keemling radial zero three three to Keemling VORTAC.”*

c. Who is responsible for obstacle clearance? DPs are designed so that adherence to the procedure by the pilot will ensure obstacle protection. Additionally:

1. Obstacle clearance responsibility also rests with the pilot when he/she chooses to climb in visual conditions in lieu of flying a DP and/or depart under increased takeoff minima rather than fly the climb gradient. Standard takeoff minima are one statute mile for aircraft having two engines or less and one-half statute mile for aircraft having more than two engines. Specified ceiling and visibility minima (VCOA or increased takeoff minima) will allow visual avoidance of obstacles until the pilot enters the standard obstacle protection area. Obstacle avoidance is not guaranteed if the pilot maneuvers farther from the airport than the specified visibility minimum prior to reaching the specified altitude. DPs may also contain what are called Low Close in Obstacles. These obstacles are less than 200 feet above the departure end of runway elevation and within one NM of the runway end, and do not require increased takeoff minimums. These obstacles are identified on the SID chart or in the Take-off Minimums and (Obstacle) Departure Procedures section of the U. S. Terminal Procedure booklet. These obstacles are especially critical to aircraft that do not lift off until close to the departure end of the runway or which climb at the minimum rate. Pilots should also consider drift following lift-off to ensure sufficient

clearance from these obstacles. That segment of the procedure that requires the pilot to see and avoid obstacles ends when the aircraft crosses the specified point at the required altitude. In all cases continued obstacle clearance is based on having climbed a minimum of 200 feet per nautical mile to the specified point and then continuing to climb at least 200 foot per nautical mile during the departure until reaching the minimum enroute altitude, unless specified otherwise.

2. ATC may assume responsibility for obstacle clearance by vectoring the aircraft prior to reaching the minimum vectoring altitude by using a Diverse Vector Area (DVA). The DVA has been assessed for departures which do not follow a specific ground track. ATC may also vector an aircraft off a previously assigned DP. In all cases, the 200 FPNM climb gradient is assumed and obstacle clearance is not provided by ATC until the controller begins to provide navigational guidance in the form of radar vectors.

**NOTE–**

*When used by the controller during departure, the term “radar contact” should not be interpreted as relieving pilots of their responsibility to maintain appropriate terrain and obstruction clearance which may include flying the obstacle DP.*

3. Pilots must preplan to determine if the aircraft can meet the climb gradient (expressed in feet per nautical mile) required by the departure procedure, and be aware that flying at a higher than anticipated ground speed increases the climb rate requirement in feet per minute. Higher than standard climb gradients are specified by a note on the departure procedure chart for graphic DPs, or in the Take-Off Minimums and (Obstacle) Departure Procedures section of the U.S. Terminal Procedures booklet for textual ODPs. The required climb gradient, or higher, must be maintained to the specified altitude or fix, then the standard climb gradient of 200 ft/NM can be resumed. A table for the conversion of climb gradient (feet per nautical mile) to climb rate (feet per minute), at a given ground speed, is included on the inside of the back cover of the U.S. Terminal Procedures booklets.

d. Where are DPs located? DPs will be listed by airport in the IFR Takeoff Minimums and (Obstacle) Departure Procedures Section, Section L, of the Terminal Procedures Publications (TPPs). If the DP is textual, it will be described in TPP Section L. SIDs and complex ODPs will be published graphically and



named. The name will be listed by airport name and runway in Section L. Graphic ODPs will also have the term “(OBSTACLE)” printed in the charted procedure title, differentiating them from SIDs.

1. An ODP that has been developed solely for obstacle avoidance will be indicated with the symbol “T” on appropriate Instrument Approach Procedure (IAP) charts and DP charts for that airport. The “T” symbol will continue to refer users to TPP Section C. In the case of a graphic ODP, the TPP Section C will only contain the name of the ODP. Since there may be both a textual and a graphic DP, Section C should still be checked for additional information. The nonstandard takeoff minimums and minimum climb gradients found in TPP Section C also apply to charted DPs and radar vector departures unless different minimums are specified on the charted DP. Takeoff minimums and departure procedures apply to all runways unless otherwise specified. New graphic DPs will have all the information printed on the graphic depiction. As a general rule, ATC will only assign an ODP from a nontowered airport when compliance with the ODP is necessary for aircraft to aircraft separation. Pilots may use the ODP to help ensure separation from terrain and obstacles.

#### e. Responsibilities

1. Each pilot, prior to departing an airport on an IFR flight should:

- (a) Consider the type of terrain and other obstacles on or in the vicinity of the departure airport;
- (b) Determine whether an ODP is available;
- (c) Determine if obstacle avoidance can be maintained visually or if the ODP should be flown; and
- (d) Consider the effect of degraded climb performance and the actions to take in the event of an engine loss during the departure. Pilots should notify ATC as soon as possible of reduced climb capability in that circumstance.

#### NOTE—

*Guidance concerning contingency procedures that address an engine failure on takeoff after  $V_1$  speed on a large or turbine-powered transport category airplane may be found in AC 120–91, Airport Obstacle Analysis.*

2. Pilots should not exceed a published speed restriction associated with a SID waypoint until passing that waypoint.

3. After an aircraft is established on an SID and subsequently vectored or cleared off of the SID or SID transition, pilots must consider the SID canceled, unless the controller adds “expect to resume SID.” Aircraft may not be vectored off of an ODP until at or above the MVA/MIA, at which time the ODP is canceled.

4. Aircraft instructed to resume a SID that contains ATC altitude restrictions, shall be issued/reissued all applicable restrictions or shall be advised to comply with those restrictions.

5. If prior to or after takeoff an altitude restriction is issued by ATC, all previously issued “ATC” altitude restrictions are cancelled including those published on a SID.

6. ATC crossing altitude restrictions published on SIDs are identified on the chart with “(ATC)” following the altitude restriction. This will indicate to the pilot and the controller that this restriction is for ATC purposes and may be deleted by ATC. When an ATC crossing altitude has been established prior to the beginning of a transition route, a minimum altitude for obstruction clearance or other design constraints will also be published at the same fix adjacent/below the “(ATC)” altitude. The absence of “(ATC)” at a “minimum altitude” indicates the restriction is there to support obstacle clearance, airspace restrictions, Navaid reception, and/or other reason(s) that mandate compliance. These altitudes CANNOT be lowered or cancelled by ATC. A standalone “(ATC)” altitude restriction may also be located on a transition route; however, it must never be lower than the published Minimum Enroute Altitude (MEA).

7. Altitude restrictions published on an ODP are necessary for obstacle clearance and/or design constraints. Compliance with these restrictions is mandatory and CANNOT be lowered or cancelled by ATC.

#### f. RNAV Departure Procedures

All public RNAV SIDs and graphic ODPs are RNAV 1. These procedures generally start with an initial RNAV or heading leg near the departure runway end. In addition, these procedures require system performance currently met by GPS or DME/DME/IRU RNAV systems that satisfy the criteria discussed in AC 90–100A, U.S. Terminal and En Route Area Navigation (RNAV) Operations. RNAV 1 proce-

dures require the aircraft's total system error remain bounded by  $\pm 1$  NM for 95% of the total flight time.

**NOTE—**

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

**5-3-2. Position Reporting**

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

**a. Position Identification.**

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



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

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

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

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

**b. Position Reporting Points.** CFRs require pilots to maintain a listening watch on the appropriate frequency and, unless operating under the provisions of subparagraph c, to furnish position reports passing certain reporting points. Reporting points are indicated by symbols on en route charts. The

designated compulsory reporting point symbol is a solid triangle  and the “on request” reporting point symbol is the open triangle . Reports passing an “on request” reporting point are only necessary when requested by ATC.

**c. Position Reporting Requirements.**

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

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

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

**4. Oceanic Environment.** In the oceanic environment, Ocean21 requires a position report for any fix that is filed in the flight plan even if it is considered to be non-compulsory. Any fix not identified on a navigation chart as being compulsory is still identified by the Ocean21 system as such and therefore requires a position report.

**NOTE—**

*ATC will inform pilots that they are in “radar contact”:*

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

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

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

of the position given because of not being tuned to the NAVAID referenced by the controller, should ask for another radar position relative to the tuned in NAVAID.

#### **d. Position Report Items:**

##### **1. Position reports should include the following items:**

- (a) Identification;
- (b) Position;
- (c) Time;
- (d) Altitude or flight level (include actual altitude or flight level when operating on a clearance specifying VFR-on-top);
- (e) Type of flight plan (not required in IFR position reports made directly to ARTCCs or approach control);
- (f) ETA and name of next reporting point;
- (g) The name only of the next succeeding reporting point along the route of flight; and
- (h) Pertinent remarks.

### **5-3-3. Additional Reports**

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

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

- (a) When vacating any previously assigned altitude or flight level for a newly assigned altitude or flight level.
- (b) When an altitude change will be made if operating on a clearance specifying VFR-on-top.
- (c) When *unable* to climb/descend at a rate of a least 500 feet per minute.
- (d) When approach has been missed. (Request clearance for specific action; i.e., to alternative airport, another approach, etc.)
- (e) Change in the average true airspeed (at cruising altitude) when it varies by 5 percent or 10 knots (whichever is greater) from that filed in the flight plan.
- (f) The time and altitude or flight level upon reaching a holding fix or point to which cleared.

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

#### **NOTE-**

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

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

#### **NOTE-**

1. *Other equipment installed in an aircraft may effectively impair safety and/or the ability to operate under IFR. If such equipment (e.g., airborne weather radar) malfunctions and in the pilot's judgment either safety or IFR capabilities are affected, reports should be made as above.*
2. *When reporting GPS anomalies, include the location and altitude of the anomaly. Be specific when describing the location and include duration of the anomaly if necessary.*

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

##### **2. When not in radar contact.**

- (a) When leaving final approach fix inbound on final approach (nonprecision approach) or when leaving the outer marker or fix used in lieu of the outer marker inbound on final approach (precision approach).
- (b) A corrected estimate at anytime it becomes apparent that an estimate as previously submitted is in error in excess of 3 minutes. For flights in the North Atlantic (NAT), a revised estimate is required if the error is 3 minutes or more.

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

#### **REFERENCE-**

*AIM, Pilot Weather Reports (PIREPs), Paragraph 7-1-20  
14 CFR Section 91.183(B) and (C).*

## Section 4. Arrival Procedures

### 5-4-1. Standard Terminal Arrival (STAR), Area Navigation (RNAV) STAR, and Flight Management System Procedures (FMSP) for Arrivals

a. A STAR is an ATC coded IFR arrival route established for application to arriving IFR aircraft destined for certain airports. RNAV STAR/FMSP procedures for arrivals serve the same purpose but are only used by aircraft equipped with FMS or GPS. The purpose of both is to simplify clearance delivery procedures and facilitate transition between en route and instrument approach procedures.

1. STAR/RNAV STAR/FMSP procedures may have mandatory speeds and/or crossing altitudes published. Other STARs may have planning information depicted to inform pilots what clearances or restrictions to “expect.” “Expect” altitudes/speeds are not considered STAR/RNAV STAR/FMSP procedures crossing restrictions unless verbally issued by ATC. Published speed restrictions are independent of altitude restrictions and are mandatory unless modified by ATC. Pilots should plan to cross waypoints with a published speed restriction, at the published speed, and should not exceed this speed past the associated waypoint unless authorized by ATC or a published note to do so.

#### NOTE–

The “**expect**” altitudes/speeds are published so that pilots may have the information for planning purposes. These altitudes/speeds must not be used in the event of lost communications unless ATC has specifically advised the pilot to expect these altitudes/speeds as part of a further clearance.

#### REFERENCE–

14 CFR Section 91.185(c)(2)(iii).

2. Pilots navigating on STAR/RNAV STAR/FMSP procedures must maintain last assigned altitude until receiving authorization to descend so as to comply with all published/issued restrictions. This authorization will contain the phraseology “DESCEND VIA.”

(a) Clearance to “descend via” authorizes pilots to:

(1) Vertically and laterally navigate on a STAR/RNAV STAR/FMSP.

(2) When cleared to a waypoint depicted on a STAR/RNAV STAR/FMSP, to descend from a previously assigned altitude at pilot’s discretion to the altitude depicted for that waypoint, and once established on the depicted arrival, to navigate laterally and vertically to meet all published restrictions.

#### NOTE–

1. Air traffic is responsible for obstacle clearance when issuing a “descend via” instruction to the pilot. The descend via is used in conjunction with STARs/RNAV STARs/FMSPs to reduce phraseology by not requiring the controller to restate the altitude at the next waypoint/fix to which the pilot has been cleared.

2. Air traffic will assign an altitude to cross the waypoint/fix, if no altitude is depicted at the waypoint/fix, for aircraft on a direct routing to a STAR/RNAV STAR/FMSP.

3. Minimum en route altitudes (MEA) are not considered restrictions; however, pilots must remain above all MEAs, unless receiving an ATC instruction to descend below the MEA.

#### EXAMPLE–

1. **Lateral/routing clearance only.**

“Cleared Hadly One arrival.”

2. **Routing with assigned altitude.**

“Cleared Hadly One arrival, descend and maintain Flight Level two four zero.”

“Cleared Hadly One arrival, descend at pilot’s discretion, maintain Flight Level two four zero.”

3. **Lateral/routing and vertical navigation clearance.**

“Descend via the Civit One arrival.”

“Descend via the Civit One arrival, except, cross Arnes at or above one one thousand.”

4. **Lateral/routing and vertical navigation clearance when assigning altitude not published on procedure.**

“Descend via the Haris One arrival, except after Bruno, maintain one zero thousand.”

“Descend via the Haris One arrival, except cross Bruno at one three thousand then maintain one zero thousand.”

5. **Direct routing to intercept a STAR/RNAV STAR/FMSP and vertical navigation clearance.**

“Proceed direct Mahem, descend via Mahem One arrival.”

“Proceed direct Luxor, cross Luxor at or above flight level two zero zero, then descend via the Ksino One Arrival.”

**NOTE–**

1. In Example 2, pilots are expected to descend to FL 240 as directed, and maintain FL 240 until cleared for further vertical navigation with a newly assigned altitude or a “descend via” clearance.

2. In Example 4, the aircraft should track laterally and vertically on the Haris One arrival and should descend so as to comply with all speed and altitude restrictions until reaching Bruno and then maintain 10,000. Upon reaching 10,000, aircraft should maintain 10,000 until cleared by ATC to continue to descend.

(b) Pilots cleared for vertical navigation using the phraseology “descend via” must inform ATC upon initial contact with a new frequency.

**EXAMPLE–**

“Delta One Twenty One leaving FL 240, descending via the Civit One arrival.”

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

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

d. STAR charts are published in the Terminal Procedures Publications (TPP) and are available on subscription from the National Aeronautical Charting Office.

**e. RNAV STAR.**

1. All public RNAV STARs are RNAV1. These procedures require system performance currently met by GPS or DME/DME/IRU RNAV systems that satisfy the criteria discussed in AC 90–100A, U.S. Terminal and En Route Area Navigation (RNAV) Operations. RNAV1 procedures require the aircraft’s total system error remain bounded by  $\pm 1$  NM for 95% of the total flight time.

2. For procedures requiring GPS, if the navigation system does not automatically alert the

flight crew of a loss of GPS, the operator must develop procedures to verify correct GPS operation.

**5–4–2. Local Flow Traffic Management Program**

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

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

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

### 5-4-3. Approach Control

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

#### b. Radar Approach Control.

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

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

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

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

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

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

2. ARTCCs are approved for and may provide approach control services to specific airports. The radar systems used by these centers do not provide the same precision as an ASR/PAR used by approach control facilities and towers, and the update rate is not as fast. Therefore, pilots may be requested to report established on the final approach course.

3. Whether aircraft are vectored to the appropriate final approach course or provide their own navigation on published routes to it, radar service is automatically terminated when the landing is completed or when instructed to change to advisory frequency at uncontrolled airports, whichever occurs first.

### 5-4-4. Advance Information on Instrument Approach

a. When landing at airports with approach control services and where two or more IAPs are published, pilots will be provided in advance of their arrival with the type of approach to expect or that they may be vectored for a visual approach. This information will be broadcast either by a controller or on ATIS. It will not be furnished when the visibility is three miles or

better and the ceiling is at or above the highest initial approach altitude established for any low altitude IAP for the airport.

**b.** The purpose of this information is to aid the pilot in planning arrival actions; however, it is not an ATC clearance or commitment and is subject to change. Pilots should bear in mind that fluctuating weather, shifting winds, blocked runway, etc., are conditions which may result in changes to approach information previously received. It is important that pilots advise ATC immediately they are unable to execute the approach ATC advised will be used, or if they prefer another type of approach.

**c.** Aircraft destined to uncontrolled airports, which have automated weather data with broadcast capability, should monitor the ASOS/AWSS/AWOS frequency to ascertain the current weather for the airport. The pilot must advise ATC when he/she has received the broadcast weather and state his/her intentions.

**NOTE—**

**1.** ASOS/AWSS/AWOS should be set to provide one-minute broadcast weather updates at uncontrolled airports that are without weather broadcast capability by a human observer.

**2.** Controllers will consider the long line disseminated weather from an automated weather system at an uncontrolled airport as trend and planning information only and will rely on the pilot for current weather information for the airport. If the pilot is unable to receive the current broadcast weather, the last long line disseminated weather will be issued to the pilot. When receiving IFR services, the pilot/aircraft operator is responsible for determining if weather/visibility is adequate for approach/landing.

**d.** When making an IFR approach to an airport not served by a tower or FSS, after ATC advises “CHANGE TO ADVISORY FREQUENCY APPROVED” you should broadcast your intentions, including the type of approach being executed, your position, and when over the final approach fix inbound (nonprecision approach) or when over the outer marker or fix used in lieu of the outer marker inbound (precision approach). Continue to monitor the appropriate frequency (UNICOM, etc.) for reports from other pilots.

## 5–4–5. Instrument Approach Procedure Charts

**a.** 14 CFR Section 91.175(a), Instrument approaches to civil airports, requires the use of SIAPs prescribed for the airport in 14 CFR Part 97 unless otherwise authorized by the Administrator (including ATC). If there are military procedures published at a civil airport, aircraft operating under 14 CFR Part 91 must use the civil procedure(s). Civil procedures are defined with “FAA” in parenthesis; e.g., (FAA), at the top, center of the procedure chart. DOD procedures are defined using the abbreviation of the applicable military service in parenthesis; e.g., (USAF), (USN), (USA). 14 CFR Section 91.175(g), Military airports, requires civil pilots flying into or out of military airports to comply with the IAPs and takeoff and landing minimums prescribed by the authority having jurisdiction at those airports. Unless an emergency exists, civil aircraft operating at military airports normally require advance authorization, commonly referred to as “Prior Permission Required” or “PPR.” Information on obtaining a PPR for a particular military airport can be found in the Airport/Facility Directory.

**NOTE—**

Civil aircraft may conduct practice VFR approaches using DOD instrument approach procedures when approved by the air traffic controller.

**1.** IAPs (standard and special, civil and military) are based on joint civil and military criteria contained in the U.S. Standard for TERPS. The design of IAPs based on criteria contained in TERPS, takes into account the interrelationship between airports, facilities, and the surrounding environment, terrain, obstacles, noise sensitivity, etc. Appropriate altitudes, courses, headings, distances, and other limitations are specified and, once approved, the procedures are published and distributed by government and commercial cartographers as instrument approach charts.

**2.** Not all IAPs are published in chart form. Radar IAPs are established where requirements and facilities exist but they are printed in tabular form in appropriate U.S. Government Flight Information Publications.

**3.** The navigation equipment required to join and fly an instrument approach procedure is indicated by the title of the procedure and notes on the chart.



(a) Straight-in IAPs are identified by the navigational system providing the final approach guidance and the runway to which the approach is aligned (e.g., VOR RWY 13). Circling only approaches are identified by the navigational system providing final approach guidance and a letter (e.g., VOR A). More than one navigational system separated by a slash indicates that more than one type of equipment must be used to execute the final approach (e.g., VOR/DME RWY 31). More than one navigational system separated by the word “or” indicates either type of equipment may be used to execute the final approach (e.g., VOR or GPS RWY 15).

(b) In some cases, other types of navigation systems including radar may be required to execute other portions of the approach or to navigate to the IAF (e.g., an NDB procedure turn to an ILS, an NDB in the missed approach, or radar required to join the procedure or identify a fix). When radar or other equipment is required for procedure entry from the en route environment, a note will be charted in the planview of the approach procedure chart (e.g., RADAR REQUIRED or ADF REQUIRED). When radar or other equipment is required on portions of the procedure outside the final approach segment, including the missed approach, a note will be charted in the notes box of the pilot briefing portion of the approach chart (e.g., RADAR REQUIRED or DME REQUIRED). Notes are not charted when VOR is required outside the final approach segment. Pilots should ensure that the aircraft is equipped with the required NAVAID(s) in order to execute the approach, including the missed approach.

**NOTE—**

Some military (i.e., U.S. Air Force and U.S. Navy) IAPs have these “additional equipment required” notes charted only in the planview of the approach procedure and do not conform to the same application standards used by the FAA.

(c) The FAA has initiated a program to provide a new notation for LOC approaches when charted on an ILS approach requiring other navigational aids to fly the final approach course. The LOC minimums will be annotated with the NAVAID required (e.g., “DME Required” or “RADAR Required”). During the transition period, ILS approaches will still exist without the annotation.

(d) Many ILS approaches having minima based on RVR are eligible for a landing minimum of RVR 1800. Some of these approaches are to runways that have touchdown zone and centerline lights. For many runways that do not have touchdown and centerline lights, it is still possible to allow a landing minimum of RVR 1800. For these runways, the normal ILS minimum of RVR 2400 can be annotated with a single or double asterisk or the dagger symbol “†”; for example “\*\* 696/24 200 (200/1/2).” A note is included on the chart stating “\*\*RVR 1800 authorized with use of FD or AP or HUD to DA.” The pilot must use the flight director, or autopilot with an approved approach coupler, or head up display to decision altitude or to the initiation of a missed approach. In the interest of safety, single pilot operators should not fly approaches to 1800 RVR minimums on runways without touchdown and centerline lights using only a flight director, unless accompanied by the use of an autopilot with an approach coupler.

(e) The naming of multiple approaches of the same type to the same runway is also changing. Multiple approaches with the same guidance will be annotated with an alphabetical suffix beginning at the end of the alphabet and working backwards for subsequent procedures (e.g., ILS Z RWY 28, ILS Y RWY 28, etc.). The existing annotations such as ILS 2 RWY 28 or Silver ILS RWY 28 will be phased out and replaced with the new designation. The Cat II and Cat III designations are used to differentiate between multiple ILSs to the same runway unless there are multiples of the same type.

(f) RNAV (GPS) approaches to LNAV, LP, LNAV/VNAV and LPV lines of minima using WAAS and RNAV (GPS) approaches to LNAV and LNAV/VNAV lines of minima using GPS are charted as RNAV (GPS) RWY (Number) (e.g., RNAV (GPS) RWY 21). VOR/DME RNAV approaches will continue to be identified as VOR/DME RNAV RWY (Number) (e.g., VOR/DME RNAV RWY 21). VOR/DME RNAV procedures which can be flown by GPS will be annotated with “or GPS” (e.g., VOR/DME RNAV or GPS RWY 31).

4. Approach minimums are based on the local altimeter setting for that airport, unless annotated otherwise; e.g., Oklahoma City/Will Rogers World approaches are based on having a Will Rogers World altimeter setting. When a different altimeter source is required, or more than one source is authorized, it will

be annotated on the approach chart; e.g., use Sidney altimeter setting, if not received, use Scottsbluff altimeter setting. Approach minimums may be raised when a nonlocal altimeter source is authorized. When more than one altimeter source is authorized, and the minima are different, they will be shown by separate lines in the approach minima box or a note; e.g., use Manhattan altimeter setting; when not available use Salina altimeter setting and increase all MDAs 40 feet. When the altimeter must be obtained from a source other than air traffic a note will indicate the source; e.g., Obtain local altimeter setting on CTAF. When the altimeter setting(s) on which the approach is based is not available, the approach is not authorized. Baro-VNAV must be flown using the local altimeter setting only. Where no local altimeter is available, the LNAV/VNAV line will still be published for use by WAAS receivers with a note that Baro-VNAV is not authorized. When a local and at least one other altimeter setting source is authorized and the local altimeter is not available Baro-VNAV is not authorized; however, the LNAV/VNAV minima can still be used by WAAS receivers using the alternate altimeter setting source.

**NOTE—**

*Barometric Vertical Navigation (baro-VNAV). An RNAV system function which uses barometric altitude information from the aircraft's altimeter to compute and present a vertical guidance path to the pilot. The specified vertical path is computed as a geometric path, typically computed between two waypoints or an angle based computation from a single waypoint. Further guidance may be found in Advisory Circular 90-105.*

5. A pilot adhering to the altitudes, flight paths, and weather minimums depicted on the IAP chart or vectors and altitudes issued by the radar controller, is assured of terrain and obstruction clearance and runway or airport alignment during approach for landing.

6. IAPs are designed to provide an IFR descent from the en route environment to a point where a safe landing can be made. They are prescribed and approved by appropriate civil or military authority to ensure a safe descent during instrument flight conditions at a specific airport. It is important that pilots understand these procedures and their use prior to attempting to fly instrument approaches.

7. TERPS criteria are provided for the following types of instrument approach procedures:

(a) Precision Approach (PA). An instrument approach based on a navigation system that provides course and glidepath deviation information meeting the precision standards of ICAO Annex 10. For example, PAR, ILS, and GLS are precision approaches.

(b) Approach with Vertical Guidance (APV). An instrument approach based on a navigation system that is not required to meet the precision approach standards of ICAO Annex 10 but provides course and glidepath deviation information. For example, Baro-VNAV, LDA with glidepath, LNAV/VNAV and LPV are APV approaches.

(c) Nonprecision Approach (NPA). An instrument approach based on a navigation system which provides course deviation information, but no glidepath deviation information. For example, VOR, NDB and LNAV. As noted in subparagraph i, Vertical Descent Angle (VDA) on Nonprecision Approaches, some approach procedures may provide a Vertical Descent Angle as an aid in flying a stabilized approach, without requiring its use in order to fly the procedure. This does not make the approach an APV procedure, since it must still be flown to an MDA and has not been evaluated with a glidepath.

b. The method used to depict prescribed altitudes on instrument approach charts differs according to techniques employed by different chart publishers. Prescribed altitudes may be depicted in four different configurations: minimum, maximum, mandatory, and recommended. The U.S. Government distributes charts produced by National Geospatial-Intelligence Agency (NGA) and FAA. Altitudes are depicted on these charts in the profile view with underscore, overscore, both or none to identify them as minimum, maximum, mandatory or recommended.

1. Minimum altitude will be depicted with the altitude value underscored. Aircraft are required to maintain altitude at or above the depicted value, e.g., 3000.

2. Maximum altitude will be depicted with the altitude value overscored. Aircraft are required to maintain altitude at or below the depicted value, e.g., 4000.

3. Mandatory altitude will be depicted with the altitude value both underscored and overscored. Aircraft are required to maintain altitude at the depicted value, e.g., 5000.

4. Recommended altitude will be depicted with no overscore or underscore. These altitudes are depicted for descent planning, e.g., 6000.

**NOTE—**

1. *Pilots are cautioned to adhere to altitudes as prescribed because, in certain instances, they may be used as the basis for vertical separation of aircraft by ATC. When a depicted altitude is specified in the ATC clearance, that altitude becomes mandatory as defined above.*

2. *The ILS glide slope is intended to be intercepted at the published glide slope intercept altitude. This point marks the PFAF and is depicted by the "lightning bolt" symbol on U.S. Government charts. Intercepting the glide slope at this altitude marks the beginning of the final approach segment and ensures required obstacle clearance during descent from the glide slope intercept altitude to the lowest published decision altitude for the approach. Interception and tracking of the glide slope prior to the published glide slope interception altitude does not necessarily ensure that minimum, maximum, and/or mandatory altitudes published for any preceding fixes will be complied with during the descent. If the pilot chooses to track the glide slope prior to the glide slope interception altitude, they remain responsible for complying with published altitudes for any preceding stepdown fixes encountered during the subsequent descent.*

**c. Minimum Safe/Sector Altitudes (MSA)** are published for emergency use on IAP charts. For conventional navigation systems, the MSA is normally based on the primary omnidirectional facility on which the IAP is predicated. The MSA depiction on the approach chart contains the facility identifier of the NAVAID used to determine the MSA altitudes. For RNAV approaches, the MSA is based on the runway waypoint (RWY WP) for straight-in approaches, or the airport waypoint (APT WP) for circling approaches. For GPS approaches, the MSA center will be the missed approach waypoint (MAWP). MSAs are expressed in feet above mean sea level and normally have a 25 NM radius; however, this radius may be expanded to 30 NM if necessary to encompass the airport landing surfaces. Ideally, a single sector altitude is established and depicted on the plan view of approach charts; however, when necessary to obtain relief from obstructions, the area may be further sectorized and as many as four MSAs established. When established, sectors may be no less than 90° in spread. MSAs provide 1,000 feet clearance over all obstructions but

do not necessarily assure acceptable navigation signal coverage.

**d. Terminal Arrival Area (TAA)**

1. The objective of the TAA is to provide a seamless transition from the en route structure to the terminal environment for arriving aircraft equipped with Flight Management System (FMS) and/or Global Positioning System (GPS) navigational equipment. The underlying instrument approach procedure is an area navigation (RNAV) procedure described in this section. The TAA provides the pilot and air traffic controller with a very efficient method for routing traffic into the terminal environment with little required air traffic control interface, and with minimum altitudes depicted that provide standard obstacle clearance compatible with the instrument procedure associated with it. The TAA will not be found on all RNAV procedures, particularly in areas of heavy concentration of air traffic. When the TAA is published, it replaces the MSA for that approach procedure. See FIG 5-4-9 for a depiction of a RNAV approach chart with a TAA.

2. The RNAV procedure underlying the TAA will be the "T" design (also called the "Basic T"), or a modification of the "T." The "T" design incorporates from one to three IAFs; an intermediate fix (IF) that serves as a dual purpose IF (IAF); a final approach fix (FAF), and a missed approach point (MAP) usually located at the runway threshold. The three IAFs are normally aligned in a straight line perpendicular to the intermediate course, which is an extension of the final course leading to the runway, forming a "T." The initial segment is normally from 3-6 NM in length; the intermediate 5-7 NM, and the final segment 5 NM. Specific segment length may be varied to accommodate specific aircraft categories for which the procedure is designed. However, the published segment lengths will reflect the highest category of aircraft normally expected to use the procedure.

(a) A standard racetrack holding pattern may be provided at the center IAF, and if present may be necessary for course reversal and for altitude adjustment for entry into the procedure. In the latter case, the pattern provides an extended distance for the descent required by the procedure. Depiction of this pattern in U.S. Government publications will utilize the "hold-in-lieu-of-PT" holding pattern symbol.

(b) The published procedure will be annotated to indicate when the course reversal is not necessary when flying within a particular TAA area; e.g., “NoPT.” Otherwise, the pilot is expected to execute the course reversal under the provisions of 14 CFR Section 91.175. The pilot may elect to use the course reversal pattern when it is not required by the procedure, but must inform air traffic control and receive clearance to do so. (See FIG 5-4-1, FIG 5-4-2, FIG 5-4-9, and paragraph 5-4-9, Procedure Turn and Hold-in-lieu of Procedure Turn).

3. The “T” design may be modified by the procedure designers where required by terrain or air traffic control considerations. For instance, the “T” design may appear more like a regularly or irregularly shaped “Y”, or may even have one or both outboard IAFs eliminated resulting in an upside down “L” or an “I” configuration. (See FIG 5-4-3 and FIG 5-4-10). Further, the leg lengths associated with the outboard IAFs may differ. (See FIG 5-4-5 and FIG 5-4-6).

4. Another modification of the “T” design may be found at airports with parallel runway configurations. Each parallel runway may be served by its own “T” IAF, IF (IAF), and FAF combination, resulting in parallel final approach courses. (See FIG 5-4-4). Common IAFs may serve both runways; however, only the intermediate and final approach segments for the landing runway will be shown on the approach chart. (See FIG 5-4-5 and FIG 5-4-6).

for a “normal” glidepath, due to its location down the runway.

3. Accordingly, pilots are advised to carefully review approach procedures, prior to initiating the approach, to identify the optimum position(s), and any unacceptable positions, from which a descent to landing can be initiated (in accordance with 14 CFR Section 91.175(c)).

**k. Area Navigation (RNAV) Instrument Approach Charts.** Reliance on RNAV systems for instrument operations is becoming more commonplace as new systems such as GPS and augmented GPS such as the Wide Area Augmentation System (WAAS) are developed and deployed. In order to support full integration of RNAV procedures into the National Airspace System (NAS), the FAA developed a new charting format for IAPs (See FIG 5-4-9). This format avoids unnecessary duplication and proliferation of instrument approach charts. The original stand alone GPS charts, titled simply “GPS,” are being converted to the newer format as the procedures are revised. One reason for the revision is the addition of WAAS based minima to the approach chart. The reformatted approach chart is titled “RNAV (GPS) RWY XX.” Up to four lines of minima are included on these charts. Ground Based Augmentation System (GBAS) Landing System (GLS) was a placeholder for future WAAS and LAAS minima, and the minima was always listed as N/A. The GLS minima line has now been replaced by the WAAS LPV (Localizer Performance with Vertical Guidance) minima on most RNAV (GPS) charts. LNAV/VNAV (lateral navigation/vertical navigation) was added to support both WAAS electronic vertical guidance and Barometric VNAV. LPV and LNAV/VNAV are both APV procedures as described in paragraph 5-4-5a7. The original GPS minima, titled “S-XX,” for straight in runway XX, is retitled LNAV (lateral navigation). Circling minima may also be published. A new type of nonprecision WAAS minima will also be published on this chart and titled LP (localizer performance). LP will be published in locations where vertically guided minima cannot be provided due to terrain and obstacles and therefore, no LPV or LNAV/VNAV minima will be published. GBAS procedures are published on a separate chart and the GLS minima line is to be used only for GBAS. ATC clearance for the RNAV procedure authorizes a properly certified pilot to utilize any minimums for which the aircraft is certi-

fied (for example, a WAAS equipped aircraft utilizes the LPV or LP minima but a GPS only aircraft may not). The RNAV chart includes information formatted for quick reference by the pilot or flight crew at the top of the chart. This portion of the chart, developed based on a study by the Department of Transportation, Volpe National Transportation System Center, is commonly referred to as the pilot briefing.

1. The minima lines are:

(a) **GLS.** “GLS” is the acronym for GBAS Landing System. The U.S. version of GBAS has traditionally been referred to as LAAS. The worldwide community has adopted GBAS as the official term for this type of navigation system. To coincide with international terminology, the FAA is also adopting the term GBAS to be consistent with the international community. This line was originally published as a placeholder for both WAAS and LAAS minima and marked as N/A since no minima was published. As the concepts for GBAS and WAAS procedure publication have evolved, GLS will now be used only for GBAS minima, which will be on a separate approach chart. Most RNAV(GPS) approach charts have had the GLS minima line replaced by a WAAS LPV line of minima.

(b) **LPV.** “LPV” is the acronym for localizer performance with vertical guidance. RNAV (GPS) approaches to LPV lines of minima take advantage of the improved accuracy of WAAS lateral and vertical guidance to provide an approach that is very similar to a Category I Instrument Landing System (ILS). The approach to LPV line of minima is designed for angular guidance with increasing sensitivity as the aircraft gets closer to the runway. The sensitivities are nearly identical to those of the ILS at similar distances. This was done intentionally to allow the skills required to proficiently fly an ILS to readily transfer to flying RNAV (GPS) approaches to the LPV line of minima. Just as with an ILS, the LPV has vertical guidance and is flown to a DA. Aircraft can fly this minima line with a statement in the Aircraft Flight Manual that the installed equipment supports LPV approaches. This includes Class 3 and 4 TSO-C146 GPS/WAAS equipment.

(c) **LNAV/VNAV.** LNAV/VNAV identifies APV minimums developed to accommodate an RNAV IAP with vertical guidance, usually provided by approach certified Baro-VNAV, but with lateral and vertical integrity limits larger than a precision approach or LPV. LNAV stands for Lateral

Navigation; VNAV stands for Vertical Navigation. This minima line can be flown by aircraft with a statement in the Aircraft Flight Manual that the installed equipment supports GPS approaches and has an approach-approved barometric VNAV, or if the aircraft has been demonstrated to support LNAV/VNAV approaches. This includes Class 2, 3 and 4 TSO-C146 GPS/WAAS equipment. Aircraft using LNAV/VNAV minimums will descend to landing via an internally generated descent path based on satellite or other approach approved VNAV systems. Since electronic vertical guidance is provided, the minima will be published as a DA. Other navigation systems may be specifically authorized to use this line of minima. (See Section A, Terms/Landing Minima Data, of the U.S. Terminal Procedures books.)

**(d) LP.** “LP” is the acronym for localizer performance. Approaches to LP lines of minima take advantage of the improved accuracy of WAAS to provide approaches, with lateral guidance and angular guidance. Angular guidance does not refer to a glideslope angle but rather to the increased lateral sensitivity as the aircraft gets closer to the runway, similar to localizer approaches. However, the LP line of minima is a Minimum Descent Altitude (MDA) rather than a DA (H). Procedures with LP lines of minima will not be published with another approach that contains approved vertical guidance (LNAV/VNAV or LPV). It is possible to have LP and LNAV published on the same approach chart but LP will only be published if it provides lower minima than an LNAV line of minima. LP is not a fail-down mode for LPV. LP will only be published if terrain, obstructions, or some other reason prevent publishing a vertically guided procedure. WAAS avionics may provide GNSS-based advisory vertical guidance during an approach to an LP line of minima. Barometric altimeter information remains the primary altitude reference for complying with any altitude restrictions. WAAS equipment may not support LP, even if it supports LPV, if it was approved before TSO-C145b and TSO-C146b. Receivers approved under previous TSOs may require an upgrade by the manufacturer in order to be used to fly to LP minima. Receivers approved for LP must have a statement in the approved Flight Manual or Supplemental Flight Manual including LP as one of the approved approach types.

**(e) LNAV.** This minima is for lateral navigation only, and the approach minimum altitude will be published as a minimum descent altitude (MDA). LNAV provides the same level of service as the present GPS stand alone approaches. LNAV minimums support the following navigation systems: WAAS, when the navigation solution will not support vertical navigation; and, GPS navigation systems which are presently authorized to conduct GPS approaches.

**NOTE—**

*GPS receivers approved for approach operations in accordance with: AC 20-138, Airworthiness Approval of Positioning and Navigation Systems, qualify for this minima. WAAS navigation equipment must be approved in accordance with the requirements specified in TSO-C145() or TSO-C146() and installed in accordance with Advisory Circular AC 20-138.*

2. Other systems may be authorized to utilize these approaches. See the description in Section A of the U.S. Terminal Procedures books for details. Operational approval must also be obtained for Baro-VNAV systems to operate to the LNAV/VNAV minimums. Baro-VNAV may not be authorized on some approaches due to other factors, such as no local altimeter source being available. Baro-VNAV is not authorized on LPV procedures. Pilots are directed to their local Flight Standards District Office (FSDO) for additional information.

**NOTE—**

*RNAV and Baro-VNAV systems must have a manufacturer supplied electronic database which must include the waypoints, altitudes, and vertical data for the procedure to be flown. The system must be able to retrieve the procedure by name from the aircraft navigation database, not just as a manually entered series of waypoints.*

### 3. ILS or RNAV (GPS) charts.

**(a)** Some RNAV (GPS) charts will also contain an ILS line of minima to make use of the ILS precision final in conjunction with the RNAV GPS capabilities for the portions of the procedure prior to the final approach segment and for the missed approach. Obstacle clearance for the portions of the procedure other than the final approach segment is still based on GPS criteria.

**NOTE—**

*Some GPS receiver installations inhibit GPS navigation whenever ANY ILS frequency is tuned. Pilots flying aircraft with receivers installed in this manner must wait until they are on the intermediate segment of the procedure*

box of the pilot briefing. When the temperature is above the high temperature or below the low temperature limit, Baro-VNAV may be used to provide a stabilized descent to the LNAV MDA; however, extra caution should be used in the visual segment to ensure a vertical correction is not required. If the VGSI is aligned with the published glidepath, and the aircraft instruments indicate on glidepath, an above or below glidepath indication on the VGSI may indicate that temperature error is causing deviations to the glidepath. These deviations should be considered if the approach is continued below the MDA.

**NOTE—**

*Many systems which apply Baro-VNAV temperature compensation only correct for cold temperature. In this case, the high temperature limitation still applies. Also, temperature compensation may require activation by maintenance personnel during installation in order to be functional, even though the system has the feature. Some systems may have a temperature correction capability, but correct the Baro-altimeter all the time, rather than just on the final, which would create conflicts with other aircraft if the feature were activated. Pilots should be aware of compensation capabilities of the system prior to disregarding the temperature limitations.*

**NOTE—**

*Temperature limitations do not apply to flying the LNAV/VNAV line of minima using approach certified WAAS receivers when LPV or LNAV/VNAV are annunciated to be available.*

**(g) WAAS Channel Number/Approach ID.**

The WAAS Channel Number is an optional equipment capability that allows the use of a 5-digit number to select a specific final approach segment without using the menu method. The Approach ID is an airport unique 4-character combination for verifying the selection and extraction of the correct final approach segment information from the aircraft database. It is similar to the ILS ident, but displayed visually rather than aurally. The Approach ID consists of the letter W for WAAS, the runway number, and a letter other than L, C or R, which could be confused with Left, Center and Right, e.g., W35A. Approach IDs are assigned in the order that WAAS approaches are built to that runway number at that airport. The WAAS Channel Number and Approach ID are displayed in the upper left corner of the approach procedure pilot briefing.

**(h)** At locations where outages of WAAS vertical guidance may occur daily due to initial

system limitations, a negative W symbol (**W**) will be placed on RNAV (GPS) approach charts. Many of these outages will be very short in duration, but may result in the disruption of the vertical portion of the approach. The **W** symbol indicates that NOTAMs or Air Traffic advisories are not provided for outages which occur in the WAAS LNAV/VNAV or LPV vertical service. Use LNAV or circling minima for flight planning at these locations, whether as a destination or alternate. For flight operations at these locations, when the WAAS avionics indicate that LNAV/VNAV or LPV service is available, then vertical guidance may be used to complete the approach using the displayed level of service. Should an outage occur during the procedure, reversion to LNAV minima may be required. As the WAAS coverage is expanded, the **W** will be removed.

**NOTE—**

*Properly trained and approved, as required, TSO-C145() and TSO-C146() equipped users (WAAS users) with and using approved baro-VNAV equipment may plan for LNAV/VNAV DA at an alternate airport. Specifically authorized WAAS users with and using approved baro-VNAV equipment may also plan for RNP 0.3 DA at the alternate airport as long as the pilot has verified RNP availability through an approved prediction program.*

## 5-4-6. Approach Clearance

**a.** An aircraft which has been cleared to a holding fix and subsequently “cleared . . . approach” has not received new routing. Even though clearance for the approach may have been issued prior to the aircraft reaching the holding fix, ATC would expect the pilot to proceed via the holding fix (his/her last assigned route), and the feeder route associated with that fix (if a feeder route is published on the approach chart) to the initial approach fix (IAF) to commence the approach. *WHEN CLEARED FOR THE APPROACH, THE PUBLISHED OFF AIRWAY (FEEDER) ROUTES THAT LEAD FROM THE EN ROUTE STRUCTURE TO THE IAF ARE PART OF THE APPROACH CLEARANCE.*

**b.** If a feeder route to an IAF begins at a fix located along the route of flight prior to reaching the holding fix, and clearance for an approach is issued, a pilot should commence the approach via the published feeder route; i.e., the aircraft would not be expected to overfly the feeder route and return to it. The pilot is expected to commence the approach in a similar manner at the IAF, if the IAF for the procedure is located along the route of flight to the holding fix.

c. If a route of flight directly to the initial approach fix is desired, it should be so stated by the controller with phraseology to include the words “direct . . .,” “proceed direct” or a similar phrase which the pilot can interpret without question. When uncertain of the clearance, immediately query ATC as to what route of flight is desired.

d. The name of an instrument approach, as published, is used to identify the approach, even though a component of the approach aid, such as the glideslope on an Instrument Landing System, is inoperative or unreliable. The controller will use the name of the approach as published, but must advise the aircraft at the time an approach clearance is issued that the inoperative or unreliable approach aid component is unusable, except when the title of the published approach procedures otherwise allows; for example, ILS Rwy 05 or LOC Rwy 05.

e. The following applies to aircraft on radar vectors and/or cleared “direct to” in conjunction with an approach clearance:

1. Maintain the last altitude assigned by ATC until the aircraft is established on a published segment of a transition route, or approach procedure segment, or other published route, for which a lower altitude is published on the chart. If already on an established route, or approach or arrival segment, you may descend to whatever minimum altitude is listed for that route or segment.

2. Continue on the vector heading until intercepting the next published ground track applicable to the approach clearance.

3. Once reaching the final approach fix via the published segments, the pilot may continue on approach to a landing.

4. If proceeding to an IAF with a published course reversal (procedure turn or hold-in-lieu of PT pattern), except when cleared for a straight in approach by ATC, the pilot must execute the procedure turn/hold-in-lieu of PT, and complete the approach.

5. If cleared to an IAF/IF via a NoPT route, or no procedure turn/hold-in-lieu of PT is published, continue with the published approach.

6. In addition to the above, RNAV aircraft may be issued a clearance direct to the IAF/IF at intercept angles not greater than 90 degrees for both conventional and RNAV instrument approaches. Controllers

may issue a heading or a course direct to a fix between the IF and FAF at intercept angles not greater than 30 degrees for both conventional and RNAV instrument approaches. In all cases, controllers will assign altitudes that ensure obstacle clearance and will permit a normal descent to the FAF. When clearing aircraft direct to the IF, ATC will radar monitor the aircraft until the IF and will advise the pilot to expect clearance direct to the IF at least 5 miles from the fix. ATC must issue a straight-in approach clearance when clearing an aircraft direct to an IAF/IF with a procedure turn or hold-in-lieu of a procedure turn, and ATC does not want the aircraft to execute the course reversal.

**NOTE—**

*Refer to 14 CFR 91.175 (i).*

7. RNAV aircraft may be issued a clearance direct to the FAF that is also charted as an IAF, in which case the pilot is expected to execute the depicted procedure turn or hold-in-lieu of procedure turn. ATC will not issue a straight-in approach clearance. If the pilot desires a straight-in approach, they must request vectors to the final approach course outside of the FAF or fly a published “NoPT” route. When visual approaches are in use, ATC may clear an aircraft direct to the FAF.

**NOTE—**

1. *In anticipation of a clearance by ATC to any fix published on an instrument approach procedure, pilots of RNAV aircraft are advised to select an appropriate IAF or feeder fix when loading an instrument approach procedure into the RNAV system.*

2. *Selection of “Vectors-to-Final” or “Vectors” option for an instrument approach may prevent approach fixes located outside of the FAF from being loaded into an RNAV system. Therefore, the selection of these options is discouraged due to increased workload for pilots to reprogram the navigation system.*

f. An RF leg is defined as a constant radius circular path around a defined turn center that starts and terminates at a fix. An RF leg may be published as part of a procedure. Since not all aircraft have the capability to fly these leg types, pilots are responsible for knowing if they can conduct an RNAV approach with an RF leg. Requirements for RF legs will be indicated on the approach chart in the notes section or at the applicable initial approach fix. Controllers will clear RNAV-equipped aircraft for instrument approach procedures containing RF legs:



1. Via published transitions, or
2. On a heading or course direct to the IAF when a hold-in-lieu of procedure turn is published, and the pilot will execute the procedure, or
3. On a heading or course direct to the IAF/IF, at intercept angles no greater than 90 degrees and the distance to the waypoint beginning the RF leg is 6NM or greater, or
4. With radar monitoring, on a heading or course direct to any waypoint 3 miles or more from the waypoint that begins the RF leg, at an intercept angle not greater than 30 degrees. (See FIG 5-4-14.)

**EXAMPLE-**

1. *Controllers will not clear aircraft direct to THIRD because that waypoint begins the RF leg, and aircraft cannot be vectored or cleared to TURN or vectored to intercept the approach segment at any point between THIRD and FORTH because this is the RF leg.*
2. *Controllers can clear Aircraft 1 direct to SCND because the distance to THIRD, where the RF leg begins is 3NM or greater and the intercept angle will be 30 degrees or less and is radar monitored. Controllers can clear Aircraft 2 direct to FIRST because the intercept angle is 90 degrees or less, and the distance from FIRST to THIRD is 6NM or greater.*

**5-4-7. Instrument Approach Procedures**

a. Aircraft approach category means a grouping of aircraft based on a speed of  $V_{REF}$ , if specified, or if  $V_{REF}$  is not specified,  $1.3 V_{SO}$  at the maximum certified landing weight.  $V_{REF}$ ,  $V_{SO}$ , and the maximum certified landing weight are those values as established for the aircraft by the certification authority of the country of registry. A pilot must use the minima corresponding to the category determined during certification or higher. Helicopters may use Category A minima. If it is necessary to operate at a speed in excess of the upper limit of the speed range for an aircraft's category, the minimums for the higher category must be used. For example, an airplane which fits into Category B, but is circling to land at a speed of 145 knots, must use the approach Category D minimums. As an additional example, a Category A airplane (or helicopter) which is operating at 130 knots on a straight-in approach must use the approach Category C minimums. See the following category limits:

1. Category A: Speed less than 91 knots.

2. Category B: Speed 91 knots or more but less than 121 knots.

3. Category C: Speed 121 knots or more but less than 141 knots.

4. Category D: Speed 141 knots or more but less than 166 knots.

5. Category E: Speed 166 knots or more.

**NOTE-**

*$V_{REF}$  in the above definition refers to the speed used in establishing the approved landing distance under the airworthiness regulations constituting the type certification basis of the airplane, regardless of whether that speed for a particular airplane is  $1.3 V_{SO}$ ,  $1.23 V_{SR}$ , or some higher speed required for airplane controllability. This speed, at the maximum certificated landing weight, determines the lowest applicable approach category for all approaches regardless of actual landing weight.*

b. When operating on an unpublished route or while being radar vectored, the pilot, when an approach clearance is received, must, in addition to complying with the minimum altitudes for IFR operations (14 CFR Section 91.177), maintain the last assigned altitude unless a different altitude is assigned by ATC, or until the aircraft is established on a segment of a published route or IAP. After the aircraft is so established, published altitudes apply to descent within each succeeding route or approach segment unless a different altitude is assigned by ATC. Notwithstanding this pilot responsibility, for aircraft operating on unpublished routes or while being radar vectored, ATC will, except when conducting a radar approach, issue an IFR approach clearance only after the aircraft is established on a segment of a published route or IAP, or assign an altitude to maintain until the aircraft is established on a segment of a published route or instrument approach procedure. For this purpose, the procedure turn of a published IAP must not be considered a segment of that IAP until the aircraft reaches the initial fix or navigation facility upon which the procedure turn is predicated.

**EXAMPLE-**

*Cross Redding VOR at or above five thousand, cleared VOR runway three four approach.*

*or*

*Five miles from outer marker, turn right heading three three zero, maintain two thousand until established on the localizer, cleared ILS runway three six approach.*

**NOTE—**

*The altitude assigned will assure IFR obstruction clearance from the point at which the approach clearance is issued until established on a segment of a published route or IAP. If uncertain of the meaning of the clearance, immediately request clarification from ATC.*

c. Several IAPs, using various navigation and approach aids may be authorized for an airport. ATC may advise that a particular approach procedure is being used, primarily to expedite traffic. If issued a clearance that specifies a particular approach procedure, notify ATC immediately if a different one is desired. In this event it may be necessary for ATC to withhold clearance for the different approach until such time as traffic conditions permit. However, a pilot involved in an emergency situation will be given priority. If the pilot is not familiar with the specific approach procedure, ATC should be advised and they will provide detailed information on the execution of the procedure.

**REFERENCE—**

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

d. The name of an instrument approach, as published, is used to identify the approach, even though a component of the approach aid, such as the glideslope on an Instrument Landing System, is inoperative or unreliable. The controller will use the name of the approach as published, but must advise the aircraft at the time an approach clearance is issued that the inoperative or unreliable approach aid component is unusable, except when the title of the published approach procedures otherwise allows, for example, ILS or LOC.

e. Except when being radar vectored to the final approach course, when cleared for a specifically prescribed IAP; i.e., “cleared ILS runway one nine approach” or when “cleared approach” i.e., execution of any procedure prescribed for the airport, pilots must execute the entire procedure commencing at an IAF or an associated feeder route as described on the IAP chart unless an appropriate new or revised ATC clearance is received, or the IFR flight plan is canceled.

f. Pilots planning flights to locations which are private airfields or which have instrument approach procedures based on private navigation aids should obtain approval from the owner. In addition, the pilot must be authorized by the FAA to fly special instrument approach procedures associated with private navigation aids (see paragraph 5-4-8).

Owners of navigation aids that are not for public use may elect to turn off the signal for whatever reason they may have; e.g., maintenance, energy conservation, etc. Air traffic controllers are not required to question pilots to determine if they have permission to land at a private airfield or to use procedures based on privately owned navigation aids, and they may not know the status of the navigation aid. Controllers presume a pilot has obtained approval from the owner and the FAA for use of special instrument approach procedures and is aware of any details of the procedure if an IFR flight plan was filed to that airport.

g. Pilots should not rely on radar to identify a fix unless the fix is indicated as “RADAR” on the IAP. Pilots may request radar identification of an OM, but the controller may not be able to provide the service due either to workload or not having the fix on the video map.

h. If a missed approach is required, advise ATC and include the reason (unless initiated by ATC). Comply with the missed approach instructions for the instrument approach procedure being executed, unless otherwise directed by ATC.

**REFERENCE—**

AIM, Missed Approach, Paragraph 5-4-21

AIM, Missed Approach, Paragraph 5-5-5

## 5-4-8. Special Instrument Approach Procedures

Instrument Approach Procedure (IAP) charts reflect the criteria associated with the U.S. Standard for Terminal Instrument [Approach] Procedures (TERPs), which prescribes standardized methods for use in developing IAPs. Standard IAPs are published in the Federal Register (FR) in accordance with Title 14 of the Code of Federal Regulations, Part 97, and are available for use by appropriately qualified pilots operating properly equipped and airworthy aircraft in accordance with operating rules and procedures acceptable to the FAA. Special IAPs are also developed using TERPS but are not given public notice in the FR. The FAA authorizes only certain individual pilots and/or pilots in individual organizations to use special IAPs, and may require additional crew training and/or aircraft equipment or performance, and may also require the use of landing aids, communications, or weather services not available for public use. Additionally, IAPs that service private use airports or heliports are generally special IAPs.

### 5-4-9. Procedure Turn and Hold-in-lieu of Procedure Turn

a. A procedure turn is the maneuver prescribed when it is necessary to reverse direction to establish the aircraft inbound on an intermediate or final approach course. The procedure turn or hold-in-lieu-of-PT is a required maneuver when it is depicted on the approach chart, unless cleared by ATC for a straight-in approach. Additionally, the procedure turn or hold-in-lieu-of-PT is not permitted when the symbol “No PT” is depicted on the initial segment being used, when a RADAR VECTOR to the final approach course is provided, or when conducting a timed approach from a holding fix. The altitude prescribed for the procedure turn is a minimum altitude until the aircraft is established on the inbound course. The maneuver must be completed within the distance specified in the profile view. For a hold-in-lieu-of-PT, the holding pattern direction must be flown as depicted and the specified leg length/timing must not be exceeded.

#### NOTE-

*The pilot may elect to use the procedure turn or hold-in-lieu-of-PT when it is not required by the procedure, but must first receive an amended clearance from ATC. If the pilot is uncertain whether the ATC clearance intends for a procedure turn to be conducted or to allow for a straight-in approach, the pilot must immediately request clarification from ATC (14 CFR Section 91.123).*

1. On U.S. Government charts, a barbed arrow indicates the maneuvering side of the outbound course on which the procedure turn is made. Headings are provided for course reversal using the

45 degree type procedure turn. However, the point at which the turn may be commenced and the type and rate of turn is left to the discretion of the pilot (limited by the charted remain within xx NM distance). Some of the options are the 45 degree procedure turn, the racetrack pattern, the teardrop procedure turn, or the 80 degree ↔ 260 degree course reversal. Racetrack entries should be conducted on the maneuvering side where the majority of protected airspace resides. If an entry places the pilot on the non-maneuvering side of the PT, correction to intercept the outbound course ensures remaining within protected airspace. Some procedure turns are specified by procedural track. These turns must be flown exactly as depicted.

2. Descent to the procedure turn (PT) completion altitude from the PT fix altitude (when one has been published or assigned by ATC) must not begin until crossing over the PT fix or abeam and proceeding outbound. Some procedures contain a note in the chart profile view that says “Maintain (altitude) or above until established outbound for procedure turn” (See FIG 5-4-15). Newer procedures will simply depict an “at or above” altitude at the PT fix without a chart note (See FIG 5-4-16). Both are there to ensure required obstacle clearance is provided in the procedure turn entry zone (See FIG 5-4-17). Absence of a chart note or specified minimum altitude adjacent to the PT fix is an indication that descent to the procedure turn altitude can commence immediately upon crossing over the PT fix, regardless of the direction of flight. This is because the minimum altitudes in the PT entry zone and the PT maneuvering zone are the same.

FIG 5-4-14  
Example of an RNAV Approach with RF Leg

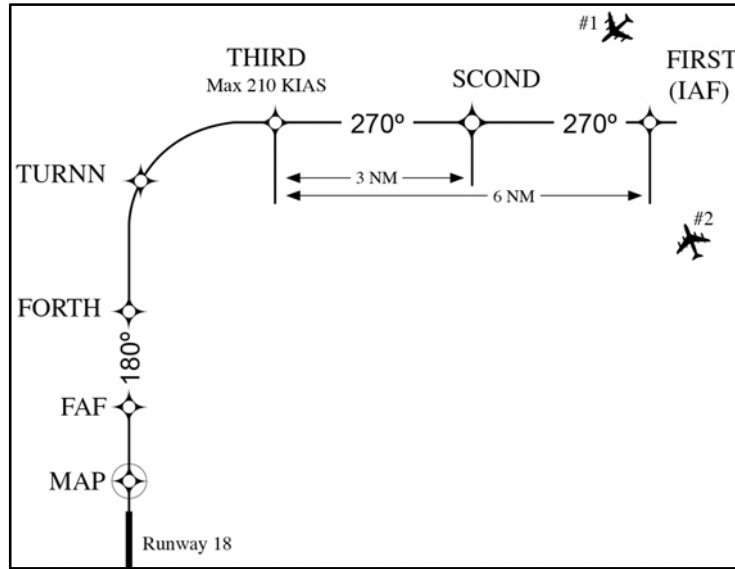


FIG 5-4-15

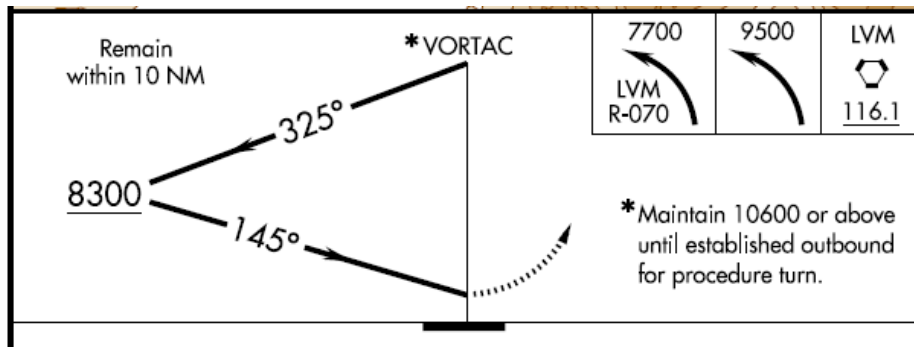


FIG 5-4-16

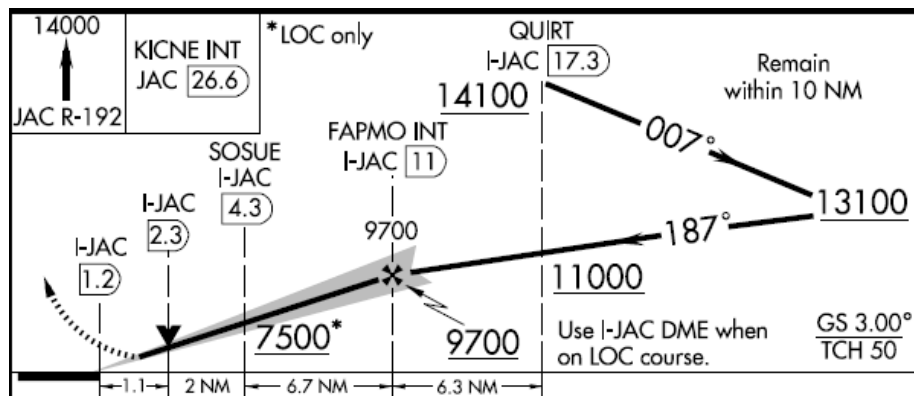
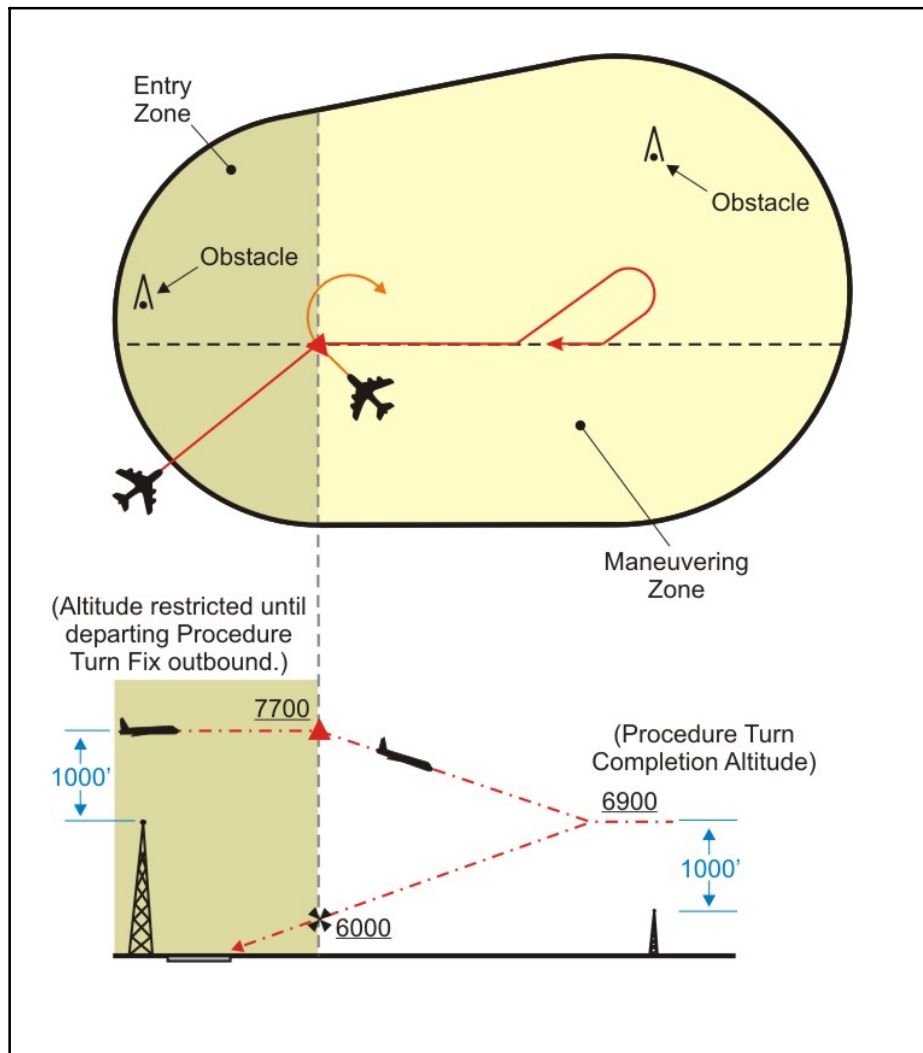


FIG 5-4-17



3. When the approach procedure involves a procedure turn, a maximum speed of not greater than 200 knots (IAS) should be observed from first overhauling the course reversal IAF through the procedure turn maneuver to ensure containment within the obstruction clearance area. Pilots should begin the outbound turn immediately after passing the procedure turn fix. The procedure turn maneuver must be executed within the distance specified in the profile view. The normal procedure turn distance is 10 miles. This may be reduced to a minimum of 5 miles where only Category A or helicopter aircraft are to be operated or increased to as much as 15 miles to accommodate high performance aircraft.

4. A teardrop procedure or penetration turn may be specified in some procedures for a required course reversal. The teardrop procedure consists of departure from an initial approach fix on an outbound course followed by a turn toward and intercepting the inbound course at or prior to the intermediate fix or point. Its purpose is to permit an aircraft to reverse direction and lose considerable altitude within reasonably limited airspace. Where no fix is available to mark the beginning of the intermediate segment, it must be assumed to commence at a point 10 miles prior to the final approach fix. When the facility is located on the airport, an aircraft is considered to be on final approach upon completion of the penetration turn. However, the final approach segment begins on the final approach course 10 miles from the facility.

5. A holding pattern in lieu of procedure turn may be specified for course reversal in some procedures. In such cases, the holding pattern is established over an intermediate fix or a final approach fix. The holding pattern distance or time specified in the profile view must be observed. For a hold-in-lieu-of-PT, the holding pattern direction must be flown as depicted and the specified leg length/timing must not be exceeded. Maximum holding airspeed limitations as set forth for all holding patterns apply. The holding pattern maneuver is completed when the aircraft is established on the inbound course after executing the appropriate entry. If cleared for the approach prior to returning to the holding fix, and the aircraft is at the prescribed altitude, additional circuits of the holding pattern are not necessary nor expected by ATC. If pilots elect to make additional circuits to lose excessive altitude or to become better established on course, it is their responsibility to so advise ATC upon receipt of their approach clearance.

**NOTE—**

*Some approach charts have an arrival holding pattern depicted at the IAF using a “thin line” holding symbol. It is charted where holding is frequently required prior to starting the approach procedure so that detailed holding instructions are not required. The arrival holding pattern is not authorized unless assigned by Air Traffic Control. Holding at the same fix may also be depicted on the enroute chart. A hold-in-lieu of procedure turn is depicted by a “thick line” symbol, and is part of the instrument approach procedure as described in paragraph 5-4-9 (See U. S. Terminal Procedures booklets page E1 for both examples.)*

6. A procedure turn is not required when an approach can be made directly from a specified intermediate fix to the final approach fix. In such cases, the term “NoPT” is used with the appropriate course and altitude to denote that the procedure turn is not required. If a procedure turn is desired, and when cleared to do so by ATC, descent below the procedure turn altitude should not be made until the aircraft is established on the inbound course, since some NoPT altitudes may be lower than the procedure turn altitudes.

**b. Limitations on Procedure Turns**

1. In the case of a radar initial approach to a final approach fix or position, or a timed approach from a holding fix, or where the procedure specifies NoPT, no pilot may make a procedure turn unless, when final approach clearance is received, the pilot so advises

ATC and a clearance is received to execute a procedure turn.

2. When a teardrop procedure turn is depicted and a course reversal is required, this type turn must be executed.

3. When a holding pattern replaces a procedure turn, the holding pattern must be followed, except when RADAR VECTORING is provided or when NoPT is shown on the approach course. The recommended entry procedures will ensure the aircraft remains within the holding pattern’s protected airspace. As in the procedure turn, the descent from the minimum holding pattern altitude to the final approach fix altitude (when lower) may not commence until the aircraft is established on the inbound course. Where a holding pattern is established in-lieu-of a procedure turn, the maximum holding pattern airspeeds apply.

**REFERENCE—**

*AIM, Holding, Paragraph 5-3-§2.*

4. The absence of the procedure turn barb in the plan view indicates that a procedure turn is not authorized for that procedure.

**5-4-10. Timed Approaches from a Holding Fix**

**a. TIMED APPROACHES** may be conducted when the following conditions are met:

1. A control tower is in operation at the airport where the approaches are conducted.

2. Direct communications are maintained between the pilot and the center or approach controller until the pilot is instructed to contact the tower.

3. If more than one missed approach procedure is available, none require a course reversal.

4. If only one missed approach procedure is available, the following conditions are met:

(a) Course reversal is not required; and,

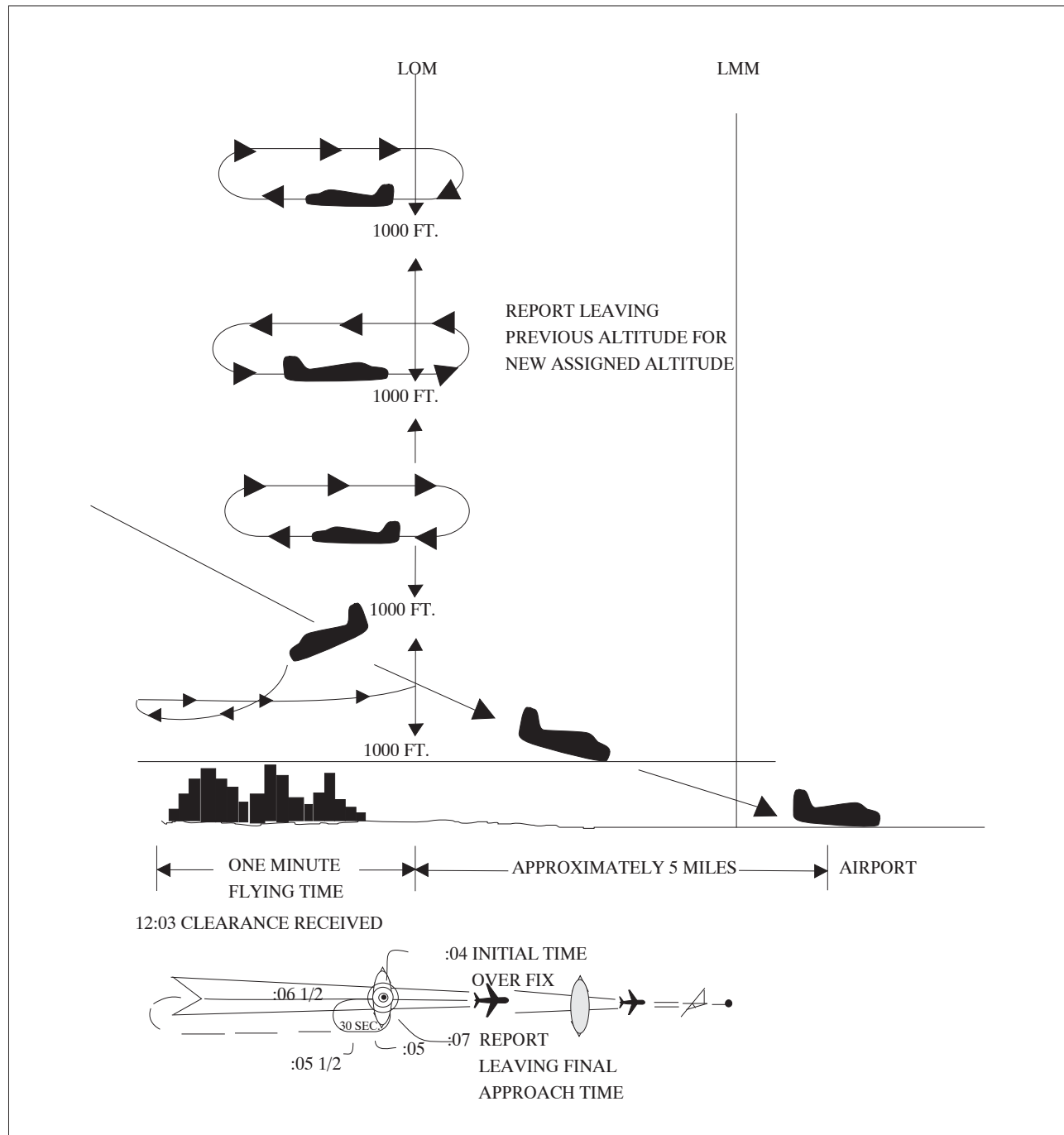
(b) Reported ceiling and visibility are equal to or greater than the highest prescribed circling minimums for the IAP.

5. When cleared for the approach, pilots must not execute a procedure turn. (14 CFR Section 91.175.)

**b.** Although the controller will not specifically state that “timed approaches are in progress,” the assigning of a time to depart the final approach fix inbound (nonprecision approach) or the outer marker or fix used in lieu of the outer marker inbound (precision approach) is indicative that timed approach procedures are being utilized, or in lieu of holding, the controller may use radar vectors to the Final Approach Course to establish a mileage interval between aircraft that will ensure the appropriate time sequence between the final approach fix/outer marker or fix used in lieu of the outer marker and the airport.

**c.** Each pilot in an approach sequence will be given advance notice as to the time they should leave the holding point on approach to the airport. When a time to leave the holding point has been received, the pilot should adjust the flight path to leave the fix as closely as possible to the designated time. (See FIG 5-4-18.)

**FIG 5-4-18**  
**Timed Approaches from a Holding Fix**



**EXAMPLE-**

*At 12:03 local time, in the example shown, a pilot holding, receives instructions to leave the fix inbound at 12:07. These instructions are received just as the pilot has completed turn at the outbound end of the holding pattern and is proceeding inbound towards the fix. Arriving back over the fix, the pilot notes that the time is 12:04 and that there are 3 minutes to lose in order to leave the fix at the assigned time. Since the time remaining is more than two minutes, the pilot plans to fly a race track pattern rather than a 360 degree turn, which would use up 2 minutes. The turns at the ends of the race track pattern will consume approximately 2 minutes. Three minutes to go, minus 2 minutes required for the turns, leaves 1 minute for level flight. Since two portions of level flight will be required to get back to the fix inbound, the pilot halves the 1 minute remaining*



*and plans to fly level for 30 seconds outbound before starting the turn back to the fix on final approach. If the winds were negligible at flight altitude, this procedure would bring the pilot inbound across the fix precisely at the specified time of 12:07. However, if expecting headwind on final approach, the pilot should shorten the 30 second outbound course somewhat, knowing that the wind will carry the aircraft away from the fix faster while outbound and decrease the ground speed while returning to the fix. On the other hand, compensating for a tailwind on final approach, the pilot should lengthen the calculated 30 second outbound heading somewhat, knowing that the wind would tend to hold the aircraft closer to the fix while outbound and increase the ground speed while returning to the fix.*

## **5-4-11. Radar Approaches**

a. The only airborne radio equipment required for radar approaches is a functioning radio transmitter and receiver. The radar controller vectors the aircraft to align it with the runway centerline. The controller continues the vectors to keep the aircraft on course until the pilot can complete the approach and landing by visual reference to the surface. There are two types of radar approaches: Precision (PAR) and Surveillance (ASR).

b. A radar approach may be given to any aircraft upon request and may be offered to pilots of aircraft in distress or to expedite traffic, however, an ASR might not be approved unless there is an ATC operational requirement, or in an unusual or emergency situation. Acceptance of a PAR or ASR by a pilot does not waive the prescribed weather minimums for the airport or for the particular aircraft operator concerned. The decision to make a radar approach when the reported weather is below the established minimums rests with the pilot.

c. PAR and ASR minimums are published on separate pages in the FAA Terminal Procedures Publication (TPP).

**1. A PRECISION APPROACH (PAR)** is one in which a controller provides highly accurate navigational guidance in azimuth and elevation to a pilot. Pilots are given headings to fly, to direct them to, and keep their aircraft aligned with the extended centerline of the landing runway. They are told to anticipate glidepath interception approximately 10 to 30 seconds before it occurs and when to start descent. The published Decision Height will be given only if the pilot requests it. If the aircraft is observed to deviate above or below the glidepath, the pilot is given the relative amount of deviation by use of terms “slightly” or “well” and is expected to adjust the aircraft’s rate of descent/ascent to return to the glidepath. Trend information is also issued with respect to the elevation of the aircraft and may be modified by the terms “rapidly” and “slowly”; e.g., “well above glidepath, coming down rapidly.”

Range from touchdown is given at least once each mile. If an aircraft is observed by the controller to proceed outside of specified safety zone limits in azimuth and/or elevation and continue to operate outside these prescribed limits, the pilot will be directed to execute a missed approach or to fly a specified course unless the pilot has the runway environment (runway, approach lights, etc.) in sight. Navigational guidance in azimuth and elevation is provided the pilot until the aircraft reaches the published Decision Height (DH). Advisory course and glidepath information is furnished by the controller until the aircraft passes over the landing threshold, at which point the pilot is advised of any deviation from the runway centerline. Radar service is automatically terminated upon completion of the approach.

**2. A SURVEILLANCE APPROACH (ASR)** is one in which a controller provides navigational guidance in azimuth only. The pilot is furnished headings to fly to align the aircraft with the extended centerline of the landing runway. Since the radar information used for a surveillance approach is considerably less precise than that used for a precision approach, the accuracy of the approach will not be as great and higher minimums will apply. Guidance in elevation is not possible but the pilot will be advised when to commence descent to the Minimum Descent Altitude (MDA) or, if appropriate, to an intermediate step-down fix Minimum Crossing Altitude and subsequently to the prescribed MDA. In addition, the pilot will be advised of the location of the Missed Approach Point (MAP) prescribed for the procedure and the aircraft’s position each mile on final from the runway, airport or heliport or MAP, as appropriate. If requested by the pilot, recommended altitudes will be issued at each mile, based on the descent gradient established for the procedure, down to the last mile that is at or above the MDA. Normally, navigational guidance will be provided until the aircraft reaches the MAP. Controllers will terminate guidance and instruct the pilot to execute a missed approach unless at the MAP the pilot has the runway,

airport or heliport in sight or, for a helicopter point-in-space approach, the prescribed visual reference with the surface is established. Also, if, at any time during the approach the controller considers that safe guidance for the remainder of the approach cannot be provided, the controller will terminate guidance and instruct the pilot to execute a missed approach. Similarly, guidance termination and missed approach will be effected upon pilot request and, for civil aircraft only, controllers may terminate guidance when the pilot reports the runway, airport/heliport or visual surface route (point-in-space approach) in sight or otherwise indicates that continued guidance is not required. Radar service is automatically terminated at the completion of a radar approach.

**NOTE—**

1. *The published MDA for straight-in approaches will be issued to the pilot before beginning descent. When a surveillance approach will terminate in a circle-to-land maneuver, the pilot must furnish the aircraft approach category to the controller. The controller will then provide the pilot with the appropriate MDA.*

2. **ASR APPROACHES ARE NOT AVAILABLE WHEN AN ATC FACILITY IS USING CENRAP.**

3. **A NO-GYRO APPROACH** is available to a pilot under radar control who experiences circumstances wherein the directional gyro or other stabilized compass is inoperative or inaccurate. When this occurs, the pilot should so advise ATC and request a No-Gyro vector or approach. Pilots of aircraft not equipped with a directional gyro or other stabilized compass who desire radar handling may also request a No-Gyro vector or approach. The pilot should make all turns at standard rate and should execute the turn immediately upon receipt of instructions. For example, “TURN RIGHT,” “STOP TURN.” When a surveillance or precision approach is made, the pilot will be advised after the aircraft has been turned onto final approach to make turns at half standard rate.

## 5-4-12. Radar Monitoring of Instrument Approaches

a. PAR facilities operated by the FAA and the military services at some joint-use (civil and military) and military installations monitor aircraft on instrument approaches and issue radar advisories to the pilot when weather is below VFR minimums (1,000 and 3), at night, or when requested by a pilot. This service is provided only when the PAR Final Approach Course coincides with the final approach of the navigational aid and only during the operational hours of the PAR. The radar advisories serve only as a secondary aid since the pilot has selected the navigational aid as the primary aid for the approach.

b. Prior to starting final approach, the pilot will be advised of the frequency on which the advisories will be transmitted. If, for any reason, radar advisories cannot be furnished, the pilot will be so advised.

c. Advisory information, derived from radar observations, includes information on:

1. Passing the final approach fix inbound (nonprecision approach) or passing the outer marker or fix used in lieu of the outer marker inbound (precision approach).

**NOTE—**

*At this point, the pilot may be requested to report sighting the approach lights or the runway.*

2. Trend advisories with respect to elevation and/or azimuth radar position and movement will be provided.

**NOTE—**

*Whenever the aircraft nears the PAR safety limit, the pilot will be advised that the aircraft is well above or below the glidepath or well left or right of course. Glidepath information is given only to those aircraft executing a precision approach, such as ILS or MLS. Altitude information is not transmitted to aircraft executing other than precision approaches because the descent portions of these approaches generally do not coincide with the depicted PAR glidepath. At locations where the MLS glidepath and PAR glidepath are not coincidental, only azimuth monitoring will be provided.*

3. If, after repeated advisories, the aircraft proceeds outside the PAR safety limit or if a radical deviation is observed, the pilot will be advised to execute a missed approach unless the prescribed visual reference with the surface is established.

d. Radar service is automatically terminated upon completion of the approach.

#### **5-4-13. ILS/MLS Approaches to Parallel Runways**

a. ATC procedures permit ILS instrument approach operations to dual or triple parallel runway configurations. ILS/MLS approaches to parallel runways are grouped into three classes: Parallel (dependent) ILS/MLS Approaches; Simultaneous Parallel (independent) ILS/MLS Approaches; and Simultaneous Close Parallel (independent) ILS Precision Runway Monitor (PRM) Approaches. (See FIG 5-4-19.) The classification of a parallel runway approach procedure is dependent on adjacent parallel runway centerline separation, ATC procedures, and airport ATC radar monitoring and communications capabilities. At some airports one or more parallel localizer courses may be offset up to 3 degrees. Offset localizer configurations result in loss of Category II capabilities and an increase in decision height (50').

b. Parallel approach operations demand heightened pilot situational awareness. A thorough Approach Procedure Chart review should be conducted with, as a minimum, emphasis on the following approach chart information: name and number of the approach, localizer frequency, inbound localizer/azimuth course, glide slope intercept altitude, decision height, missed approach instructions, special notes/procedures, and the assigned runway location/proximity to adjacent runways. Pilots will be advised that simultaneous ILS/MLS or simultaneous close parallel ILS PRM approaches are in use. This information may be provided through the ATIS.

c. The close proximity of adjacent aircraft conducting simultaneous parallel ILS/MLS and simultaneous close parallel ILS PRM approaches mandates strict pilot compliance with all ATC clearances. ATC assigned airspeeds, altitudes, and headings must be complied with in a timely manner. Autopilot coupled ILS/MLS approaches require pilot knowledge of procedures necessary to comply with ATC instructions. Simultaneous parallel ILS/MLS and simultaneous close parallel ILS PRM approaches necessitate precise localizer tracking to minimize final monitor controller intervention, and unwanted No Transgression Zone (NTZ) penetration. In the unlikely event of a breakout, ATC will not assign altitudes lower than the minimum vectoring altitude. Pilots should notify ATC immediately if there is a degradation of aircraft or navigation systems.

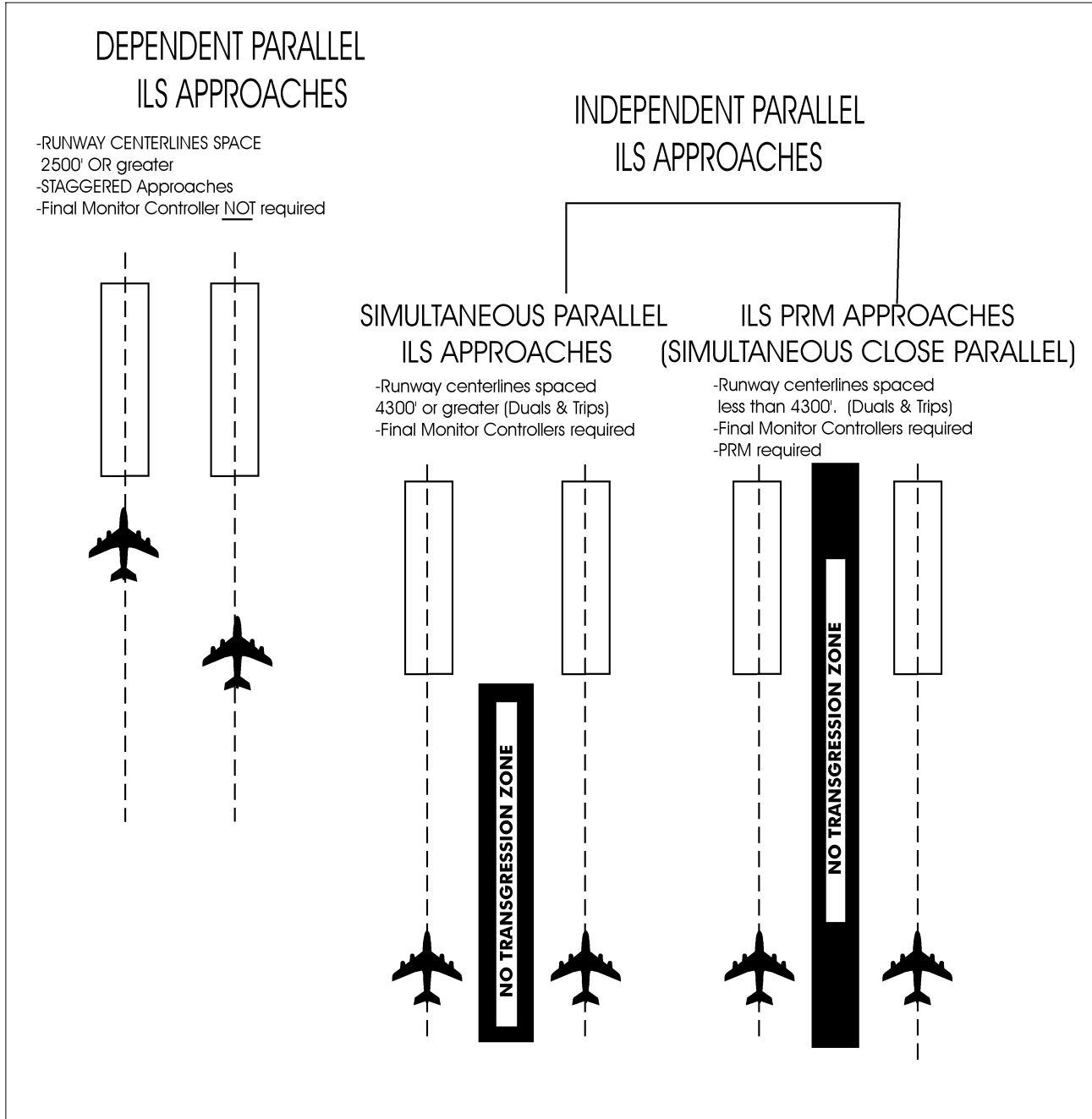
d. Strict radio discipline is mandatory during parallel ILS/MLS approach operations. This includes an alert listening watch and the avoidance of lengthy, unnecessary radio transmissions. Attention must be given to proper call sign usage to prevent the inadvertent execution of clearances intended for another aircraft. Use of abbreviated call signs must be avoided to preclude confusion of aircraft with similar sounding call signs. Pilots must be alert to unusually long periods of silence or any unusual background sounds in their radio receiver. A stuck microphone may block the issuance of ATC instructions by the final monitor controller during simultaneous parallel ILS/MLS and simultaneous close parallel ILS PRM approaches.

#### **REFERENCE-**

*AIM, Chapter 4, Section 2, Radio Communications Phraseology and Techniques, gives additional communications information.*

e. Use of Traffic Collision Avoidance Systems (TCAS) provides an additional element of safety to parallel approach operations. Pilots should follow recommended TCAS operating procedures presented in approved flight manuals, original equipment manufacturer recommendations, professional newsletters, and FAA publications.

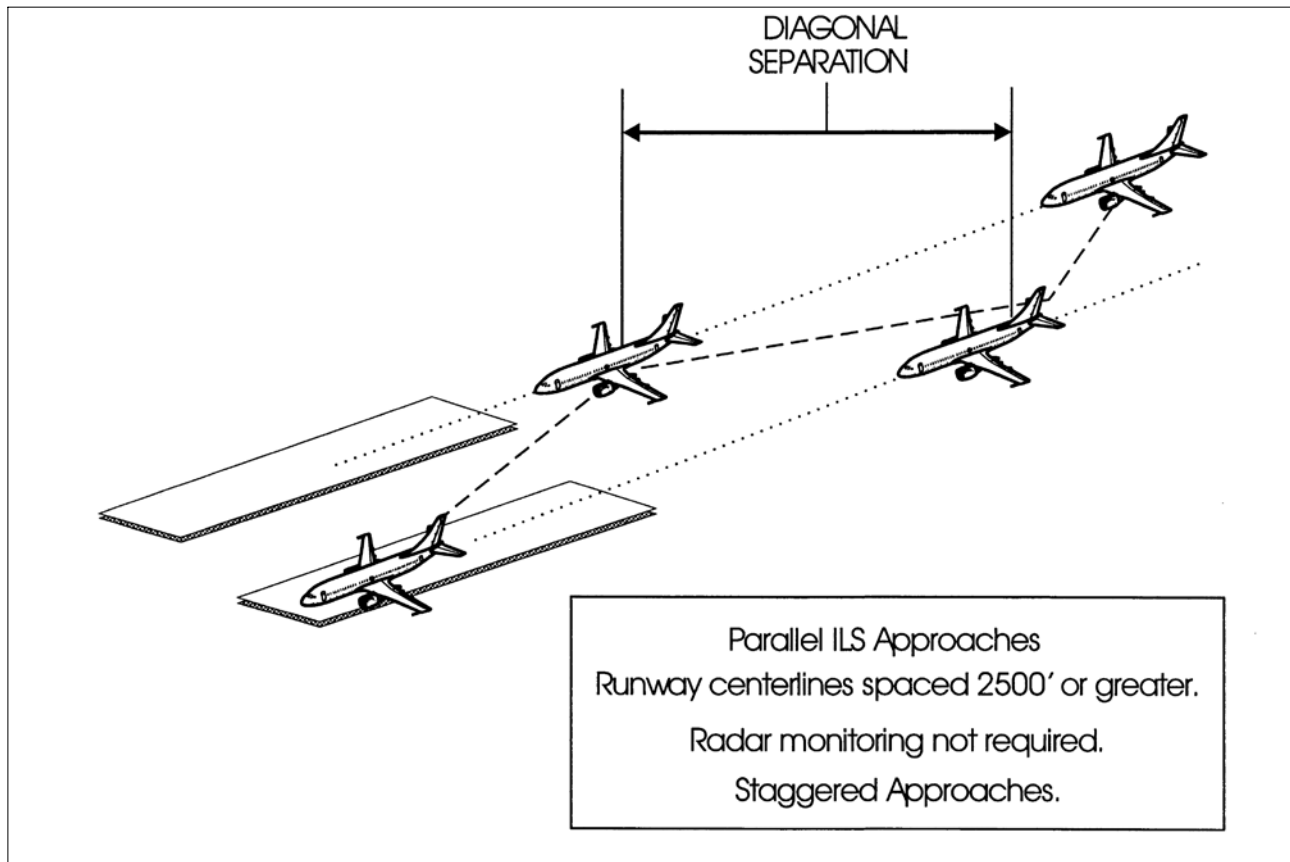
**FIG 5-4-19**  
**Parallel ILS Approaches**



**5-4-14. Parallel ILS/MLS Approaches (Dependent)**

(See FIG 5-4-20.)

FIG 5-4-20  
Staggered ILS Approaches



**a.** Parallel approaches are an ATC procedure permitting parallel ILS/MLS approaches to airports having parallel runways separated by at least 2,500 feet between centerlines. Integral parts of a total system are ILS/MLS, radar, communications, ATC procedures, and required airborne equipment.

**b.** A parallel (dependent) approach differs from a simultaneous (independent) approach in that, the minimum distance between parallel runway centerlines is reduced; there is no requirement for radar monitoring or advisories; and a staggered separation of aircraft on the adjacent localizer/azimuth course is required.

**c.** Aircraft are afforded a minimum of 1.5 miles radar separation diagonally between successive aircraft on the adjacent localizer/azimuth course

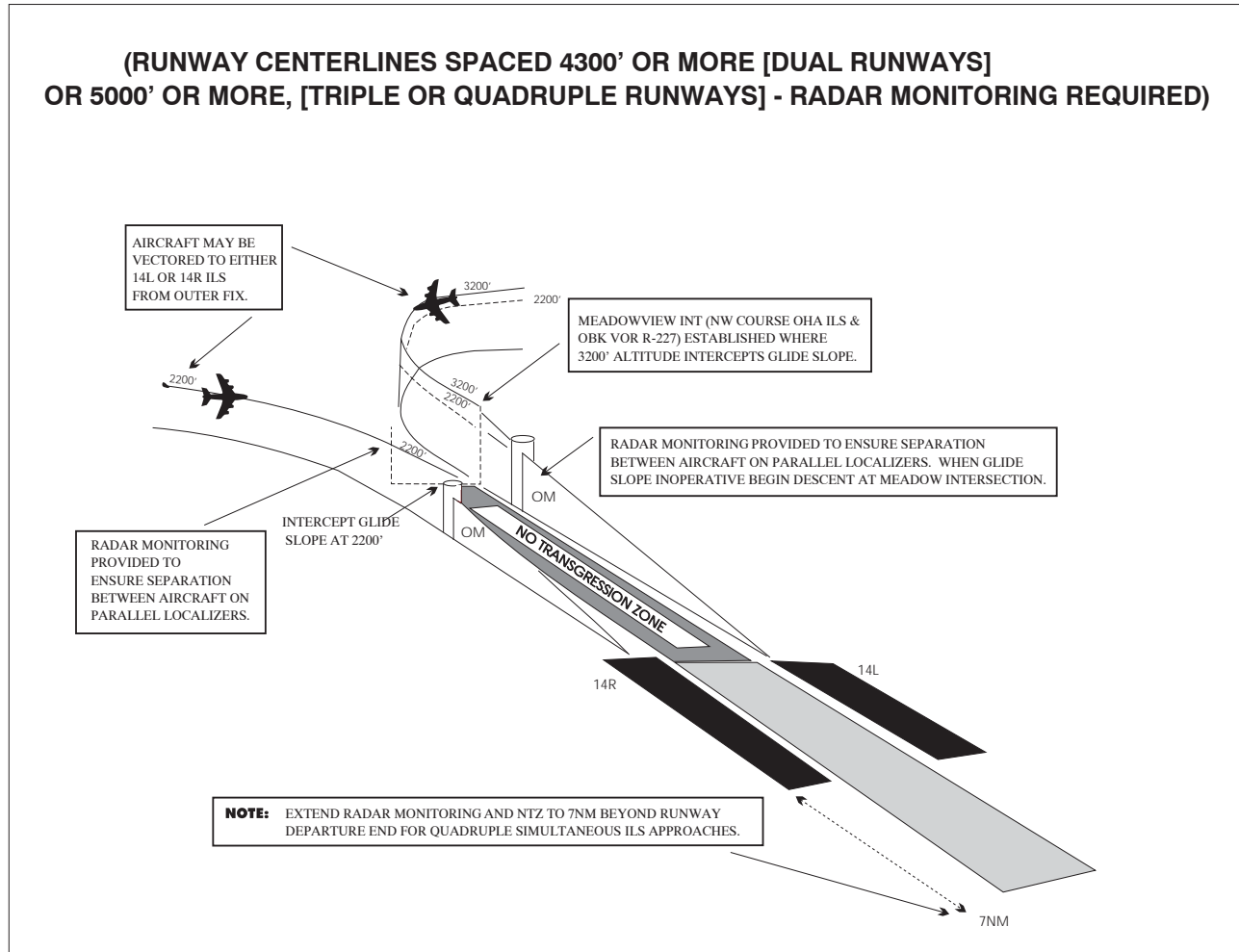
when runway centerlines are at least 2,500 feet but no more than 4,300 feet apart. When runway centerlines are more than 4,300 feet but no more than 9,000 feet apart a minimum of 2 miles diagonal radar separation is provided. Aircraft on the same localizer/azimuth course within 10 miles of the runway end are provided a minimum of 2.5 miles radar separation. In addition, a minimum of 1,000 feet vertical or a minimum of three miles radar separation is provided between aircraft during turn on to the parallel final approach course.

**d.** Whenever parallel ILS/MLS approaches are in progress, pilots are informed that approaches to both runways are in use. In addition, the radar controller will have the interphone capability of communicating with the tower controller where separation responsibility has not been delegated to the tower.

## 5-4-15. Simultaneous Parallel ILS/MLS Approaches (Independent)

(See FIG 5-4-21.)

**FIG 5-4-21**  
**Simultaneous Parallel ILS Approaches**



**a. System.** An approach system permitting simultaneous ILS/MLS approaches to parallel runways with centerlines separated by 4,300 to 9,000 feet, and equipped with final monitor controllers. Simultaneous parallel ILS/MLS approaches require radar monitoring to ensure separation between aircraft on the adjacent parallel approach course. Aircraft position is tracked by final monitor controllers who will issue instructions to aircraft observed deviating from the assigned localizer course. Staggered radar separation procedures are not utilized. Integral parts of a total system are ILS/MLS, radar, communications, ATC procedures, and required airborne equipment. The Approach Procedure Chart permitting simultaneous

parallel ILS/MLS approaches will contain the note "simultaneous approaches authorized RWYS 14L and 14R," identifying the appropriate runways as the case may be. When advised that simultaneous parallel ILS/MLS approaches are in progress, pilots must advise approach control immediately of malfunctioning or inoperative receivers, or if a simultaneous parallel ILS/MLS approach is not desired.

**b. Radar Monitoring.** This service is provided for each simultaneous parallel ILS/MLS approach to ensure aircraft do not deviate from the final approach course. Radar monitoring includes instructions if an aircraft nears or penetrates the prescribed NTZ (an

area 2,000 feet wide located equidistant between parallel final approach courses). This service will be provided as follows:

1. During turn on to parallel final approach, aircraft will be provided 3 miles radar separation or a minimum of 1,000 feet vertical separation. The assigned altitude must be maintained until intercepting the glide path, unless cleared otherwise by ATC. Aircraft will not be vectored to intercept the final approach course at an angle greater than thirty degrees.

2. The final monitor controller will have the capability of overriding the tower controller on the tower frequency.

3. Pilots will be instructed to monitor the tower frequency to receive advisories and instructions.

4. Aircraft observed to overshoot the turn-on or to continue on a track which will penetrate the NTZ will be instructed to return to the correct final approach course immediately. The final monitor controller may also issue missed approach or breakout instructions to the deviating aircraft.

**PHRASEOLOGY–**

*“(Aircraft call sign) YOU HAVE CROSSED THE FINAL APPROACH COURSE. TURN (left/right) IMMEDIATELY AND RETURN TO THE LOCALIZER/AZIMUTH COURSE,”*

*or*

*“(aircraft call sign) TURN (left/right) AND RETURN TO THE LOCALIZER/AZIMUTH COURSE.”*

5. If a deviating aircraft fails to respond to such instructions or is observed penetrating the NTZ, the aircraft on the adjacent final approach course may be instructed to alter course.

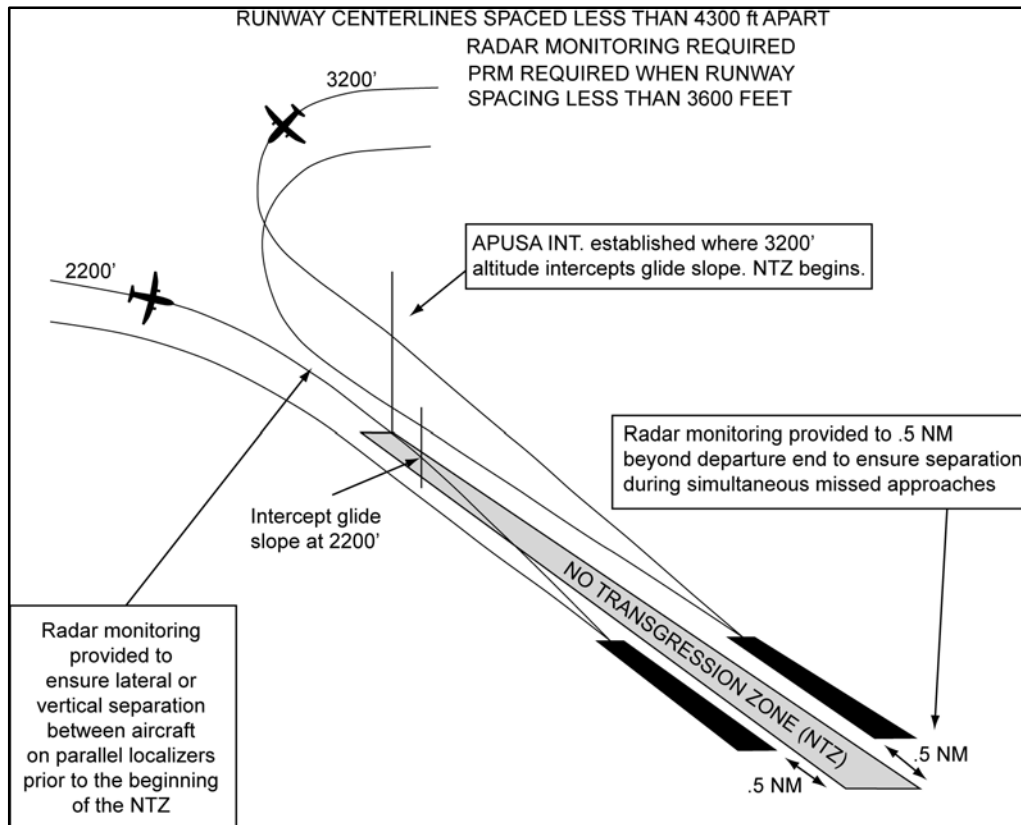
**PHRASEOLOGY–**

*“TRAFFIC ALERT (aircraft call sign) TURN (left/right) IMMEDIATELY HEADING (degrees), (climb/descend) AND MAINTAIN (altitude).”*

6. Radar monitoring will automatically be terminated when visual separation is applied, the aircraft reports the approach lights or runway in sight, or the aircraft is 1 mile or less from the runway threshold (for runway centerlines spaced 4,300 feet or greater). Final monitor controllers will **not** advise pilots when radar monitoring is terminated.

**5-4-16. Simultaneous Close Parallel ILS PRM and RNAV (GPS) PRM Approaches (Independent) and Simultaneous Offset Instrument Approaches (SOIA)**  
(See FIG 5-4-22.)

**FIG 5-4-22**  
**ILS PRM Approaches**  
**Simultaneous Close Parallel)**



**a. System.**

1. ILS PRM is an acronym for Instrument Landing System/Precision Runway Monitor.

(a) No Transgression Zone (NTZ) monitoring is required for all simultaneous close parallel PRM approaches. A Precision Runway Monitor (PRM) is an NTZ monitoring system that is required to conduct simultaneous ILS PRM approaches to parallel runways with centerlines separated by **less** than 3,600 feet but at least 3,400 feet for parallel approach courses, and at least 3,000 feet if one ILS is offset by 2.5 to 3.0 degrees. The airspace between the final approach courses is provided by two PRM monitor controllers, one for each approach course. To qualify for reduced lateral runway separation when runway spacing is less than 3,600 feet, NTZ monitor controllers must utilize high update radar or other high

update surveillance system. The PRM system displays almost instantaneous radar information. The system consists of high resolution ATC radar displays, automated tracking software which provides PRM monitor controllers with aircraft identification, position, speed and a ten-second projected position, as well as visual and aural controller alerts. The PRM system is a supplemental requirement for simultaneous close parallel approaches below 3,600 feet in addition to the system requirements for simultaneous parallel ILS/MLS approaches described in Paragraph 5-4-15, Simultaneous Parallel ILS/MLS Approaches (Independent).

RNAV (GPS) PRM approaches may be substituted for one or both of the ILS PRM approaches in a simultaneous close parallel operation, or may be substituted for the ILS PRM and/or the LDA PRM approach in a SOIA operation. ATC may substitute



RNAV (GPS) PRM approaches for one or both of the ILS PRM approaches, or in the case of SOIA, for either or both of the ILS PRM and LDA PRM approaches. The pilot may also request to fly the RNAV (GPS) PRM approach in lieu of either the ILS PRM and LDA PRM approach. In the event of the loss of ground based NAVAIDS, the ATIS may advertise RNAV (GPS) PRM approaches to the effected runway or runways. RNAV (GPS) PRM approaches carry the same applicable notations as do ILS PRM and LDA PRM approaches. The Attention All Users Page addresses ILS PRM, LDA PRM, and RNAV (GPS) PRM approaches as applicable. When an RNAV (GPS) PRM approach is used in lieu of an ILS PRM or LDA PRM approach, vertical guidance must be used. In all cases, the RNAV (GPS) PRM approach utilizes the same fixes, crossing altitudes, and missed approach procedure as contained in the ILS PRM or LDA PRM approach which it overlays. In the discussion below, an RNAV (GPS) PRM approach may be substituted for an ILS PRM or LDA PRM approach. The RNAV (GPS) lateral course may be substituted for reference to the ILS or LDA course. In SOIA, the RNAV (GPS) PRM Missed Approach Point (MAP) may be substituted for the LDA PRM MAP.

**NOTE—**

*All simultaneous independent approaches to runways or approach courses less than 4,300 feet apart are categorized as simultaneous close parallel and include PRM in the approach name. Between 4,299 feet and 3,600 feet runway spacing, PRM or other high update rate surveillance system to monitor the NTZ is not required.*

(b) Simultaneous close parallel ILS PRM approaches are depicted on a separate Approach Procedure Chart titled ILS PRM Rwy XXX (Simultaneous Close Parallel).

2. SOIA is an acronym for Simultaneous Offset Instrument Approach, a procedure used to conduct simultaneous approaches to runways spaced less than 3,000 feet, but at least 750 feet apart. The SOIA procedure utilizes an ILS PRM approach to one runway and an offset Localizer Type Directional Aid (LDA) PRM approach with glide slope to the adjacent runway. In SOIA operations, aircraft are paired, with the aircraft conducting the ILS PRM approach always positioned slightly ahead of the aircraft conducting the LDA PRM approach.

(a) The ILS PRM approach plates used in SOIA operations are identical to other ILS PRM approach plates, with an additional note, which provides the separation between the two runways used for simultaneous approaches. The LDA PRM approach plate displays the required notations for closely spaced approaches as well as depicting the visual segment of the approach.

(b) When course centerline spacing is less than 3600 feet but at least 3000 feet, controllers monitor the SOIA ILS PRM and LDA PRM approaches with a PRM system using high update radar and high-resolution ATC radar displays in exactly the same manner as is done for ILS PRM approaches. The procedures and system requirements for SOIA ILS PRM and LDA PRM approaches are identical with those used for simultaneous close parallel ILS PRM approaches until near the LDA PRM approach missed approach point (MAP) -- where visual acquisition of the ILS aircraft by the aircraft conducting the LDA PRM approach occurs. Since the ILS PRM and LDA PRM approaches are identical except for the visual segment in the SOIA concept, an understanding of the procedures for conducting ILS PRM approaches is essential before conducting a SOIA ILS PRM or LDA PRM operation.

(c) In SOIA, the approach course separation (instead of the runway separation) meets established close parallel approach criteria. Refer to FIG 5-4-23 for the generic SOIA approach geometry. A visual segment of the LDA PRM approach is established between the LDA MAP and the runway threshold. Aircraft transition in visual conditions from the LDA course, beginning at the LDA MAP, to align with the runway and can be stabilized by 500 feet above ground level (AGL) on the extended runway centerline. Aircraft will be "paired" in SOIA operations, with the ILS aircraft ahead of the LDA aircraft prior to the LDA aircraft reaching the LDA MAP. A cloud ceiling for the approach is established so that the LDA aircraft has nominally 30 seconds to acquire the leading ILS aircraft prior to the LDA aircraft reaching the LDA MAP. If visual acquisition is not accomplished, a missed approach must be executed at the LDA MAP.

**b. Requirements.**

Besides system requirements as identified in subparagraph a, above, all pilots must have completed special training before accepting a clearance to con-

duct ILS PRM or LDA PRM Simultaneous Close Parallel Approaches.

**1. Pilot Training Requirement.** Pilots must complete **special pilot training**, as outlined below, before accepting a clearance for a simultaneous close parallel ILS PRM or LDA PRM approach.

(a) For operations under 14 CFR Parts 121, 129, and 135 pilots must comply with FAA approved company training as identified in their Operations Specifications. Training, at a minimum, must require pilots to view the FAA video “ILS PRM AND SOIA APPROACHES: INFORMATION FOR AIR CARRIER PILOTS.” Refer to [http://www.faa.gov/training\\_testing/training/prm/](http://www.faa.gov/training_testing/training/prm/) for additional information and to view or download the video.

(b) For operations under Part 91:

(1) Pilots operating **transport category** aircraft must be familiar with PRM operations as contained in this section of the AIM. In addition, **pilots operating transport category aircraft** must view the FAA video “ILS PRM AND SOIA APPROACHES: INFORMATION FOR AIR CARRIER PILOTS.” Refer to [http://www.faa.gov/training\\_testing/training/prm/](http://www.faa.gov/training_testing/training/prm/) for additional information and to view or download the video.

(2) Pilots *not* operating **transport category** aircraft must be familiar with PRM and SOIA operations as contained in this section of the AIM. The FAA strongly recommends that pilots *not* involved in **transport category** aircraft operations view the FAA video, “ILS PRM AND SOIA APPROACHES: INFORMATION FOR GENERAL AVIATION PILOTS.” Refer to [http://www.faa.gov/training\\_testing/training/prm/](http://www.faa.gov/training_testing/training/prm/) for additional information and to view or download the video.

**2. ATC Directed Breakout.** An ATC directed “breakout” is defined as a vector off the ILS or LDA approach course in response to another aircraft penetrating the NTZ, the 2,000 foot wide area located equidistance between the two approach courses that is monitored by the PRM monitor controllers.

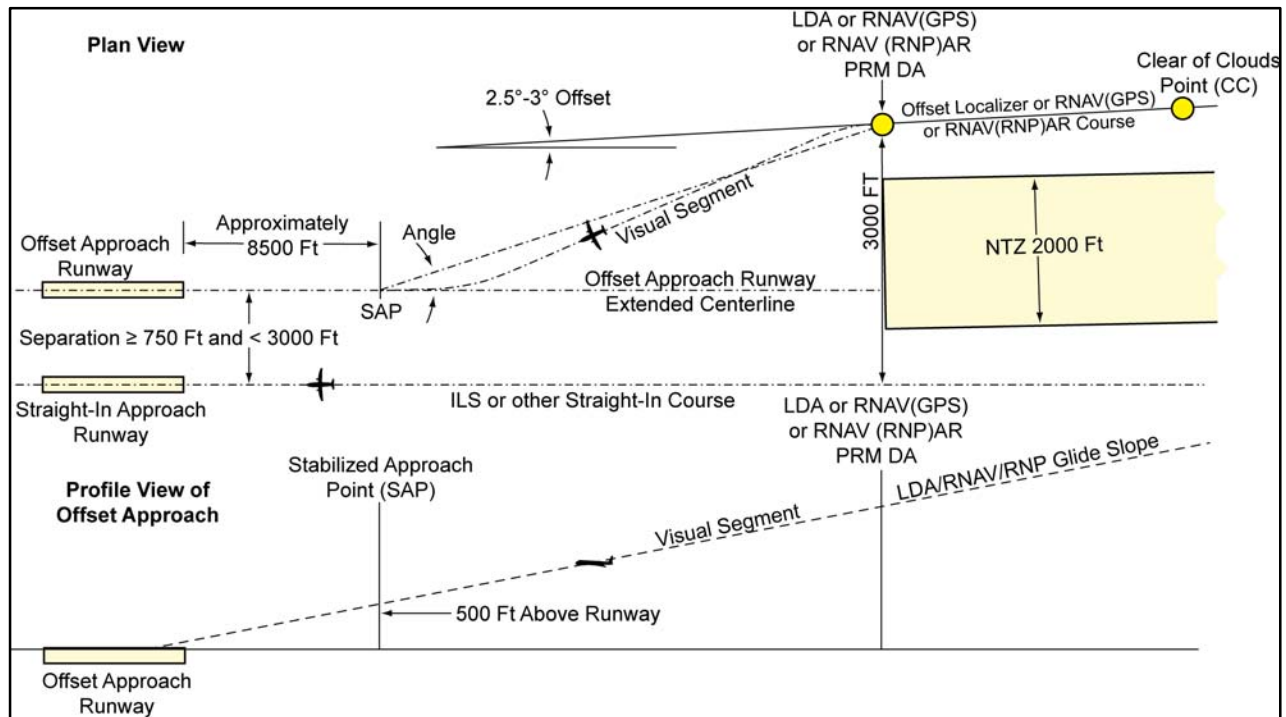
**3. Dual Communications.** The aircraft flying the ILS PRM or LDA PRM approach must have the capability of enabling the pilot/s to listen to two communications frequencies simultaneously.

**c. Radar Monitoring.** Simultaneous close parallel ILS PRM and LDA PRM approaches require that final monitor controllers utilize the PRM system when runways (or in the case of SOIA, the final approach course separation) are spaced less than 3,600 feet but at least 3,000 feet apart to ensure prescribed separation standards are met. Procedures and communications phraseology are also described in Paragraph 5-4-15, Simultaneous Parallel ILS/MLS Approaches (Independent). A minimum of 3 miles radar separation or 1,000 feet vertical separation will be provided during the turn-on to close parallel final approach courses. To ensure separation is maintained, and in order to avoid an imminent situation during simultaneous close parallel ILS PRM or SOIA ILS PRM and LDA PRM approaches, pilots must immediately comply with PRM monitor controller instructions. In the event of a missed approach, radar monitoring is provided to one-half mile beyond the more distant of the two runway departure ends for ILS PRM approaches. In SOIA, PRM radar monitoring terminates at the LDA MAP. Final monitor controllers will **not** notify pilots when radar monitoring is terminated.

**d. Attention All Users Page (AAUP).** Multiple PRM approach charts at the same airport have a single AAUP associated with them that must be referred to in preparation for conducting the approach. This page contains the following instructions that must be followed if the pilot is unable to accept an ILS PRM or LDA PRM approach.

**1.** At airports that conduct PRM operations, (ILS PRM, and the case of airports where SOIAs are conducted, ILS PRM and LDA PRM approaches) pilots who are unable to participate will be afforded appropriate arrival services as operational conditions permit and must notify the controlling ARTCC as soon as practical, but at least 100 miles from destination.

FIG 5-4-23  
SOIA Approach Geometry



**NOTE—**

- SAP** The SAP is a design point along the extended centerline of the intended landing runway on the glide slope at 500 feet above the landing threshold. It is used to verify a sufficient distance is provided for the visual maneuver after the missed approach point (MAP) to permit the pilots to conform to approved, stabilized approach criteria.
- MAP** The point along the LDA where the course separation with the adjacent ILS reaches 3,000 feet. The altitude of the glide slope at that point determines the approach minimum descent altitude and is where the NTZ terminates. Maneuvering inside the MAP is done in visual conditions.
- Angle** Angle formed at the intersection of the extended LDA runway centerline and a line drawn between the LDA MAP and the SAP. The size of the angle is determined by the FAA SOIA computer design program, and is dependent on whether CAT D aircraft use the LDA and the spacing between the runways.
- Visibility** Distance from MAP to runway threshold in statute miles (light credit applies).
- Procedure** LDA aircraft must see the runway landing environment and, if less than standard radar separation exists between the aircraft on the adjacent ILS course, the LDA aircraft must visually acquire the ILS aircraft and report it in sight to ATC prior to the LDA MAP.
- CC** Clear of Clouds.

2. The AAUP covers the following operational topics:

Bullet points are published which summarize the PRM procedures which apply to each approach. The following information may be summarized in the bullet points or published in more detail in the Expanded Procedures section of the AAUP.

(a) **ATIS.** When the ATIS broadcast advises ILS PRM approaches are in progress (or ILS PRM and LDA PRM approaches in the case of SOIA), pilots should brief to fly the ILS PRM or LDA PRM approach. If later advised to expect the ILS or LDA approach (should one be published), the ILS PRM or LDA PRM chart may be used after completing the following briefing items. The pilot may also request to fly the RNAV (GPS) PRM approach in lieu of either the ILS PRM and LDA PRM approach. In the event of the loss of ground based NAVAIDS, the ATIS may advertise RNAV (GPS) PRM approaches to the effected runway or runways.

(1) Minimums and missed approach procedures are unchanged.

(2) PRM Monitor frequency no longer required.

(3) ATC may assign a lower altitude for glide slope intercept.

**NOTE–**

*In the case of the LDA PRM approach, this briefing procedure only applies if an LDA-DME approach is also published.*

In the case of the SOIA ILS PRM and LDA PRM procedure, the AAUP describes the weather conditions in which simultaneous approaches are authorized:

Simultaneous approach weather minimums are X,XXX feet (ceiling), x miles (visibility).

(b) **Dual VHF Communications Required.** To avoid blocked transmissions, each runway will have two frequencies, a primary and a PRM monitor frequency. The tower controller will transmit on both frequencies. The monitor controller's transmissions, if needed, will override both frequencies. Pilots will ONLY transmit on the tower controller's frequency, but will listen to both frequencies. Select the PRM monitor frequency audio only when instructed

by ATC to contact the tower. The volume levels should be set about the same on both radios so that the pilots will be able to hear transmissions on at least one frequency if the other is blocked. Site specific procedures take precedence over the general information presented in this paragraph. Refer to the AAUP for applicable procedures at specific airports.

**NOTE–**

*At SFO, pilots conducting SOIA operations select the monitor frequency audio when communicating with the final radar controller. In this special case, the monitor controller's transmissions, if required, override the final controller's frequency.*

(c) **Breakouts.** Breakouts differ from other types of abandoned approaches in that they can happen anywhere and unexpectedly. Pilots directed by ATC to break off an approach must assume that an aircraft is blundering toward them and a breakout must be initiated **immediately**.

(1) **Hand-fly breakouts.** All breakouts are to be hand-flown to ensure the maneuver is accomplished in the shortest amount of time.

(2) **ATC Directed "Breakouts."** ATC directed breakouts will consist of a turn and a climb or descent. Pilots must always initiate the breakout in response to an air traffic controller's instruction. Controllers will give a descending breakout only when there are no other reasonable options available, but in no case will the descent be below the minimum vectoring altitude (MVA) which provides at least 1,000 feet required obstruction clearance. The AAUP may provide the MVA in the final approach segment as X,XXX feet at (Name) Airport.

**NOTE–**

*"TRAFFIC ALERT." If an aircraft enters the "NO TRANSGRESSION ZONE" (NTZ), the controller will breakout the threatened aircraft on the adjacent approach. The phraseology for the breakout will be:*

**PHRASEOLOGY–**

*TRAFFIC ALERT, (aircraft call sign) TURN (left/right) IMMEDIATELY, HEADING (degrees), CLIMB/DESCEND AND MAINTAIN (altitude).*

(d) **ILS PRM Navigation.** The pilot may find crossing altitudes published along the final approach course. If the approach geometry warrants it, the pilot is advised that descending on the ILS glideslope ensures complying with any charted crossing restrictions.

## **SOIA and ILS PRM differences as noted on the AAUP**

**(e) ILS PRM, LDA Traffic (only published on the AAUP when the ILS PRM approach is used in conjunction with an LDA PRM approach to the adjacent runway).** To provide better situational awareness, and because traffic on the LDA may be visible on the ILS aircraft's TCAS, pilots are reminded of the fact that aircraft will be maneuvering behind them to align with the adjacent runway. While conducting the ILS PRM approach to Runway XXX, other aircraft may be conducting the offset LDA PRM approach to Runway XXX. These aircraft will approach from the (left/right)-rear and will realign with Runway XXX after making visual contact with the ILS traffic. Under normal circumstances, these aircraft will not pass the ILS traffic.

**SOIA LDA PRM Items.** The AAUP section for the SOIA LDA PRM approach contains most information found in the ILS PRM section. It replaces certain information as seen below and provides pilots with the procedures to be used in the visual segment of the LDA PRM approach from the LDA MAP until landing.

**(f) SOIA LDA PRM Navigation (replaces ILS PRM (d) and (e) above).** The pilot may find crossing altitudes published along the final approach course. The pilot is advised that descending on the LDA glideslope ensures complying with any charted crossing restrictions. Remain on the LDA course until passing XXXXX (LDA MAP name) intersection prior to maneuvering to align with the centerline of Runway XXX.

**(g) SOIA (Name) Airport Visual Segment (replaces ILS PRM (e) above).** Pilot procedures for navigating beyond the LDA MAP are spelled out. If ATC advises that there is traffic on the adjacent ILS, pilots are authorized to continue past the LDA MAP to align with runway centerline when:

- (1) the ILS traffic is in sight and is expected to remain in sight,
- (2) ATC has been advised that "traffic is in sight." (ATC is not required to acknowledge this transmission),
- (3) the runway environment is in sight.

Otherwise, a missed approach must be executed. Between the LDA MAP and the runway threshold, pi-

lots conducting the LDA PRM approach are responsible for separating themselves visually from traffic conducting the ILS PRM approach to the adjacent runway, which means maneuvering the aircraft as necessary to avoid that traffic until landing, and providing wake turbulence avoidance, if applicable. Pilots maintaining visual separation should advise ATC, as soon as practical, if visual contact with the aircraft conducting the ILS PRM approach is lost and execute a missed approach unless otherwise instructed by ATC.

## **e. Differences between ILS and ILS PRM approaches of importance to the pilot.**

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

**2. Communications.** To help in avoiding communication problems caused by stuck microphones and two parties talking at the same time, two frequencies for each runway will be in use during ILS PRM and LDA PRM approach operations, the primary tower frequency and the PRM monitor frequency. The tower controller transmits and receives in a normal fashion on the primary frequency and also transmits on the PRM monitor frequency. The moni-

or controller's transmissions override on both frequencies. The pilots flying the approach will listen to both frequencies but only transmit on the primary tower frequency. If the PRM monitor controller initiates a breakout and the primary frequency is blocked by another transmission, the breakout instruction will still be heard on the PRM monitor frequency.

**NOTE—**

*At some airports, the override capability may be on other than the tower frequency (KSFO overrides the final radar controller frequency). Pilots should carefully review the dual communications requirements on the AAUP prior to accepting a PRM approach.*

**3. Hand-flown Breakouts.** The use of the autopilot is encouraged while flying an ILS PRM or LDA PRM approach, but the autopilot must be disengaged in the rare event that a breakout is issued. Simulation studies of breakouts have shown that a hand-flown breakout can be initiated consistently faster than a breakout performed using the autopilot.

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

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

**5. Breakouts.** The probability is extremely low that an aircraft will "blunder" from its assigned approach course and enter the NTZ, causing ATC to "breakout" the aircraft approaching on the adjacent

ILS or LDA course. However, because of the close proximity of the final approach courses, it is essential that pilots follow the ATC breakout instructions precisely and expeditiously. The controller's "breakout" instructions provide conflict resolution for the threatened aircraft, with the turn portion of the "breakout" being the single most important element in achieving maximum protection. A descending breakout will only be issued when it is the only controller option. In no case will the controller descend an aircraft below the MVA, which will provide at least 1,000 feet clearance above obstacles. The pilot is not expected to exceed 1,000 feet per minute rate of descent in the event a descending breakout is issued.

### **5-4-17. Simultaneous Converging Instrument Approaches**

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

**b.** The basic concept requires that dedicated, separate standard instrument approach procedures be developed for each converging runway included. Missed Approach Points must be at least 3 miles apart and missed approach procedures ensure that missed approach protected airspace does not overlap.

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

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

### **5-4-18. RNP AR Instrument Approach Procedures**

These procedures require authorization analogous to the special authorization required for Category II or III ILS procedures. Authorization required (AR)

procedures are to be conducted by aircrews meeting special training requirements in aircraft that meet the specified performance and functional requirements.

#### **a. Unique characteristics of RNP AR Approaches**

**1. RNP value.** Each published line of minima has an associated RNP value. The indicated value defines the lateral and vertical performance requirements. A minimum RNP type is documented as part of the RNP AR authorization for each operator and may vary depending on aircraft configuration or operational procedures (e.g., GPS inoperative, use of flight director vice autopilot).

**2. Curved path procedures.** Some RNP approaches have a curved path, also called a radius-to-a-fix (RF) leg. Since not all aircraft have the capability to fly these arcs, pilots are responsible for knowing if they can conduct an RNP approach with an arc or not. Aircraft speeds, winds and bank angles have been taken into consideration in the development of the procedures.

**3. RNP required for extraction or not.** Where required, the missed approach procedure may use RNP values less than RNP-1. The reliability of the navigation system has to be very high in order to conduct these approaches. Operation on these procedures generally requires redundant equipment, as no single point of failure can cause loss of both approach and missed approach navigation.

**4. Non-standard speeds or climb gradients.** RNP AR approaches are developed based on standard approach speeds and a 200 ft/NM climb gradient in the missed approach. Any exceptions to these standards will be indicated on the approach procedure, and the operator should ensure they can comply with any published restrictions before conducting the operation.

**5. Temperature Limits.** For aircraft using barometric vertical navigation (without temperature compensation) to conduct the approach, low and high-temperature limits are identified on the procedure. Cold temperatures reduce the glidepath angle while high temperatures increase the glidepath angle. Aircraft using baro VNAV with temperature compensation or aircraft using an alternate means for vertical guidance (e.g., SBAS) may disregard the temperature restrictions. The charted temperature limits are evaluated for the final approach segment only. Regardless of charted temperature limits or temperature compensation by the FMS, the pilot may need to manually compensate for cold temperature on minimum altitudes and the decision altitude.

**6. Aircraft size.** The achieved minimums may be dependent on aircraft size. Large aircraft may require higher minimums due to gear height and/or wingspan. Approach procedure charts will be annotated with applicable aircraft size restrictions.

## b. Types of RNP AR Approach Operations

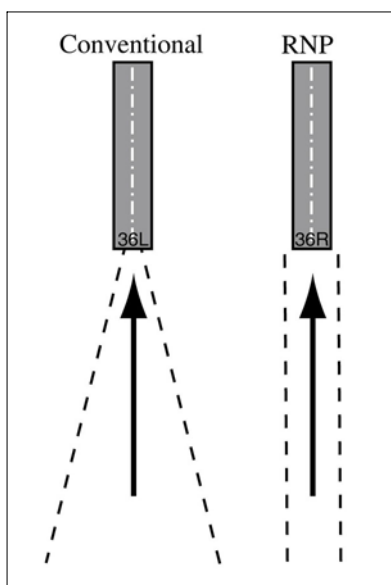
### 1. RNP Stand-alone Approach Operations.

RNP AR procedures can provide access to runways regardless of the ground-based NAVAID infrastructure, and can be designed to avoid obstacles, terrain, airspace, or resolve environmental constraints.

### 2. RNP Parallel Approach (RPA)

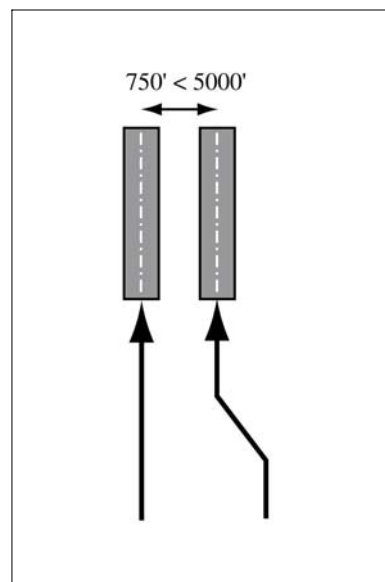
**Operations.** RNP AR procedures can be used for parallel approaches where the runway separation is adequate (See FIG 5-4-24). Parallel approach procedures can be used either simultaneously or as stand-alone operations. They may be part of either independent or dependent operations depending on the ATC ability to provide radar monitoring.

FIG 5-4-24



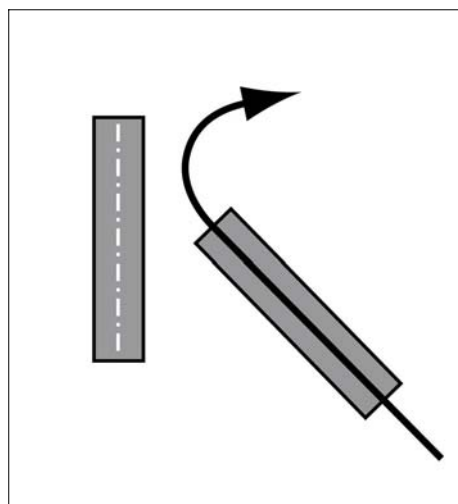
**3. RNP Parallel Approach Runway Transitions (RPAT) Operations.** RPAT approaches begin as a parallel IFR approach operation using simultaneous independent or dependent procedures. (See FIG 5-4-25). Visual separation standards are used in the final segment of the approach after the final approach fix, to permit the RPAT aircraft to transition in visual conditions along a predefined lateral and vertical path to align with the runway centerline.

FIG 5-4-25



**4. RNP Converging Runway Operations.** At airports where runways converge, but may or may not intersect, an RNP AR approach can provide a precise curved missed approach path that conforms to aircraft separation minimums for simultaneous operations (See FIG 5-4-26). By flying this curved missed approach path with high accuracy and containment provided by RNP, dual runway operations may continue to be used to lower ceiling and visibility values than currently available. This type of operation allows greater capacity at airports where it can be applied.

FIG 5-4-26





### 5-4-19. Side-step Maneuver

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

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

**NOTE—**

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

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

### 5-4-20. Approach and Landing Minimums

a. **Landing Minimums.** The rules applicable to landing minimums are contained in 14 CFR Section 91.175. TBL 5-4-1 may be used to convert RVR to ground or flight visibility. For converting RVR values that fall between listed values, use the next higher RVR value; do not interpolate. For example, when converting 1800 RVR, use 2400 RVR with the resultant visibility of  $1\frac{1}{2}$  mile.

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

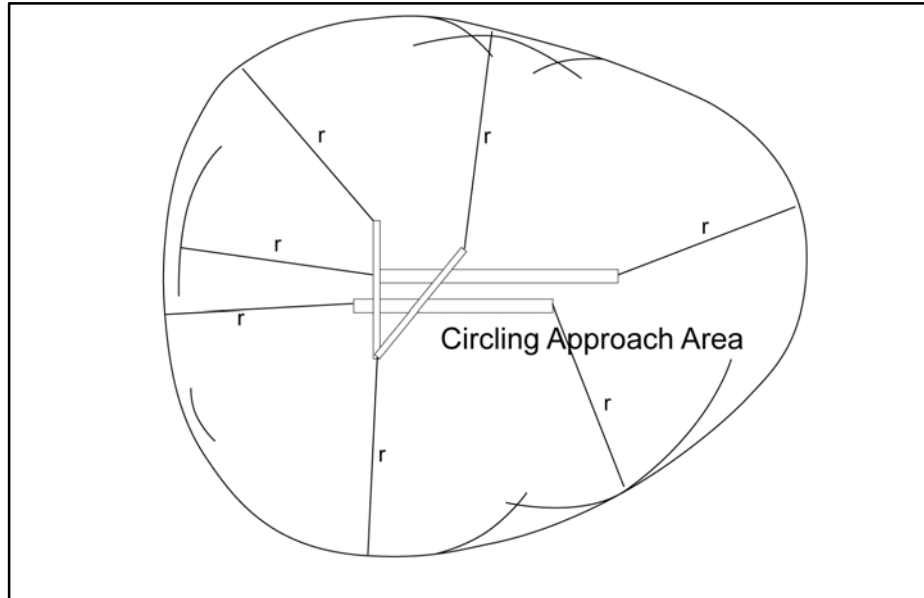
TBL 5-4-1

RVR Value Conversions

RVR	Visibility (statute miles)
1600	$\frac{1}{4}$
2400	$\frac{1}{2}$
3200	$\frac{5}{8}$
4000	$\frac{3}{4}$
4500	$\frac{7}{8}$
5000	1
6000	$1\frac{1}{4}$

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

**FIG 5-4-27**  
**Final Approach Obstacle Clearance**



**NOTE-**

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

**FIG 5-4-28**  
**Standard and Expanded Circling Approach Radii in the U.S. TPP**

**STANDARD CIRCLING APPROACH MANEUVERING RADIUS**

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

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

**C EXPANDED CIRCLING APPROACH MANEUVERING AIRSPACE RADIUS**

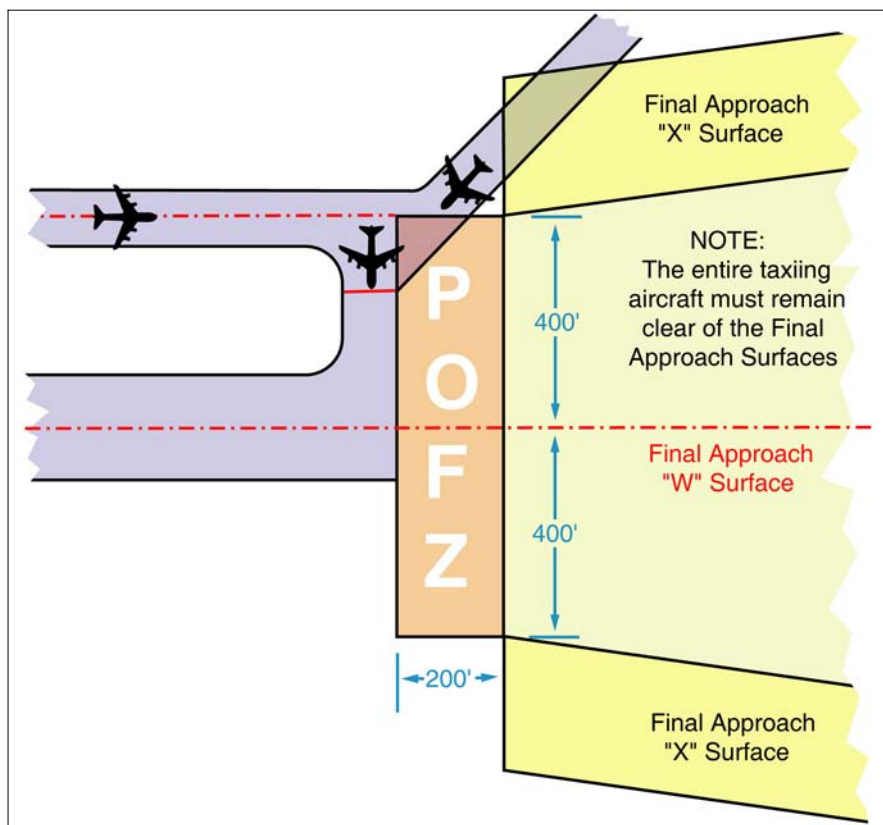
Circling approach protected areas developed after late 2012 use the radius distance shown in the following table, expressed in nautical miles (NM), dependent on aircraft approach category, and the altitude of the circling MDA, which accounts for true airspeed increase with altitude. The approaches using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

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

**2. Precision Obstacle Free Zone (POFZ).** A volume of airspace above an area beginning at the runway threshold, at the threshold elevation, and centered on the extended runway centerline. The POFZ is 200 feet (60m) long and 800 feet (240m) wide. The POFZ must be clear when an aircraft on a vertically guided final approach is within 2 nautical miles of the runway threshold and the reported ceiling is below 250 feet or visibility less than  $\frac{3}{4}$  statute mile

(SM) (or runway visual range below 4,000 feet). If the POFZ is not clear, the MINIMUM authorized height above touchdown (HAT) and visibility is 250 feet and  $\frac{3}{4}$  SM. The POFZ is considered clear even if the wing of the aircraft holding on a taxiway waiting for runway clearance penetrates the POFZ; however, neither the fuselage nor the tail may infringe on the POFZ. The POFZ is applicable at all runway ends including displaced thresholds.

FIG 5-4-29  
Precision Obstacle Free Zone (POFZ)



**c. Straight-in Minimums** are shown on the IAP when the final approach course is within 30 degrees of the runway alignment (15 degrees for GPS IAPs) and a normal descent can be made from the IFR altitude shown on the IAP to the runway surface. When either the normal rate of descent or the runway alignment factor of 30 degrees (15 degrees for GPS IAPs) is exceeded, a straight-in minimum is not published and a circling minimum applies. The fact that a straight-in minimum is not published does not preclude pilots from landing straight-in if they have the active runway in sight and have sufficient time to

make a normal approach for landing. Under such conditions and when ATC has cleared them for landing on that runway, pilots are not expected to circle even though only circling minimums are published. If they desire to circle, they should advise ATC.

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

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

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

1. Maneuver the shortest path to the base or downwind leg, as appropriate, considering existing weather conditions. There is no restriction from passing over the airport or other runways.
2. It should be recognized that circling maneuvers may be made while VFR or other flying is in progress at the airport. Standard left turns or specific instruction from the controller for maneuvering must be considered when circling to land.
3. At airports without a control tower, it may be desirable to fly over the airport to observe wind and turn indicators and other traffic which may be on the runway or flying in the vicinity of the airport.

#### REFERENCE—

AC 90–66A, *Recommended Standards Traffic patterns for Aeronautical Operations at Airports without Operating Control Towers.*

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

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

### 5–4–21. Missed Approach

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

**b.** Obstacle protection for missed approach is predicated on the missed approach being initiated at the decision altitude/height (DA/H) or at the missed approach point and not lower than minimum descent altitude (MDA). A climb gradient of at least 200 feet per nautical mile is required, (except for Copter approaches, where a climb of at least 400 feet per nautical mile is required), unless a higher climb gradient is published in the notes section of the approach procedure chart. When higher than standard climb gradients are specified, the end point of the non-standard climb will be specified at either an altitude or a fix. Pilots must preplan to ensure that the aircraft can meet the climb gradient (expressed in feet per nautical mile) required by the procedure in the event of a missed approach, and be aware that flying at a higher than anticipated ground speed increases the climb rate requirement (feet per minute). Tables for the conversion of climb gradients (feet per nautical mile) to climb rate (feet per minute), based on ground speed, are included on page D1 of the U.S. Terminal Procedures booklets. Reasonable buffers are provided for normal maneuvers. However, no

consideration is given to an abnormally early turn. Therefore, when an early missed approach is executed, pilots should, unless otherwise cleared by ATC, fly the IAP as specified on the approach plate to the missed approach point at or above the MDA or DH before executing a turning maneuver.

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

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

**e.** Some locations may have a preplanned alternate missed approach procedure for use in the event the primary NAVAID used for the missed approach procedure is unavailable. To avoid confusion, the alternate missed approach instructions are not published on the chart. However, the alternate missed

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

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

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

FIG 5-4-30

### Circling and Missed Approach Obstruction Clearance Areas

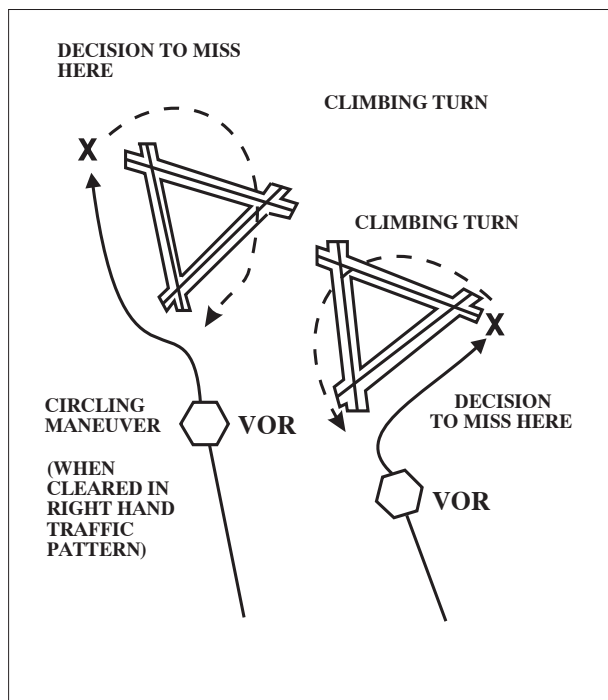
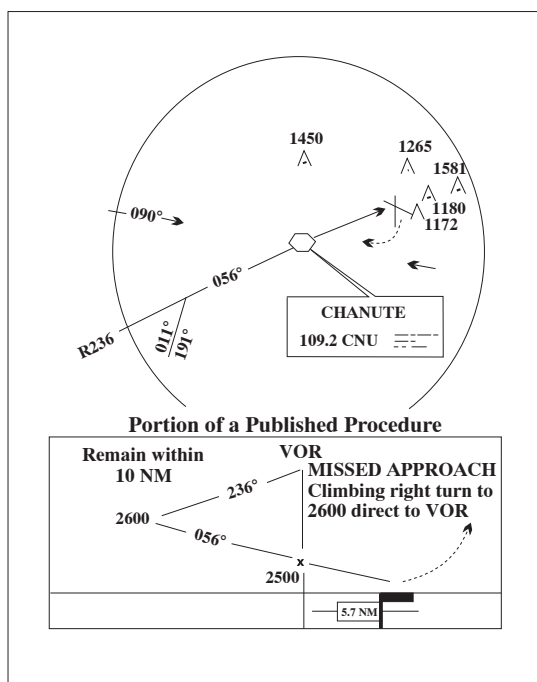


FIG 5-4-31

### Missed Approach



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

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

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

climb restrictions, charted obstacles, published obstacle departure procedure, takeoff visual climb requirements as expressed by nonstandard takeoff minima, other traffic expected to be in the vicinity, or other factors not specifically expressed by the approach procedures.

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

An EFVS is an installed airborne system which uses an electronic means to provide a display of the forward external scene topography (the applicable natural or manmade features of a place or region especially in a way to show their relative positions and elevation) through the use of imaging sensors, such as forward looking infrared, millimeter wave radiometry, millimeter wave radar, and/or low light level image intensifying. The EFVS imagery is displayed along with the additional flight information and aircraft flight symbology required by 14 CFR 91.175 (m) on a head-up display (HUD), or an equivalent display, in the same scale and alignment as the external view and includes the display element, sensors, computers and power supplies, indications, and controls. The display is typically presented to the pilot by means of an approved HUD.

**a. Basic Strategy Using EFVS.** When flying an instrument approach procedure (IAP), if the runway environment cannot be visually acquired at decision altitude (DA) or minimum descent altitude (MDA) using natural vision, then a pilot may use an EFVS to continue descending down to 100 feet above the Touchdown Zone Elevation (TDZE), provided all of the visibility requirements of 14 CFR part 91.175 (l) are met. The primary reference for maneuvering the aircraft is based on what the pilot sees through the EFVS. At 100 feet above the TDZE, a pilot can continue to descend only when the visual reference requirements for descent below 100 feet can be seen using natural vision (without the aid of the EFVS). In other words, a pilot may not continue to rely on the EFVS sensor image to identify the required visual references below 100 feet above the TDZE. Supporting information is provided by the flight path vector (FPV), flight path angle (FPA) reference cue, on-board navigation system, and other imagery and flight symbology displayed on the EFVS. The FPV and FPA reference cue, along with the EFVS imagery of the Touchdown Zone (TDZ), provide the primary

vertical path reference for the pilot when vertical guidance from a precision approach or approach with vertical guidance is not available.

**1. Straight-In Instrument Approach Procedures.** An EFVS may be used to descend below DA or MDA from any straight-in IAP, other than Category II or Category III approaches, provided all of the requirements of 14 CFR part 91.175 (l) are met. This includes straight-in precision approaches, approaches with vertical guidance (for example, LPV or LNAV/VNAV), and non-precision approaches (for example, VOR, NDB, LOC, RNAV, GPS, LDA, SDF, etc.).

**2. Circling Approach Procedure.** An IAP with a circle-to-land maneuver or circle-to-land minimums does not meet criteria for straight-in landing minimums. While the regulations do not prohibit EFVS from being used during any phase of flight, they do prohibit it from being used for operational credit on anything but a straight-in IAP with straight-in landing minima. EFVS must only be used during a circle-to-land maneuver provided the visual references required throughout the circling maneuver are distinctly visible using natural vision. An EFVS cannot be used to satisfy the requirement that an identifiable part of the airport be distinctly visible to the pilot during a circling maneuver at or above MDA or while descending below MDA from a circling maneuver.

**3. Enhanced Flight Visibility.** Flight visibility is determined by using natural vision, and enhanced flight visibility (EFV) is determined by using an EFVS. 14 CFR part 91.175 (l) requires that the EFV observed by using an EFVS cannot be less than the visibility prescribed in the IAP to be used in order to continue to descend below the DA or MDA.

**b. EFVS Operations At or Below DA or MDA Down to 100 Feet Above the TDZE.** The visual segment of an IAP begins at DA or MDA and continues to the runway. There are two means of operating in the visual segment—one is by using natural vision and the other is by using an EFVS. If the pilot determines that the EFV observed by using the EFVS is not less than the minimum visibility prescribed in the IAP being flown, and the pilot acquires the required visual references prescribed in 14 CFR part 91.175 (l)(3) using the EFVS, then the pilot can continue the approach to 100 feet above the TDZE. To continue the approach, the pilot uses the EFVS image to visually acquire the runway environment (the approach

light system (ALS), if installed, or both the runway threshold and the TDZ), confirm lateral alignment, maneuver to the extended runway centerline earlier than would otherwise be possible, and continue a normal descent from the DA or MDA to 100 feet above the TDZE.

**1. Required Visual References.** In order to descend below DA or MDA, the following visual references (specified in 14 CFR part 91.175 (l)(3)) for the runway of intended landing must be distinctly visible and identifiable to the pilot using the EFVS:

- (a) The ALS (if installed), or
- (b) The following visual references in both (b)(1) and (b)(2) below:
  - (1) The runway threshold, identified by at least one of the following: the beginning of the runway landing surface, the threshold lights, or the runway end identifier lights (REIL).

- (2) The TDZ, identified by at least one of the following: the runway TDZ landing surface, the TDZ lights, the TDZ markings, or the runway lights.

**2. Comparison of Visual Reference Requirements for EFVS and Natural Vision.** The EFVS visual reference requirements of 14 CFR part 91.175 (l)(3) comprise a more stringent standard than the visual reference requirements prescribed under 14 CFR part 91.175 (c)(3) when using natural vision. The more stringent standard is needed because an EFVS might not display the color of the lights used to identify specific portions of the runway or might not be able to consistently display the runway markings. The main differences for EFVS operations are that the visual glide slope indicator (VGSi) lights cannot be used as a visual reference, and specific visual references from both the threshold and TDZ must be distinctly visible and identifiable. However, when using natural vision, only one of the specified visual references must be visible and identifiable.

**3. Visual References and Offset Approaches.** Pilots must be especially knowledgeable of the approach conditions and approach course alignment when considering whether to rely on EFVS during a non-precision approach with an offset final approach course. Depending upon the combination of crosswind correction and the lateral field of view provided by a particular EFVS, the required visual references may or may not be within the pilot's view

looking through the EFVS display. Pilots conducting any non-precision approach must verify lateral alignment with the runway centerline when determining when to descend from MDA.

**4. When to Go Around.** Any pilot operating an aircraft with an EFVS installed should be aware that the requirements of 14 CFR part 91.175 (c) for using natural vision and the requirements of 14 CFR part 91.175 (l) for using an EFVS are different. A pilot would, therefore, first have to determine whether an approach will be commenced using natural vision or using an EFVS. While these two sets of requirements provide a parallel decisionmaking process, the requirements for when a missed approach must be executed differ. Using EFVS, a missed approach must be initiated at or below DA or MDA down to 100 feet above TDZE whenever the pilot determines that:

- (a) The EFV is less than the visibility minima prescribed for the IAP being used;
- (b) The required visual references for the runway of intended landing are no longer distinctly visible and identifiable to the pilot using the EFVS imagery;
- (c) The aircraft is not continuously in a position from which a descent to a landing can be made on the intended runway, at a normal rate of descent, using normal maneuvers; or
- (d) For operations under 14 CFR parts 121 and 135, the descent rate of the aircraft would not allow touchdown to occur within the TDZ of the runway of intended landing.

**5. Missed Approach Considerations.** It should be noted that a missed approach after passing the DA, or beyond the missed approach point (MAP), involves additional risk until established on the published missed approach segment. Initiating a go-around after passing the published MAP may result in loss of obstacle clearance. As with any approach, pilot planning should include contingencies between the published MAP and touchdown with reference to obstacle clearance, aircraft performance, and alternate escape plans.

**c. EFVS Operations At and Below 100 Feet Above the TDZE.** At and below 100 feet above the TDZE, the regulations do not require the EFVS to be turned off or the display to be stowed in order to continue to a landing. A pilot may continue the approach



below this altitude using an EFVS as long as the required visual references can be seen through the display using natural vision. An operator may not continue to descend beyond this point by relying solely on the sensor image displayed on the EFVS.

**1. Required Visual References.** In order to descend below 100 feet above the TDZE, the flight visibility—assessed using natural vision—must be sufficient for the following visual references to be distinctly visible and identifiable to the pilot without reliance on the EFVS to continue to a landing:

- (a) The lights or markings of the threshold, or
- (b) The lights or markings of the TDZ.

It is important to note that from 100 feet above the TDZE and below, the flight visibility does not have to be equal to or greater than the visibility prescribed for the IAP in order to continue descending. It only has to be sufficient for the visual references required by 14 CFR part 91.175 (l)(4) to be distinctly visible and identifiable to the pilot without reliance on the EFVS.

**2. Comparison of Visual Reference Requirements for EFVS and Natural Vision.** Again, the visual reference requirements for EFVS in 14 CFR part 91.175 (l)(4) are more stringent than those required for natural vision in 14 CFR part 91.175 (c)(3). The main differences for EFVS operations are that the ALS and red terminating bars or red side row bars, the REIL, and the VASI cannot be used as visual references. Only very specific visual references from the threshold or the TDZ can be used (that is, the lights or markings of the threshold or the lights or markings of the TDZ).

**3. When to Go Around.** A missed approach must be initiated when the pilot determines that:

- (a) The flight visibility is no longer sufficient to distinctly see and identify the required visual references listed in 14 CFR part 91.175 (l)(4) using natural vision;
- (b) The aircraft is not continuously in a position from which a descent to a landing can be made on the intended runway, at a normal rate of descent, using normal maneuvers; or
- (c) For operations under 14 CFR parts 121 and 135, the descent rate of the aircraft would not allow touchdown to occur within the TDZ of the runway of intended landing.

While touchdown within the TDZ is not specifically addressed in the regulations for operators other than 14 CFR parts 121 and 135 operators, continued operations below DA or MDA where touchdown in the TDZ is not assured, where a high sink rate occurs, or where the decision to conduct a missed approach procedure is not executed in a timely manner, all create a significant risk to the operation.

**4. Missed Approach Considerations.** As noted earlier, a missed approach initiated after the DA or MAP involves additional risk. At 100 feet or less above the runway, it is likely that an aircraft is significantly below the TERPS missed approach obstacle clearance surface. Prior planning is recommended and should include contingencies between the published MAP and touchdown with reference to obstacle clearance, aircraft performance, and alternate escape plans.

**d. Light Emitting Diode (LED) Airport Lighting Impact on EFVS Operations.** The FAA has recently begun to replace incandescent lamps with LEDs at some airports in threshold lights, taxiway edge lights, taxiway centerline lights, low intensity runway edge lights, windcone lights, beacons, and some obstruction lighting. Pilots should be aware that LED lights cannot be sensed by current EFVS systems.

## 5-4-23. Visual Approach

**a.** A visual approach is conducted on an IFR flight plan and authorizes a pilot to proceed visually and clear of clouds to the airport. The pilot must have either the airport or the preceding identified aircraft in sight. This approach must be authorized and controlled by the appropriate air traffic control facility. Reported weather at the airport must have a ceiling at or above 1,000 feet and visibility 3 miles or greater. ATC may authorize this type approach when it will be operationally beneficial. Visual approaches are an IFR procedure conducted under IFR in visual meteorological conditions. Cloud clearance requirements of 14 CFR Section 91.155 are not applicable, unless required by operation specifications.

**b. Operating to an Airport Without Weather Reporting Service.** ATC will advise the pilot when weather is not available at the destination airport. ATC may initiate a visual approach provided there is a reasonable assurance that weather at the airport is a

ceiling at or above 1,000 feet and visibility 3 miles or greater (e.g., area weather reports, PIREPs, etc.).

**c. Operating to an Airport With an Operating Control Tower.** Aircraft may be authorized to conduct a visual approach to one runway while other aircraft are conducting IFR or VFR approaches to another parallel, intersecting, or converging runway. When operating to airports with parallel runways separated by less than 2,500 feet, the succeeding aircraft must report sighting the preceding aircraft unless standard separation is being provided by ATC. When operating to parallel runways separated by at least 2,500 feet but less than 4,300 feet, controllers will clear/vector aircraft to the final at an angle not greater than 30 degrees unless radar, vertical, or visual separation is provided during the turn-on. The purpose of the 30 degree intercept angle is to reduce the potential for overshoots of the final and to preclude side-by-side operations with one or both aircraft in a belly-up configuration during the turn-on. Once the aircraft are established within 30 degrees of final, or on the final, these operations may be conducted simultaneously. When the parallel runways are separated by 4,300 feet or more, or intersecting/converging runways are in use, ATC may authorize a visual approach after advising all aircraft involved that other aircraft are conducting operations to the other runway. This may be accomplished through use of the ATIS.

**d. Separation Responsibilities.** If the pilot has the airport in sight but cannot see the aircraft to be followed, ATC may clear the aircraft for a visual approach; however, ATC retains both separation and wake vortex separation responsibility. When visually following a preceding aircraft, acceptance of the visual approach clearance constitutes acceptance of pilot responsibility for maintaining a safe approach interval and adequate wake turbulence separation.

**e.** A visual approach is not an IAP and therefore has no missed approach segment. If a go around is necessary for any reason, aircraft operating at controlled airports will be issued an appropriate advisory/clearance/instruction by the tower. At uncontrolled airports, aircraft are expected to remain clear of clouds and complete a landing as soon as possible. If a landing cannot be accomplished, the aircraft is expected to remain clear of clouds and contact ATC as soon as possible for further clearance.

Separation from other IFR aircraft will be maintained under these circumstances.

**f.** Visual approaches reduce pilot/controller workload and expedite traffic by shortening flight paths to the airport. It is the pilot's responsibility to advise ATC as soon as possible if a visual approach is not desired.

**g.** Authorization to conduct a visual approach is an IFR authorization and does not alter IFR flight plan cancellation responsibility.

#### REFERENCE—

*AIM, Canceling IFR Flight Plan, Paragraph 5-1-15*

**h.** Radar service is automatically terminated, without advising the pilot, when the aircraft is instructed to change to advisory frequency.

### 5-4-24. Charted Visual Flight Procedure (CVFP)

**a.** CVFPs are charted visual approaches established for environmental/noise considerations, and/or when necessary for the safety and efficiency of air traffic operations. The approach charts depict prominent landmarks, courses, and recommended altitudes to specific runways. CVFPs are designed to be used primarily for turbojet aircraft.

**b.** These procedures will be used only at airports with an operating control tower.

**c.** Most approach charts will depict some NAVAID information which is for supplemental navigational guidance only.

**d.** Unless indicating a Class B airspace floor, all depicted altitudes are for noise abatement purposes and are recommended only. Pilots are not prohibited from flying other than recommended altitudes if operational requirements dictate.

**e.** When landmarks used for navigation are not visible at night, the approach will be annotated "*PROCEDURE NOT AUTHORIZED AT NIGHT.*"

**f.** CVFPs usually begin within 20 flying miles from the airport.

**g.** Published weather minimums for CVFPs are based on minimum vectoring altitudes rather than the recommended altitudes depicted on charts.

**h.** CVFPs are not instrument approaches and do not have missed approach segments.

**i.** ATC will not issue clearances for CVFPs when the weather is less than the published minimum.

**j.** ATC will clear aircraft for a CVFP after the pilot reports sighting a charted landmark or a preceding aircraft. If instructed to follow a preceding aircraft, pilots are responsible for maintaining a safe approach interval and wake turbulence separation.

**k.** Pilots should advise ATC if at any point they are unable to continue an approach or lose sight of a preceding aircraft. Missed approaches will be handled as a go-around.

#### **5-4-25. Contact Approach**

**a.** Pilots operating in accordance with an IFR flight plan, provided they are clear of clouds and have at least 1 mile flight visibility and can reasonably expect to continue to the destination airport in those conditions, may request ATC authorization for a contact approach.

**b.** Controllers may authorize a contact approach provided:

- 1.** The contact approach is specifically requested by the pilot. ATC cannot initiate this approach.

**EXAMPLE-**

*Request contact approach.*

- 2.** The reported ground visibility at the destination airport is at least 1 statute mile.

- 3.** The contact approach will be made to an airport having a standard or special instrument approach procedure.

- 4.** Approved separation is applied between aircraft so cleared and between these aircraft and other IFR or special VFR aircraft.

**EXAMPLE-**

*Cleared contact approach (and, if required) at or below (altitude) (routing) if not possible (alternative procedures) and advise.*

**c.** A contact approach is an approach procedure that may be used by a pilot (with prior authorization from ATC) in lieu of conducting a standard or special IAP to an airport. It is not intended for use by a pilot on an IFR flight clearance to operate to an airport not having a published and functioning IAP. Nor is it intended for an aircraft to conduct an instrument approach to one airport and then, when “in the clear,” discontinue that approach and proceed to another airport. In the execution of a contact approach, the

pilot assumes the responsibility for obstruction clearance. If radar service is being received, it will automatically terminate when the pilot is instructed to change to advisory frequency.

#### **5-4-26. Landing Priority**

A clearance for a specific type of approach (ILS, MLS, ADF, VOR or Straight-in Approach) to an aircraft operating on an IFR flight plan does not mean that landing priority will be given over other traffic. ATCTs handle all aircraft, regardless of the type of flight plan, on a “first-come, first-served” basis. Therefore, because of local traffic or runway in use, it may be necessary for the controller in the interest of safety, to provide a different landing sequence. In any case, a landing sequence will be issued to each aircraft as soon as possible to enable the pilot to properly adjust the aircraft’s flight path.

#### **5-4-27. Overhead Approach Maneuver**

**a.** Pilots operating in accordance with an IFR flight plan in Visual Meteorological Conditions (VMC) may request ATC authorization for an overhead maneuver. An overhead maneuver is not an instrument approach procedure. Overhead maneuver patterns are developed at airports where aircraft have an operational need to conduct the maneuver. An aircraft conducting an overhead maneuver is considered to be VFR and the IFR flight plan is cancelled when the aircraft reaches the initial point on the initial approach portion of the maneuver. (See FIG 5-4-32.) The existence of a standard overhead maneuver pattern does not eliminate the possible requirement for an aircraft to conform to conventional rectangular patterns if an overhead maneuver cannot be approved. Aircraft operating to an airport without a functioning control tower must initiate cancellation of an IFR flight plan prior to executing the overhead maneuver. Cancellation of the IFR flight plan must be accomplished after crossing the landing threshold on the initial portion of the maneuver or after landing. Controllers may authorize an overhead maneuver and issue the following to arriving aircraft:

- 1.** Pattern altitude and direction of traffic. This information may be omitted if either is standard.

**PHRASEOLOGY-**

*PATTERN ALTITUDE (altitude). RIGHT TURNS.*

2. Request for a report on initial approach.

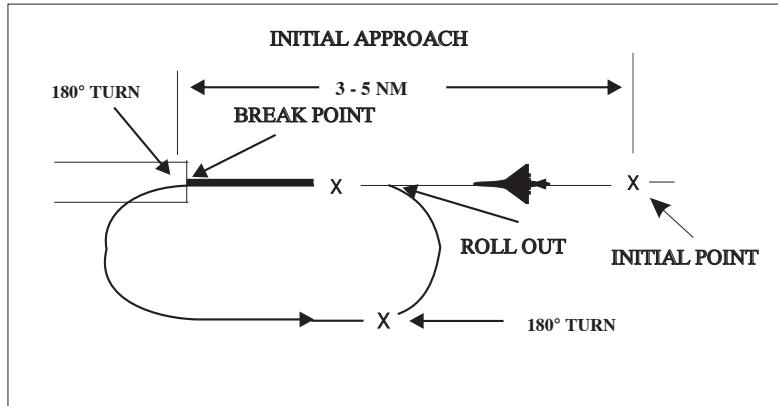
**PHRASEOLOGY–**  
**REPORT INITIAL.**

3. “Break” information and a request for the pilot to report. The “Break Point” will be specified if

nonstandard. Pilots may be requested to report “break” if required for traffic or other reasons.

**PHRASEOLOGY–**  
**BREAK AT (specified point).**  
**REPORT BREAK.**

**FIG 5-4-32**  
**Overhead Maneuver**



## Section 2. Emergency Services Available to Pilots

### 6-2-1. Radar Service for VFR Aircraft in Difficulty

a. Radar equipped ATC facilities can provide radar assistance and navigation service (vectors) to VFR aircraft in difficulty when the pilot can talk with the controller, and the aircraft is within radar coverage. Pilots should clearly understand that authorization to proceed in accordance with such radar navigational assistance does not constitute authorization for the pilot to violate CFRs. In effect, assistance is provided on the basis that navigational guidance information is advisory in nature, and the responsibility for flying the aircraft safely remains with the pilot.

b. Experience has shown that many pilots who are not qualified for instrument flight cannot maintain control of their aircraft when they encounter clouds or other reduced visibility conditions. In many cases, the controller will not know whether flight into instrument conditions will result from ATC instructions. To avoid possible hazards resulting from being vectored into IFR conditions, a pilot in difficulty should keep the controller advised of the current weather conditions being encountered and the weather along the course ahead and observe the following:

1. If a course of action is available which will permit flight and a safe landing in VFR weather conditions, noninstrument rated pilots should choose the VFR condition rather than requesting a vector or approach that will take them into IFR weather conditions; or

2. If continued flight in VFR conditions is not possible, the noninstrument rated pilot should so advise the controller and indicating the lack of an instrument rating, declare a *distress* condition; or

3. If the pilot is instrument rated and current, and the aircraft is instrument equipped, the pilot should so indicate by requesting an IFR flight clearance. Assistance will then be provided on the basis that the aircraft can operate safely in IFR weather conditions.

### 6-2-2. Transponder Emergency Operation

a. When a *distress* or *urgency* condition is encountered, the pilot of an aircraft with a coded radar beacon transponder, who desires to alert a ground radar facility, should squawk Mode 3/A, Code 7700/Emergency and Mode C altitude reporting and then immediately establish communications with the ATC facility.

b. Radar facilities are equipped so that Code 7700 normally triggers an alarm or special indicator at all control positions. Pilots should understand that they might not be within a radar coverage area. Therefore, they should continue squawking Code 7700 and establish radio communications as soon as possible.

### 6-2-3. Intercept and Escort

a. The concept of airborne intercept and escort is based on the Search and Rescue (SAR) aircraft establishing visual and/or electronic contact with an aircraft in difficulty, providing in-flight assistance, and escorting it to a safe landing. If bailout, crash landing or ditching becomes necessary, SAR operations can be conducted without delay. For most incidents, particularly those occurring at night and/or during instrument flight conditions, the availability of intercept and escort services will depend on the proximity of SAR units with suitable aircraft on alert for immediate dispatch. In limited circumstances, other aircraft flying in the vicinity of an aircraft in difficulty can provide these services.

b. If specifically requested by a pilot in difficulty or if a *distress* condition is declared, SAR coordinators *will* take steps to intercept and escort an aircraft. Steps may be initiated for intercept and escort if an *urgency* condition is declared and unusual circumstances make such action advisable.

c. It is the pilot's prerogative to refuse intercept and escort services. Escort services will normally be provided to the nearest adequate airport. Should the pilot receiving escort services continue onto another location after reaching a safe airport, or decide not to divert to the nearest safe airport, the escort aircraft is not obligated to continue and further escort is

discretionary. The decision will depend on the circumstances of the individual incident.

## **6-2-4. Emergency Locator Transmitter (ELT)**

### **a. General.**

1. ELTs are required for most General Aviation airplanes.

*REFERENCE—  
14 CFR SECTION 91.207.*

2. ELTs of various types were developed as a means of locating downed aircraft. These electronic, battery operated transmitters operate on one of three frequencies. These operating frequencies are 121.5 MHz, 243.0 MHz, and the newer 406 MHz. ELTs operating on 121.5 MHz and 243.0 MHz are analog devices. The newer 406 MHz ELT is a digital transmitter that can be encoded with the owner's contact information or aircraft data. The latest 406 MHz ELT models can also be encoded with the aircraft's position data which can help SAR forces locate the aircraft much more quickly after a crash. The 406 MHz ELTs also transmits a stronger signal when activated than the older 121.5 MHz ELTs.

(a) The Federal Communications Commission (FCC) requires 406 MHz ELTs be registered with the National Oceanic and Atmospheric Administration (NOAA) as outlined in the ELTs documentation. The FAA's 406 MHz ELT Technical Standard Order (TSO) TSO-C126 also requires that each 406 MHz ELT be registered with NOAA. The reason is NOAA maintains the owner registration database for U.S. registered 406 MHz alerting devices, which includes ELTs. NOAA also operates the United States' portion of the Cospas-Sarsat satellite distress alerting system designed to detect activated ELTs and other distress alerting devices.

(b) In the event that a properly registered 406 MHz ELT activates, the Cospas-Sarsat satellite system can decode the owner's information and provide that data to the appropriate search and rescue (SAR) center. In the United States, NOAA provides the alert data to the appropriate U.S. Air Force Rescue Coordination Center (RCC) or U.S. Coast Guard Rescue Coordination Center. That RCC can then telephone or contact the owner to verify the status of the aircraft. If the aircraft is safely secured in a hangar, a costly ground or airborne search is

avoided. In the case of an inadvertent 406 MHz ELT activation, the owner can deactivate the 406 MHz ELT. If the 406 MHz ELT equipped aircraft is being flown, the RCC can quickly activate a search. 406 MHz ELTs permit the Cospas-Sarsat satellite system to narrow the search area to a more confined area compared to that of a 121.5 MHz or 243.0 MHz ELT. 406 MHz ELTs also include a low-power 121.5 MHz homing transmitter to aid searchers in finding the aircraft in the terminal search phase.

(c) Each analog ELT emits a distinctive downward swept audio tone on 121.5 MHz and 243.0 MHz.

(d) If "armed" and when subject to crash-generated forces, ELTs are designed to automatically activate and continuously emit their respective signals, analog or digital. The transmitters will operate continuously for at least 48 hours over a wide temperature range. A properly installed, maintained, and functioning ELT can expedite search and rescue operations and save lives if it survives the crash and is activated.

(e) Pilots and their passengers should know how to activate the aircraft's ELT if manual activation is required. They should also be able to verify the aircraft's ELT is functioning and transmitting an alert after a crash or manual activation.

(f) Because of the large number of 121.5 MHz ELT false alerts and the lack of a quick means of verifying the actual status of an activated 121.5 MHz or 243.0 MHz analog ELT through an owner registration database, U.S. SAR forces do not respond as quickly to initial 121.5/243.0 MHz ELT alerts as the SAR forces do to 406 MHz ELT alerts. Compared to the almost instantaneous detection of a 406 MHz ELT, SAR forces' normal practice is to wait for either a confirmation of a 121.5/243.0 MHz alert by additional satellite passes or through confirmation of an overdue aircraft or similar notification. In some cases, this confirmation process can take hours. SAR forces can initiate a response to 406 MHz alerts in minutes compared to the potential delay of hours for a 121.5/243.0 MHz ELT.

3. The Cospas-Sarsat system has announced the termination of satellite monitoring and reception of the 121.5 MHz and 243.0 MHz frequencies in 2009. The Cospas-Sarsat system will continue to monitor the 406 MHz frequency. What this means for pilots is that after the termination date, those aircraft with only

121.5 MHz or 243.0 MHz ELT's onboard will have to depend upon either a nearby Air Traffic Control facility receiving the alert signal or an overflying aircraft monitoring 121.5 MHz or 243.0 MHz detecting the alert. To ensure adequate monitoring of these frequencies and timely alerts after 2009, all airborne pilots should periodically monitor these frequencies to try and detect an activated 121.5/243.0 MHz ELT.

#### **b. Testing.**

1. ELTs should be tested in accordance with the manufacturer's instructions, preferably in a shielded or screened room or specially designed test container to prevent the broadcast of signals which could trigger a false alert.

2. When this cannot be done, aircraft operational testing is authorized as follows:

(a) Analog 121.5/243 MHz ELTs should only be tested during the first 5 minutes after any hour. If operational tests must be made outside of this period, they should be coordinated with the nearest FAA Control Tower or FSS. Tests should be no longer than three audible sweeps. If the antenna is removable, a dummy load should be substituted during test procedures.

(b) Digital 406 MHz ELTs should only be tested in accordance with the unit's manufacturer's instructions.

(c) Airborne tests are not authorized.

#### **c. False Alarms.**

1. Caution should be exercised to prevent the inadvertent activation of ELTs in the air or while they are being handled on the ground. Accidental or unauthorized activation will generate an emergency signal that cannot be distinguished from the real thing, leading to expensive and frustrating searches. A false ELT signal could also interfere with genuine emergency transmissions and hinder or prevent the timely location of crash sites. Frequent false alarms could also result in complacency and decrease the vigorous reaction that must be attached to all ELT signals.

2. Numerous cases of inadvertent activation have occurred as a result of aerobatics, hard landings, movement by ground crews and aircraft maintenance.

These false alarms can be minimized by monitoring 121.5 MHz and/or 243.0 MHz as follows:

(a) In flight when a receiver is available.

(b) Before engine shut down at the end of each flight.

(c) When the ELT is handled during installation or maintenance.

(d) When maintenance is being performed near the ELT.

(e) When a ground crew moves the aircraft.

(f) If an ELT signal is heard, turn off the aircraft's ELT to determine if it is transmitting. If it has been activated, maintenance might be required before the unit is returned to the "ARMED" position. You should contact the nearest Air Traffic facility and notify it of the inadvertent activation.

#### **d. Inflight Monitoring and Reporting.**

1. Pilots are encouraged to monitor 121.5 MHz and/or 243.0 MHz while inflight to assist in identifying possible emergency ELT transmissions. On receiving a signal, report the following information to the nearest air traffic facility:

(a) Your position at the time the signal was first heard.

(b) Your position at the time the signal was last heard.

(c) Your position at maximum signal strength.

(d) Your flight altitudes and frequency on which the emergency signal was heard: 121.5 MHz or 243.0 MHz. If possible, positions should be given relative to a navigation aid. If the aircraft has homing equipment, provide the bearing to the emergency signal with each reported position.

### **6-2-5. FAA K-9 Explosives Detection Team Program**

a. The FAA's Office of Civil Aviation Security Operations manages the FAA K-9 Explosives Detection Team Program which was established in 1972. Through a unique agreement with law enforcement agencies and airport authorities, the FAA has strategically placed FAA-certified K-9 teams (a team is one handler and one dog) at airports throughout the country. If a bomb threat is received

while an aircraft is in flight, the aircraft can be directed to an airport with this capability. The FAA provides initial and refresher training for all handlers, provides single purpose explosive detector dogs, and requires that each team is annually evaluated in five areas for FAA certification: aircraft (widebody and narrowbody), vehicles, terminal, freight (cargo), and luggage. **If you desire this service, notify your company or an FAA air traffic control facility.**

**b.** The following list shows the locations of current FAA K-9 teams:

*TBL 6-2-1*

**FAA Sponsored Explosives Detection  
Dog/Handler Team Locations**

<b>Airport Symbol</b>	<b>Location</b>
ATL	Atlanta, Georgia
BHM	Birmingham, Alabama
BOS	Boston, Massachusetts
BUF	Buffalo, New York
CLT	Charlotte, North Carolina
ORD	Chicago, Illinois
CVG	Cincinnati, Ohio
DFW	Dallas, Texas
DEN	Denver, Colorado
DTW	Detroit, Michigan
IAH	Houston, Texas
JAX	Jacksonville, Florida
MCI	Kansas City, Missouri
LAX	Los Angeles, California
MEM	Memphis, Tennessee
MIA	Miami, Florida
MKE	Milwaukee, Wisconsin
MSY	New Orleans, Louisiana
MCO	Orlando, Florida
PHX	Phoenix, Arizona
PIT	Pittsburgh, Pennsylvania
PDX	Portland, Oregon
SLC	Salt Lake City, Utah
SFO	San Francisco, California
SJU	San Juan, Puerto Rico
SEA	Seattle, Washington

STL	St. Louis, Missouri
TUS	Tucson, Arizona
TUL	Tulsa, Oklahoma

**c.** If due to weather or other considerations an aircraft with a suspected hidden explosive problem were to land or intended to land at an airport other than those listed in b above, it is recommended that they call the FAA's Washington Operations Center (telephone 202-267-3333, if appropriate) or have an air traffic facility with which you can communicate contact the above center requesting assistance.

## **6-2-6. Search and Rescue**

**a. General.** SAR is a lifesaving service provided through the combined efforts of the federal agencies signatory to the National SAR Plan, and the agencies responsible for SAR within each state. Operational resources are provided by the U.S. Coast Guard, DOD components, the Civil Air Patrol, the Coast Guard Auxiliary, state, county and local law enforcement and other public safety agencies, and private volunteer organizations. Services include search for missing aircraft, survival aid, rescue, and emergency medical help for the occupants after an accident site is located.

**b. National Search and Rescue Plan.** By federal interagency agreement, the National Search and Rescue Plan provides for the effective use of all available facilities in all types of SAR missions. These facilities include aircraft, vessels, pararescue and ground rescue teams, and emergency radio fixing. Under the plan, the U.S. Coast Guard is responsible for the coordination of SAR in the Maritime Region, and the USAF is responsible in the Inland Region. To carry out these responsibilities, the Coast Guard and the Air Force have established Rescue Coordination Centers (RCCs) to direct SAR activities within their regions. For aircraft emergencies, distress, and urgency, information normally will be passed to the appropriate RCC through an ARTCC or FSS.

**c. Coast Guard Rescue Coordination Centers.** (See TBL 6-2-2.)



**TBL 6-2-2****Coast Guard Rescue Coordination Centers**

<b>Coast Guard Rescue Coordination Centers</b>	
Alameda, CA 510-437-3701	Miami, FL 305-415-6800
Boston, MA 617-223-8555	New Orleans, LA 504-589-6225
Cleveland, OH 216-902-6117	Portsmouth, VA 757-398-6390
Honolulu, HI 808-541-2500	Seattle, WA 206-220-7001
Juneau, AK 907-463-2000	San Juan, PR 787-289-2042

**d. Air Force Rescue Coordination Centers.**

(See TBL 6-2-3 and TBL 6-2-4.)

**TBL 6-2-3****Air Force Rescue Coordination Center  
48 Contiguous States**

<b>Air Force Rescue Coordination Center</b>	
<b>Tyndall AFB, Florida</b>	<b>Phone</b>
Commercial	850-283-5955
WATS	800-851-3051
DSN	523-5955

**TBL 6-2-4****Air Command Rescue Coordination Center  
Alaska**

<b>Alaskan Air Command Rescue Coordination Center</b>	
<b>Elmendorf AFB, Alaska</b>	<b>Phone</b>
Commercial	907-428-7230 800-420-7230 (outside Anchorage)
DSN	317-551-7230

**e. Joint Rescue Coordination Center.**

(See TBL 6-2-5.)

**TBL 6-2-5****Joint Rescue Coordination Center  
Hawaii**

<b>Honolulu Joint Rescue Coordination Center</b>	
<b>HQ 14th CG District Honolulu</b>	<b>Phone</b>
Commercial	808-541-2500
DSN	448-0301

**f. Emergency and Overdue Aircraft.**

1. ARTCCs and FSSs will alert the SAR system when information is received from any source that an aircraft is in difficulty, overdue, or missing.

(a) Radar facilities providing radar flight following or advisories consider the loss of radar and radios, without service termination notice, to be a possible emergency. Pilots receiving VFR services from radar facilities should be aware that SAR may be initiated under these circumstances.

(b) A filed flight plan is the most timely and effective indicator that an aircraft is overdue. Flight plan information is invaluable to SAR forces for search planning and executing search efforts.

2. Prior to departure on every flight, local or otherwise, someone at the departure point should be advised of your destination and route of flight if other than direct. Search efforts are often wasted and rescue is often delayed because of pilots who thoughtlessly takeoff without telling anyone where they are going. File a flight plan for *your* safety.

3. According to the National Search and Rescue Plan, "The life expectancy of an injured survivor decreases as much as 80 percent during the first 24 hours, while the chances of survival of uninjured survivors rapidly diminishes after the first 3 days."

4. An Air Force Review of 325 SAR missions conducted during a 23-month period revealed that "Time works against people who experience a *distress* but are not on a flight plan, since 36 hours normally pass before family concern initiates an (alert)."

**g. VFR Search and Rescue Protection.**

1. To receive this valuable protection, *file a VFR or DVFR Flight Plan* with an FAA FSS. For maximum protection, file only to the point of first intended landing, and refile for each leg to final destination. When a lengthy flight plan is filed, with several stops en route and an ETE to final destination, a mishap could occur on any leg, and unless other information is received, it is probable that no one would start looking for you until 30 minutes after your ETA at your final destination.

2. If you land at a location other than the intended destination, report the landing to the nearest FAA FSS and advise them of your original destination.

3. If you land en route and are delayed more than 30 minutes, report this information to the nearest FSS and give them your original destination.

4. If your ETE changes by 30 minutes or more, report a new ETA to the nearest FSS and give them your original destination. Remember that if you fail to respond within one-half hour after your ETA at final destination, a search will be started to locate you.

5. It is important that you *close your flight plan IMMEDIATELY AFTER ARRIVAL AT YOUR FINAL DESTINATION WITH THE FSS DESIGNATED WHEN YOUR FLIGHT PLAN WAS FILED. The pilot is responsible for closure of a VFR or DVFR flight plan; they are not closed automatically.* This will prevent needless search efforts.

6. The rapidity of rescue on land or water will depend on how accurately your position may be determined. If a flight plan has been followed and your position is on course, rescue will be expedited.

#### **h. Survival Equipment.**

1. For flight over uninhabited land areas, it is wise to take and know how to use survival equipment for the type of climate and terrain.

2. If a forced landing occurs at sea, chances for survival are governed by the degree of crew proficiency in emergency procedures and by the availability and effectiveness of water survival equipment.

#### **i. Body Signal Illustrations.**

1. If you are forced down and are able to attract the attention of the pilot of a rescue airplane, the body

signals illustrated on these pages can be used to transmit messages to the pilot circling over your location.

2. Stand in the open when you make the signals.

3. Be sure the background, as seen from the air, is not confusing.

4. Go through the motions slowly and repeat each signal until you are positive that the pilot understands you.

#### **j. Observance of Downed Aircraft.**

1. Determine if crash is marked with a yellow cross; if so, the crash has already been reported and identified.

2. If possible, determine type and number of aircraft and whether there is evidence of survivors.

3. Fix the position of the crash as accurately as possible with reference to a navigational aid. If possible, provide geographic or physical description of the area to aid ground search parties.

4. Transmit the information to the nearest FAA or other appropriate radio facility.

5. If circumstances permit, orbit the scene to guide in other assisting units until their arrival or until you are relieved by another aircraft.

6. Immediately after landing, make a complete report to the nearest FAA facility, or Air Force or Coast Guard Rescue Coordination Center. The report can be made by a long distance collect telephone call.

*FIG 6-2-1*  
**Ground-Air Visual Code for Use by Survivors**

NO.	MESSAGE	CODE SYMBOL
1	Require assistance	V
2	Require medical assistance	X
3	No or Negative	N
4	Yes or Affirmative	Y
5	Proceeding in this direction	↑

**IF IN DOUBT, USE INTERNATIONAL SYMBOL    S O S**  
**INSTRUCTIONS**

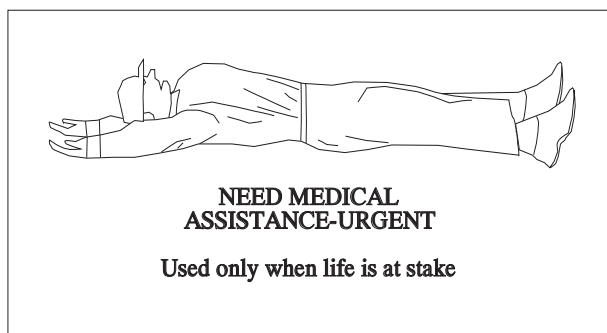
1. Lay out symbols by using strips of fabric or parachutes, pieces of wood, stones, or any available material.
2. Provide as much color contrast as possible between material used for symbols and background against which symbols are exposed.
3. Symbols should be at least 10 feet high or larger. Care should be taken to lay out symbols exactly as shown.
4. In addition to using symbols, every effort is to be made to attract attention by means of radio, flares, smoke, or other available means.
5. On snow covered ground, signals can be made by dragging, shoveling or tramping. Depressed areas forming symbols will appear black from the air.
6. Pilot should acknowledge message by rocking wings from side to side.

*FIG 6-2-2*  
**Ground-Air Visual Code for use by Ground Search Parties**

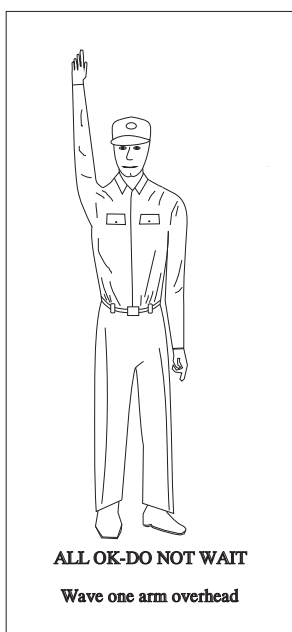
NO.	MESSAGE	CODE SYMBOL
1	Operation completed.	L L L
2	We have found all personnel.	LL
3	We have found only some personnel.	++
4	We are not able to continue. Returning to base.	XX
5	Have divided into two groups. Each proceeding in direction indicated.	↗ ↘
6	Information received that aircraft is in this direction.	→ →
7	Nothing found. Will continue search.	N N

Note: These visual signals have been accepted for international use and appear in Annex 12 to the Convention on International Civil Aviation.

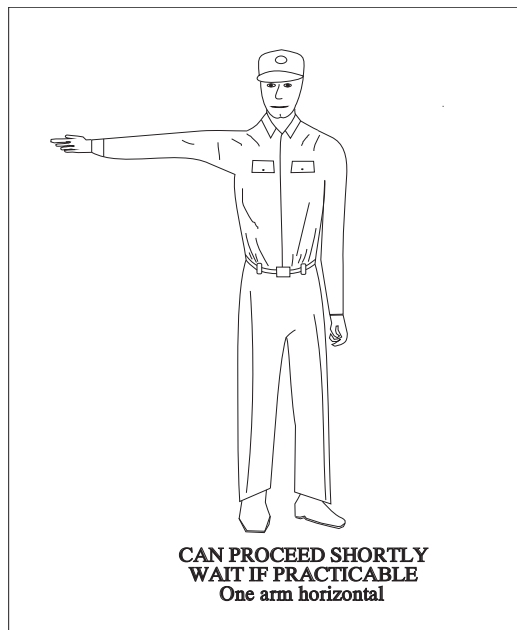
**FIG 6-2-3**  
**Urgent Medical Assistance**



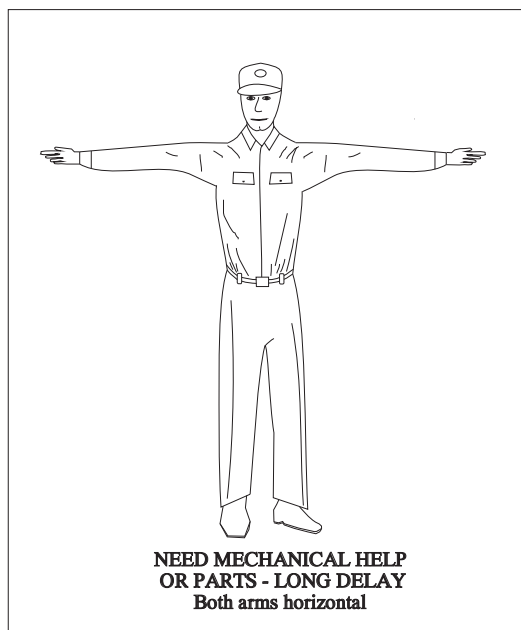
**FIG 6-2-4**  
**All OK**



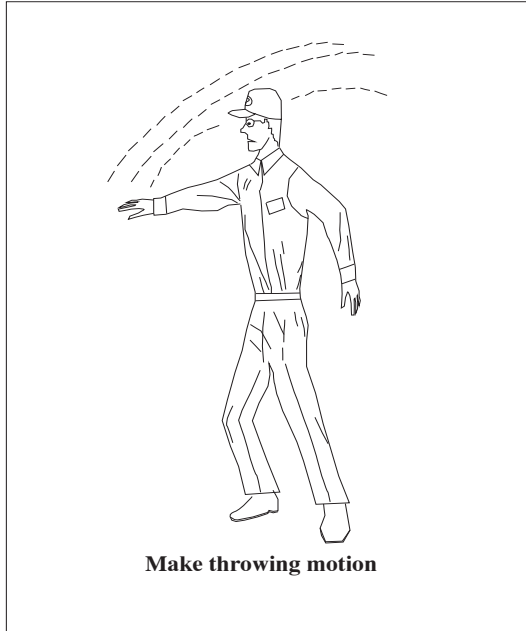
**FIG 6-2-5**  
**Short Delay**



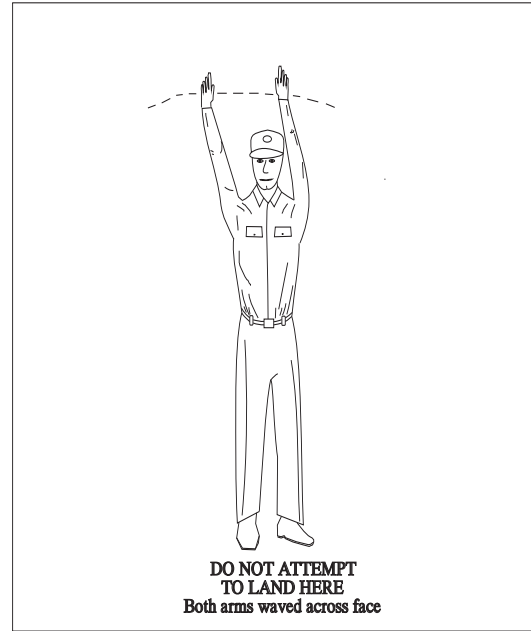
**FIG 6-2-6**  
**Long Delay**



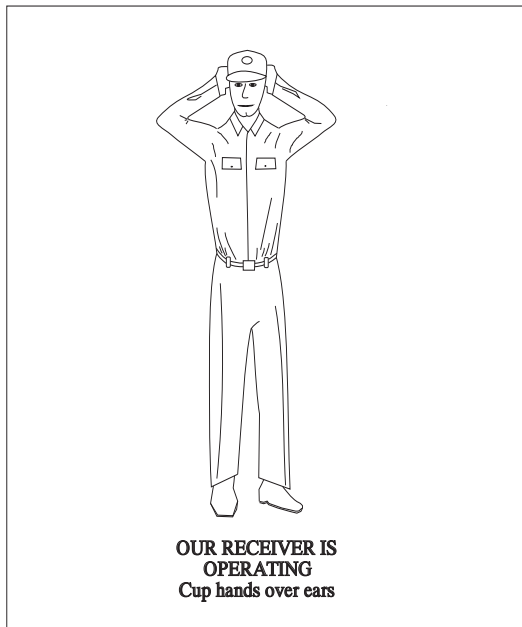
**FIG 6-2-7**  
**Drop Message**



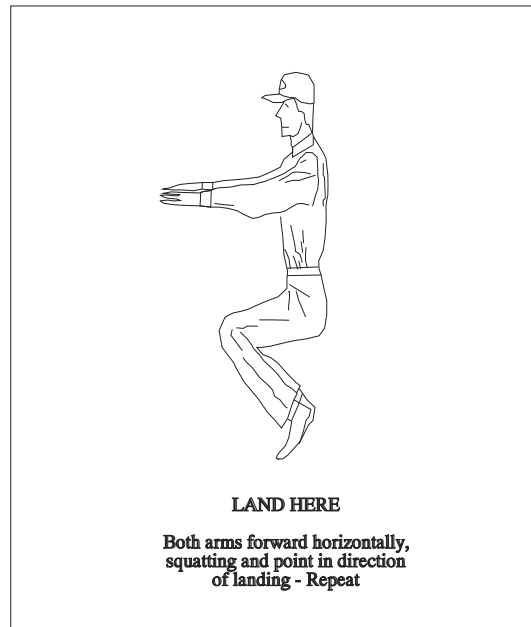
**FIG 6-2-9**  
**Do Not Land Here**



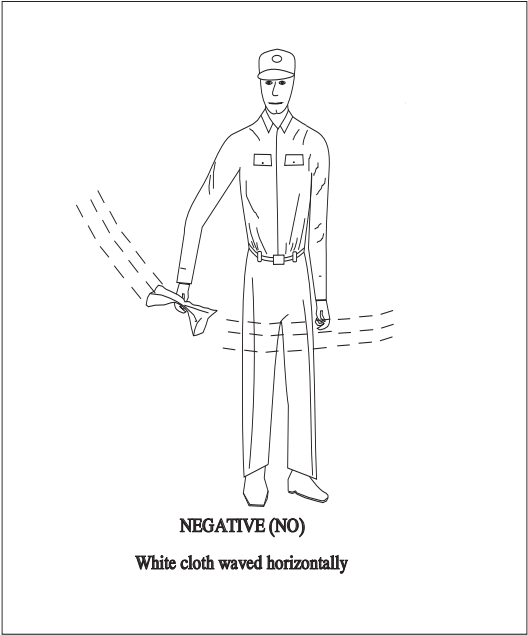
**FIG 6-2-8**  
**Receiver Operates**



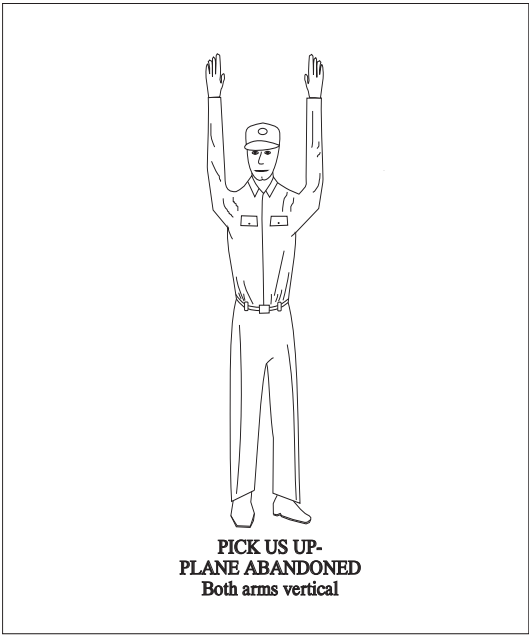
**FIG 6-2-10**  
**Land Here**



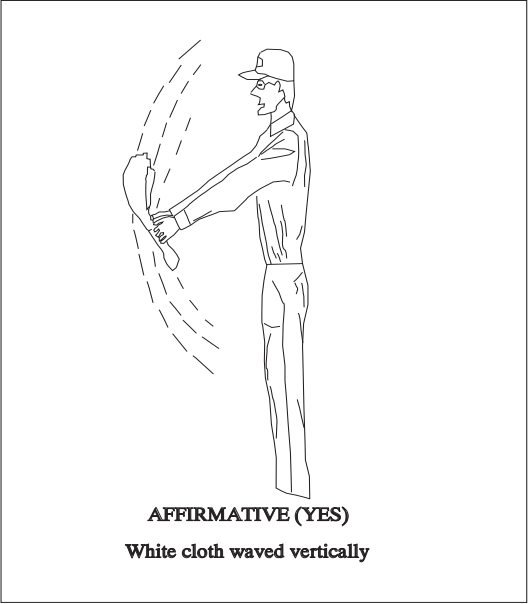
**FIG 6-2-11**  
**Negative (Ground)**



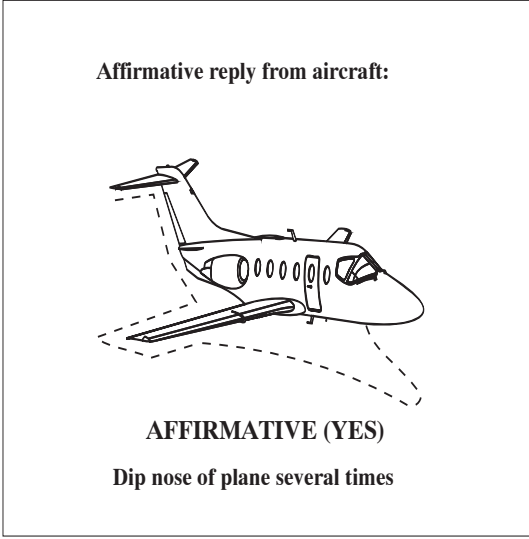
**FIG 6-2-13**  
**Pick Us Up**



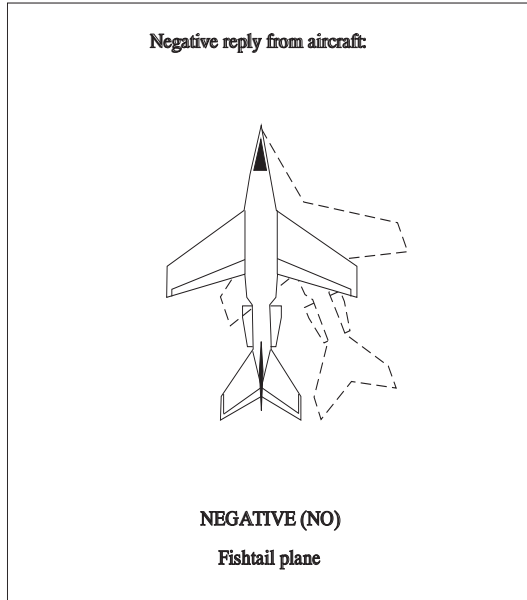
**FIG 6-2-12**  
**Affirmative (Ground)**



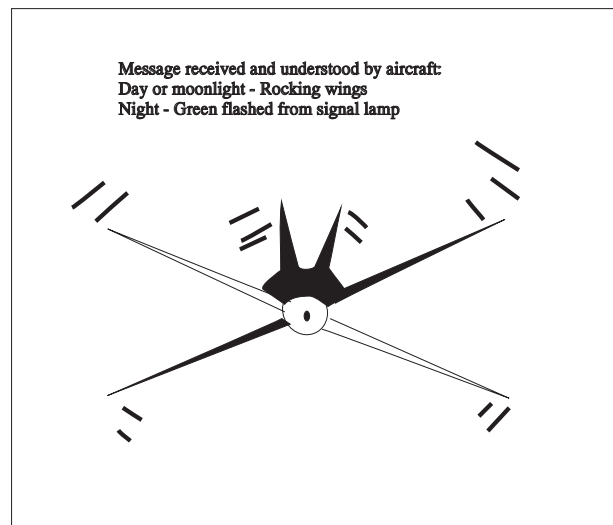
**FIG 6-2-14**  
**Affirmative (Aircraft)**



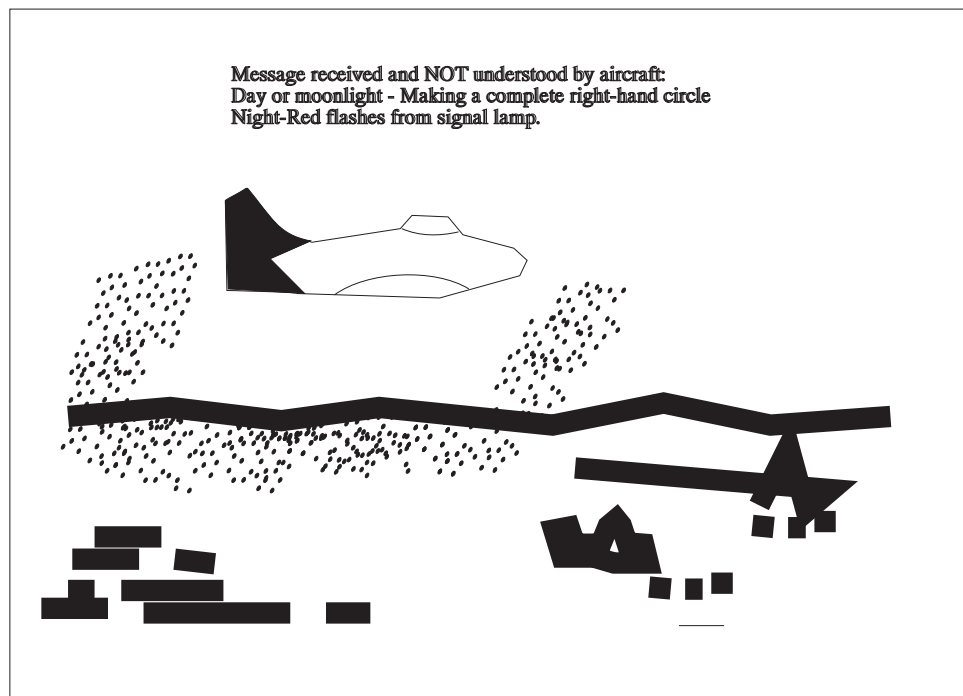
**FIG 6-2-15**  
**Negative (Aircraft)**



**FIG 6-2-16**  
**Message received and understood (Aircraft)**



**FIG 6-2-17**  
**Message received and NOT understood (Aircraft)**







## **6. The Terminal Weather Information for Pilots System (TWIP).**

(a) With the increase in the quantity and quality of terminal weather information available through TDWR, the next step is to provide this information directly to pilots rather than relying on voice communications from ATC. The National Airspace System has long been in need of a means of delivering terminal weather information to the cockpit more efficiently in terms of both speed and accuracy to enhance pilot awareness of weather hazards and reduce air traffic controller workload. With the TWIP capability, terminal weather information, both alphanumerically and graphically, is now available directly to the cockpit on a test basis at 9 locations.

(b) TWIP products are generated using weather data from the TDWR or the Integrated Terminal Weather System (ITWS) testbed. TWIP products are generated and stored in the form of text and character graphic messages. Software has been developed to allow TDWR or ITWS to format the data and send the TWIP products to a database resident at Aeronautical Radio, Inc. (ARINC). These products can then be accessed by pilots using the ARINC Aircraft Communications Addressing and Reporting System (ACARS) data link services. Airline dispatchers can also access this database and send messages to specific aircraft whenever wind shear activity begins or ends at an airport.

(c) TWIP products include descriptions and character graphics of microburst alerts, wind shear alerts, significant precipitation, convective activity within 30 NM surrounding the terminal area, and expected weather that will impact airport operations. During inclement weather, i.e., whenever a predetermined level of precipitation or wind shear is detected within 15 miles of the terminal area, TWIP products are updated once each minute for text messages and once every five minutes for character graphic messages. During good weather (below the predetermined precipitation or wind shear parameters) each message is updated every 10 minutes. These products are intended to improve the situational awareness of the pilot/flight crew, and to aid in flight planning prior to arriving or departing the terminal area. It is important to understand that, in the context of TWIP, the predetermined levels for inclement versus good weather has nothing to do with the criteria for

VFR/MVFR/IFR/LIFR; it only deals with precipitation, wind shears and microbursts.

## **7-1-27. PIREPs Relating to Volcanic Ash Activity**

a. Volcanic eruptions which send ash into the upper atmosphere occur somewhere around the world several times each year. Flying into a volcanic ash cloud can be extremely dangerous. At least two B747s have lost all power in all four engines after such an encounter. Regardless of the type aircraft, some damage is almost certain to ensue after an encounter with a volcanic ash cloud. Additionally, studies have shown that volcanic eruptions are the only significant source of large quantities of sulphur dioxide (SO<sub>2</sub>) gas at jet-cruising altitudes. Therefore, the detection and subsequent reporting of SO<sub>2</sub> is of significant importance. Although SO<sub>2</sub> is colorless, its presence in the atmosphere should be suspected when a sulphur-like or rotten egg odor is present throughout the cabin.

b. While some volcanoes in the U.S. are monitored, many in remote areas are not. These unmonitored volcanoes may erupt without prior warning to the aviation community. A pilot observing a volcanic eruption who has not had previous notification of it may be the only witness to the eruption. Pilots are strongly encouraged to transmit a PIREP regarding volcanic eruptions and any observed volcanic ash clouds or detection of sulphur dioxide (SO<sub>2</sub>) gas associated with volcanic activity.

c. Pilots should submit PIREPs regarding volcanic activity using the Volcanic Activity Reporting (VAR) form as illustrated in Appendix 2. If a VAR form is not immediately available, relay enough information to identify the position and type of volcanic activity.

d. Pilots should verbally transmit the data required in items 1 through 8 of the VAR as soon as possible. The data required in items 9 through 16 of the VAR should be relayed after landing if possible.

## **7-1-28. Thunderstorms**

a. Turbulence, hail, rain, snow, lightning, sustained updrafts and downdrafts, icing conditions—all are present in thunderstorms. While there is some evidence that maximum turbulence exists at the middle level of a thunderstorm, recent studies show little variation of turbulence intensity with altitude.

b. There is no useful correlation between the external visual appearance of thunderstorms and the severity or amount of turbulence or hail within them. The visible thunderstorm cloud is only a portion of a turbulent system whose updrafts and downdrafts often extend far beyond the visible storm cloud. Severe turbulence can be expected up to 20 miles from severe thunderstorms. This distance decreases to about 10 miles in less severe storms.

c. Weather radar, airborne or ground based, will normally reflect the areas of moderate to heavy precipitation (radar does not detect turbulence). The frequency and severity of turbulence generally increases with the radar reflectivity which is closely associated with the areas of highest liquid water content of the storm. **NO FLIGHT PATH THROUGH AN AREA OF STRONG OR VERY STRONG RADAR ECHOES SEPARATED BY 20–30 MILES OR LESS MAY BE CONSIDERED FREE OF SEVERE TURBULENCE.**

d. Turbulence beneath a thunderstorm should not be minimized. This is especially true when the relative humidity is low in any layer between the surface and 15,000 feet. Then the lower altitudes may be characterized by strong out flowing winds and severe turbulence.

e. The probability of lightning strikes occurring to aircraft is greatest when operating at altitudes where temperatures are between minus 5 degrees Celsius and plus 5 degrees Celsius. Lightning can strike aircraft flying in the clear in the vicinity of a thunderstorm.

f. METAR reports do not include a descriptor for severe thunderstorms. However, by understanding severe thunderstorm criteria, i.e., 50 knot winds or  $\frac{3}{4}$  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. Above all, remember this: never regard any thunderstorm “lightly” even when radar observers report the 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 disastrous.

3. Don't fly without airborne radar into a cloud mass containing scattered embedded thunderstorms. Scattered thunderstorms not embedded usually can be visually circumnavigated.

4. Don't trust the visual appearance to be a reliable indicator of the turbulence inside a thunderstorm.

5. 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.

6. Do clear the top of a known or suspected severe thunderstorm by at least 1,000 feet altitude for each 10 knots of wind speed at the cloud top. This should exceed the altitude capability of most aircraft.

7. Do circumnavigate the entire area if the area has  $\frac{6}{10}$  thunderstorm coverage.

8. Do remember that vivid and frequent lightning indicates the probability of a strong thunderstorm.

9. Do regard as extremely hazardous any thunderstorm with tops 35,000 feet or higher whether the top is visually sighted or determined by radar.

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 you have one and secure all loose objects.

2. Plan and hold your course to take you through the storm in a minimum time.

*TBL 7-5-1***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 Printing Office by facsimile request to (202) 512-2250, and can be ordered using Mastercard or Visa.

**7-5-9. 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.

## **7-5-10. 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.

## 7-5-11. Precipitation Static

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

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

1. Complete loss of VHF communications.
2. Erroneous magnetic compass readings (30 percent in error).
3. High pitched squeal on audio.
4. Motor boat sound on audio.
5. Loss of all avionics in clouds.
6. VLF navigation system inoperative most of the time.
7. Erratic instrument readouts.
8. Weak transmissions and poor receptivity of radios.
9. "St. Elmo's Fire" on windshield.

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

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

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

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

**g.** Each manufacturer of static dischargers offers information concerning appropriate discharger location on specific airframes. Such locations emphasize the trailing outboard surfaces of wings and horizontal tail surfaces, plus the tip of the vertical stabilizer, where charge tends to accumulate on the airframe.

Sufficient dischargers must be provided to allow for current-carrying capacity which will maintain airframe potential below the corona threshold of the trailing edges.

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

### **7-5-12. Light Amplification by Stimulated Emission of Radiation (Laser) Operations and Reporting Illumination of Aircraft**

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

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

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

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

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

1. UTC Date and Time of Event.
2. Call Sign or Aircraft Registration Number.
3. Type Aircraft.
4. Nearest Major City.
5. Altitude.
6. Location of Event (Latitude/Longitude and/or Fixed Radial Distance (FRD)).
7. Brief Description of the Event and any other Pertinent Information.

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

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

#### **PHRASEOLOGY-**

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

#### **EXAMPLE-**

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

#### **REFERENCE-**

FAAO 7110.65, *Unauthorized Laser Illumination of Aircraft, Para 10-2-14.*

FAAO 7210.3, *Reporting Laser Illumination of Aircraft, Para 2-1-27.*

**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 Airport/Facility Directory for information regarding these activities.

## 7-5-13. Flying in Flat Light 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. 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.

**c. 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.

### **d. 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.

**e. 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.

### **f. 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.

### **g. 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.

#### **h. 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.

**i. 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.

**j. 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.

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

### **7-5-14. 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 web site by selecting the current year's information bulletins:

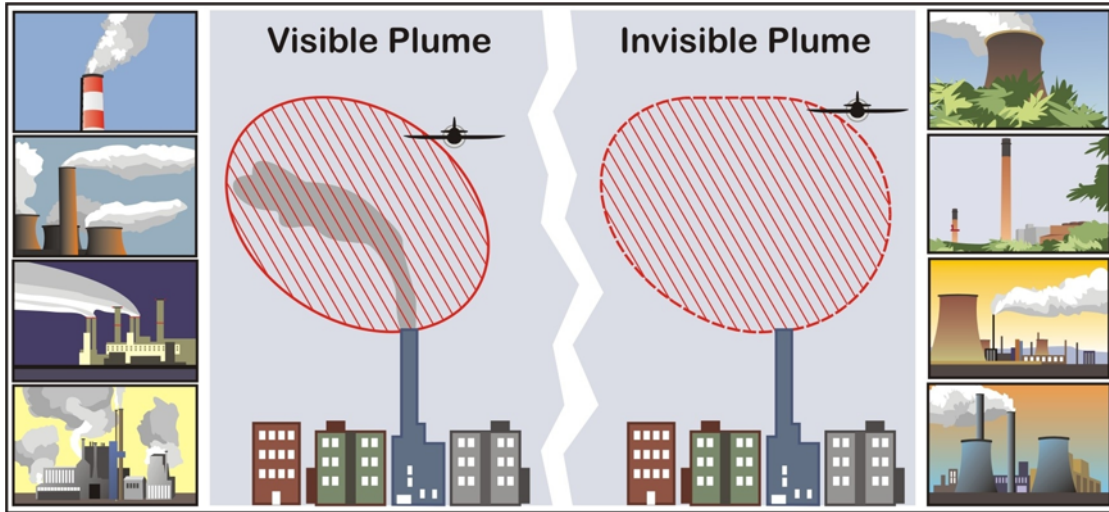
[http://www.faa.gov/library/manuals/examiners\\_inspectors/8400/fsat](http://www.faa.gov/library/manuals/examiners_inspectors/8400/fsat)

## **7-5-15. Avoid Flight in the Vicinity of Thermal Plumes (Smoke Stacks and Cooling Towers)**

**a. Flight Hazards Exist Around Thermal Plumes.** Thermal 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. High temperature exhaust plumes may 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, especially during takeoff and landing.

**b. When able, a pilot should fly upwind of possible thermal plumes.** When a plume is visible via smoke or a condensation cloud, remain clear and realize a plume may have both visible and invisible characteristics. Exhaust stacks without visible plumes may still be in full operation, and airspace in the vicinity should be treated with caution. As with mountain wave turbulence or clear air turbulence, an invisible plume may be encountered unexpectedly. Cooling towers, power plant stacks, exhaust fans, and other similar structures are depicted in FIG 7-5-2. Whether plumes are visible or invisible, the total extent of their unstable air is difficult to ascertain. FAA studies are underway to further characterize the effects of thermal plumes as exhaust effluents. Until the results of these studies are known and possible changes to rules and policy are identified and/or published, pilots are encouraged to exercise caution when flying in the vicinity of thermal plumes. Pilots are encouraged to reference the Airport/Facility Directory where amplifying notes may caution pilots and identify the location of structure(s) emitting thermal plumes.

**FIG 7-5-2**  
**Plumes**



## Appendix 3. Abbreviations/Acronyms

As used in this manual, the following abbreviations/acronyms have the meanings indicated.

Abbreviation/ Acronym	Meaning
AAWU . . . . .	Alaskan Aviation Weather Unit
AAS . . . . .	Airport Advisory Service
AC . . . . .	Advisory Circular
ACAR . . . . .	Aircraft Communications Addressing and Reporting System
ADCUS . . . . .	Advise Customs
ADDS . . . . .	Aviation Digital Data Service
ADF . . . . .	Automatic Direction Finder
ADIZ . . . . .	Air Defense Identification Zone
ADS-B . . . . .	Automatic Dependent Surveillance–Broadcast
AeroNav . . . . .	Aeronautical Navigation Products
AFB . . . . .	Air Force Base
AFCS . . . . .	Automatic Flight Control System
A/FD . . . . .	Airport/Facility Directory
AFIS . . . . .	Automatic Flight Information Service
AFM . . . . .	Aircraft Flight Manual
AGL . . . . .	Above Ground Level
AHRS . . . . .	Attitude Heading Reference System
AIM . . . . .	Aeronautical Information Manual
AIRMET . . . . .	Airmen’s Meteorological Information
ALD . . . . .	Available Landing Distance
ALS . . . . .	Approach Light Systems
AMSL . . . . .	Above Mean Sea Level
ANP . . . . .	Actual Navigation Performance
AOCC . . . . .	Airline Operations Control Center
AP . . . . .	Autopilot System
APV . . . . .	Approach with Vertical Guidance
AR . . . . .	Authorization Required
ARENA . . . . .	Areas Noted for Attention
ARFF IC . . . . .	Aircraft Rescue and Fire Fighting Incident Commander
ARINC . . . . .	Aeronautical Radio Incorporated
ARO . . . . .	Airport Reservations Office
ARSA . . . . .	Airport Radar Service Area
ARSR . . . . .	Air Route Surveillance Radar
ARTCC . . . . .	Air Route Traffic Control Center
ARTS . . . . .	Automated Radar Terminal System
ASDE-X . . . . .	Airport Surface Detection Equipment – Model X
ASOS . . . . .	Automated Surface Observing System
ASR . . . . .	Airport Surveillance Radar

Abbreviation/ Acronym	Meaning
ASRS . . . . .	Aviation Safety Reporting System
ATC . . . . .	Air Traffic Control
ATCRBS . . . . .	Air Traffic Control Radar Beacon System
ATCSCC . . . . .	Air Traffic Control System Command Center
ATCT . . . . .	Airport Traffic Control Tower
ATD . . . . .	Along–Track Distance
ATIS . . . . .	Automatic Terminal Information Service
ATT . . . . .	Attitude Retention System
AWC . . . . .	Aviation Weather Center
AWOS . . . . .	Automated Weather Observing System
AWSS . . . . .	Automated Weather Sensor System
AWTT . . . . .	Aviation Weather Technology Transfer
AWW . . . . .	Severe Weather Forecast Alert
BAASS . . . . .	Bigelow Aerospace Advanced Space Studies
BBS . . . . .	Bulletin Board System
BC . . . . .	Back Course
BECMG . . . . .	Becoming group
C/A . . . . .	Coarse Acquisition
CARTS . . . . .	Common Automated Radar Terminal System (ARTS) (to include ARTS IIIIE and ARTS IIE)
CAT . . . . .	Clear Air Turbulence
CD . . . . .	Controller Display
CDI . . . . .	Course Deviation Indicator
CDR . . . . .	Coded Departure Route
CERAP . . . . .	Combined Center/RAPCON
CFA . . . . .	Controlled Firing Area
CFIT . . . . .	Controlled Flight into Terrain
CFR . . . . .	Code of Federal Regulations
COA . . . . .	Certificate of Waiver or Authorization
CPDLC . . . . .	Controller Pilot Data Link Communications
CTAF . . . . .	Common Traffic Advisory Frequency
CVFP . . . . .	Charted Visual Flight Procedure
CVRS . . . . .	Computerized Voice Reservation System
CWA . . . . .	Center Weather Advisory
CWSU . . . . .	Center Weather Service Unit
DA . . . . .	Decision Altitude
DCA . . . . .	Ronald Reagan Washington National Airport
DCP . . . . .	Data Collection Package
DER . . . . .	Departure End of Runway

Abbreviation/ Acronym	Meaning
DH . . . . .	Decision Height
DME . . . . .	Distance Measuring Equipment
DME/N . . . . .	Standard DME
DME/P . . . . .	Precision DME
DOD . . . . .	Department of Defense
DP . . . . .	Instrument Departure Procedure
DPU . . . . .	Data Processor Unit
DRT . . . . .	Diversion Recovery Tool
DRVSM . . . . .	Domestic Reduced Vertical Separation Minimum
DUATS . . . . .	Direct User Access Terminal System
DVA . . . . .	Diverse Vector Area
DVFR . . . . .	Defense Visual Flight Rules
DVRSN . . . . .	Diversion
EDCT . . . . .	Expect Departure Clearance Time
EFAS . . . . .	En Route Flight Advisory Service
EFV . . . . .	Enhanced Flight Visibility
EFVS . . . . .	Enhanced Flight Vision System
ELT . . . . .	Emergency Locator Transmitter
EMAS . . . . .	Engineered Materials Arresting System
EPE . . . . .	Estimate of Position Error
ESV . . . . .	Expanded Service Volume
ETA . . . . .	Estimated Time of Arrival
ETD . . . . .	Estimated Time of Departure
ETE . . . . .	Estimated Time En Route
EWINS . . . . .	Enhanced Weather Information System
EWR . . . . .	Newark International Airport
FA . . . . .	Area Forecast
FAA . . . . .	Federal Aviation Administration
FAF . . . . .	Final Approach Fix
FAROS . . . . .	Final Approach Runway Occupancy Signal
FAWP . . . . .	Final Approach Waypoint
FB . . . . .	Fly-by
FCC . . . . .	Federal Communications Commission
FD . . . . .	Flight Director System
FDC . . . . .	Flight Data Center
FDE . . . . .	Fault Detection and Exclusion
FIR . . . . .	Flight Information Region
FIS . . . . .	Flight Information Service
FISDL . . . . .	Flight Information Services Data Link
FLIP . . . . .	Flight Information Publication
FMS . . . . .	Flight Management System
FMSP . . . . .	Flight Management System Procedure
FO . . . . .	Fly-over
FPA . . . . .	Flight Path Angle
FPV . . . . .	Flight Path Vector
FPNM . . . . .	Feet Per Nautical Mile

Abbreviation/ Acronym	Meaning
FSDO . . . . .	Flight Standards District Office
FSS . . . . .	Flight Service Station
GBAS . . . . .	Ground Based Augmentation System
GEO . . . . .	Geostationary Satellite
GLS . . . . .	GBAS Landing System
GNSS . . . . .	Global Navigation Satellite System
GNSSP . . . . .	Global Navigation Satellite System Panel
GPS . . . . .	Global Positioning System
GRI . . . . .	Group Repetition Interval
GSD . . . . .	Geographical Situation Display
GUS . . . . .	Ground Uplink Station
HAT . . . . .	Height Above Touchdown
HDTA . . . . .	High Density Traffic Airports
HEMS . . . . .	Helicopter Emergency Medical Services
HIRL . . . . .	High Intensity Runway Lights
HIWAS . . . . .	Hazardous Inflight Weather Advisory Service
HRR . . . . .	Helicopter Rapid Refueling Procedures
HUD . . . . .	Head-Up Display
Hz . . . . .	Hertz
IAF . . . . .	Initial Approach Fix
IAP . . . . .	Instrument Approach Procedure
IAS . . . . .	Indicated Air Speed
IAWP . . . . .	Initial Approach Waypoint
ICAO . . . . .	International Civil Aviation Organization
IF . . . . .	Intermediate Fix
IFIM . . . . .	International Flight Information Manual
IFR . . . . .	Instrument Flight Rules
ILS . . . . .	Instrument Landing System
ILS/PRM . . . . .	Instrument Landing System/Precision Runway Monitor
IM . . . . .	Inner Marker
IMC . . . . .	Instrument Meteorological Conditions
InFO . . . . .	Information For Operators
INS . . . . .	Inertial Navigation System
IOC . . . . .	Initial Operational Capability
IR . . . . .	IFR Military Training Route
IRU . . . . .	Inertial Reference Unit
ITWS . . . . .	Integrated Terminal Weather System
JFK . . . . .	John F. Kennedy International Airport
kHz . . . . .	Kilohertz
LAA . . . . .	Local Airport Advisory
LAAS . . . . .	Local Area Augmentation System
LAHSO . . . . .	Land and Hold Short Operations
LAWRS . . . . .	Limited Aviation Weather Reporting Station
LDA . . . . .	Localizer Type Directional Aid

Abbreviation/ Acronym	Meaning
LDA/PRM . .	Localizer Type Directional Aid/Precision Runway Monitor
LGA . . . . .	LaGuardia Airport
LIRL . . . . .	Low Intensity Runway Lights
LLWAS . . . . .	Low Level Wind Shear Alert System
LLWAS NE .	Low Level Wind Shear Alert System Network Expansion
LLWAS-RS .	Low Level Wind Shear Alert System Relocation/Sustainment
LNAV . . . . .	Lateral Navigation
LOC . . . . .	Localizer
LOP . . . . .	Line-of-position
LORAN . . . .	Long Range Navigation System
LP . . . . .	Localizer Performance
LPV . . . . .	Localizer Performance with Vertical Guidance
LUAW . . . . .	Line Up and Wait
LZ . . . . .	Landing Zone
MAHWP . . .	Missed Approach Holding Waypoint
MAP . . . . .	Missed Approach Point
MAWP . . . . .	Missed Approach Waypoint
MDA . . . . .	Minimum Descent Altitude
MEA . . . . .	Minimum En Route Altitude
MEARTS . . .	Micro En Route Automated Radar Tracking System
METAR . . . .	Aviation Routine Weather Report
MHz . . . . .	Megahertz
MIRL . . . . .	Medium Intensity Runway Lights
MLS . . . . .	Microwave Landing System
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

Abbreviation/ Acronym	Meaning
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
NMAC . . . . .	Near Midair Collision
NOAA . . . . .	National Oceanic and Atmospheric Administration
NOPAC . . . .	North Pacific
NoPT . . . . .	No Procedure Turn Required
NOTAM . . . .	Notice to Airmen
NPA . . . . .	Nonprecision Approach
NRS . . . . .	Navigation Reference System
NSA . . . . .	National Security Area
NSW . . . . .	No Significant Weather
NTAP . . . . .	Notices to Airmen Publication
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

Abbreviation/ Acronym	Meaning
RAA . . . . .	Remote Advisory Airport
RAIM . . . . .	Receiver Autonomous Integrity Monitoring
STMP . . . . .	Special Traffic Management Program
SWSL . . . . .	Supplemental Weather Service Locations
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
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
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
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

Abbreviation/ Acronym	Meaning
STARS . . . . .	Standard Terminal Automation Replacement System
TA . . . . .	Traffic Advisory
TAA . . . . .	Terminal Arrival Area
TAC . . . . .	Terminal Area Chart
TACAN . . . . .	Tactical Air Navigation
TAF . . . . .	Aerodrome Forecast
TAS . . . . .	True Air Speed
TCAS . . . . .	Traffic Alert and Collision Avoidance System
TCH . . . . .	Threshold Crossing Height
TD . . . . .	Time Difference
TDLS . . . . .	Tower Data Link System
TDWR . . . . .	Terminal Doppler Weather Radar
TDZ . . . . .	Touchdown Zone
TDZE . . . . .	Touchdown Zone Elevation
TDZL . . . . .	Touchdown Zone Lights
TEC . . . . .	Tower En Route Control
THL . . . . .	Takeoff Hold Lights
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



Abbreviation/ Acronym	Meaning
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
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

Abbreviation/ Acronym	Meaning
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
WA . . . . .	AIRMET
WAAS . . . . .	Wide Area Augmentation System
WAC . . . . .	World Aeronautical Chart
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
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

---

## 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:

AREA NAVIGATION (RNAV) GPS PRM APPROACH  
LOCALIZER TYPE DIRECTIONAL AID (LDA) PRM APPROACH  
SIMULTANEOUS OFFSET INSTRUMENT APPROACH (SOIA)

e. Terms Deleted:

DF  
DF APPROACH PROCEDURE  
DF FIX  
DF GUIDANCE  
DF STEER  
DIRECTION FINDER  
UDF  
UVDF  
VDF

f. Terms Modified:

CONTROLLER PILOT DATA LINK COMMUNICATIONS (CPDLC)  
GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS)  
GLOBAL POSITIONING SYSTEM (GPS)  
ILS PRM APPROACH  
LORAN  
NIGHT  
PRECISION RUNWAY MONITOR (PRM)  
SECURITY NOTICE (SECNOT)

g. Editorial/format changes were made where necessary. Revision bars were not used due to the insignificant nature of the changes.



**APD–**

(See AUTOMATED PROBLEM DETECTION.)

**APDIA–**

(See AUTOMATED PROBLEM DETECTION INHIBITED AREA.)

**APPROACH CLEARANCE–** Authorization by ATC for a pilot to conduct an instrument approach. The type of instrument approach for which a clearance and other pertinent information is provided in the approach clearance when required.

(See CLEARED APPROACH.)

(See INSTRUMENT APPROACH PROCEDURE.)

(Refer to AIM.)

(Refer to 14 CFR Part 91.)

**APPROACH CONTROL FACILITY–** A terminal ATC facility that provides approach control service in a terminal area.

(See APPROACH CONTROL SERVICE.)

(See RADAR APPROACH CONTROL FACILITY.)

**APPROACH CONTROL SERVICE–** Air traffic control service provided by an approach control facility for arriving and departing VFR/IFR aircraft and, on occasion, en route aircraft. At some airports not served by an approach control facility, the ARTCC provides limited approach control service.

(See ICAO term APPROACH CONTROL SERVICE.)

(Refer to AIM.)

**APPROACH CONTROL SERVICE [ICAO]–** Air traffic control service for arriving or departing controlled flights.

**APPROACH GATE–** An imaginary point used within ATC as a basis for vectoring aircraft to the final approach course. The gate will be established along the final approach course 1 mile from the final approach fix on the side away from the airport and will be no closer than 5 miles from the landing threshold.

**APPROACH LIGHT SYSTEM–**

(See AIRPORT LIGHTING.)

**APPROACH SEQUENCE–** The order in which aircraft are positioned while on approach or awaiting approach clearance.

(See LANDING SEQUENCE.)

(See ICAO term APPROACH SEQUENCE.)

**APPROACH SEQUENCE [ICAO]–** The order in which two or more aircraft are cleared to approach to land at the aerodrome.

**APPROACH SPEED–** The recommended speed contained in aircraft manuals used by pilots when making an approach to landing. This speed will vary for different segments of an approach as well as for aircraft weight and configuration.

**APPROPRIATE ATS AUTHORITY [ICAO]–** The relevant authority designated by the State responsible for providing air traffic services in the airspace concerned. In the United States, the “appropriate ATS authority” is the Program Director for Air Traffic Planning and Procedures, ATP-1.

**APPROPRIATE AUTHORITY–**

a. Regarding flight over the high seas: the relevant authority is the State of Registry.

b. Regarding flight over other than the high seas: the relevant authority is the State having sovereignty over the territory being overflown.

**APPROPRIATE OBSTACLE CLEARANCE MINIMUM ALTITUDE–** Any of the following:

(See MINIMUM EN ROUTE IFR ALTITUDE.)

(See MINIMUM IFR ALTITUDE.)

(See MINIMUM OBSTRUCTION CLEARANCE ALTITUDE.)

(See MINIMUM VECTORING ALTITUDE.)

**APPROPRIATE TERRAIN CLEARANCE MINIMUM ALTITUDE–** Any of the following:

(See MINIMUM EN ROUTE IFR ALTITUDE.)

(See MINIMUM IFR ALTITUDE.)

(See MINIMUM OBSTRUCTION CLEARANCE ALTITUDE.)

(See MINIMUM VECTORING ALTITUDE.)

**APRON–** A defined area on an airport or heliport intended to accommodate aircraft for purposes of loading or unloading passengers or cargo, refueling, parking, or maintenance. With regard to seaplanes, a ramp is used for access to the apron from the water.

(See ICAO term APRON.)

**APRON [ICAO]–** A defined area, on a land aerodrome, intended to accommodate aircraft for purposes of loading or unloading passengers, mail or cargo, refueling, parking or maintenance.

**ARC–** The track over the ground of an aircraft flying at a constant distance from a navigational aid by reference to distance measuring equipment (DME).

**AREA CONTROL CENTER [ICAO]**– An air traffic control facility primarily responsible for ATC services being provided IFR aircraft during the en route phase of flight. The U.S. equivalent facility is an air route traffic control center (ARTCC).

**AREA NAVIGATION (RNAV)**– A method of navigation which permits aircraft operation on any desired flight path within the coverage of ground– or space–based navigation aids or within the limits of the capability of self-contained aids, or a combination of these.

**Note:** Area navigation includes performance–based navigation as well as other operations that do not meet the definition of performance–based navigation.

#### **AREA NAVIGATION (RNAV) APPROACH CONFIGURATION:**

**a. STANDARD T**– An RNAV approach whose design allows direct flight to any one of three initial approach fixes (IAF) and eliminates the need for procedure turns. The standard design is to align the procedure on the extended centerline with the missed approach point (MAP) at the runway threshold, the final approach fix (FAF), and the initial approach/intermediate fix (IAF/IF). The other two IAFs will be established perpendicular to the IF.

**b. MODIFIED T**– An RNAV approach design for single or multiple runways where terrain or operational constraints do not allow for the standard T. The “T” may be modified by increasing or decreasing the angle from the corner IAF(s) to the IF or by eliminating one or both corner IAFs.

**c. STANDARD I**– An RNAV approach design for a single runway with both corner IAFs eliminated. Course reversal or radar vectoring may be required at busy terminals with multiple runways.

**d. TERMINAL ARRIVAL AREA (TAA)**– The TAA is controlled airspace established in conjunction with the Standard or Modified T and I RNAV approach configurations. In the standard TAA, there are three areas: straight-in, left base, and right base. The arc boundaries of the three areas of the TAA are published portions of the approach and allow aircraft to transition from the en route structure direct to the nearest IAF. TAAs will also eliminate or reduce feeder routes, departure extensions, and procedure turns or course reversal.

**1. STRAIGHT-IN AREA**– A 30NM arc centered on the IF bounded by a straight line extending through the IF perpendicular to the intermediate course.

**2. LEFT BASE AREA**– A 30NM arc centered on the right corner IAF. The area shares a boundary with the straight-in area except that it extends out for 30NM from the IAF and is bounded on the other side by a line extending from the IF through the FAF to the arc.

**3. RIGHT BASE AREA**– A 30NM arc centered on the left corner IAF. The area shares a boundary with the straight-in area except that it extends out for 30NM from the IAF and is bounded on the other side by a line extending from the IF through the FAF to the arc.

**AREA NAVIGATION (RNAV) GLOBAL POSITIONING SYSTEM (GPS) PRECISION RUNWAY MONITORING (PRM) APPROACH** – A GPS approach, which requires vertical guidance, used in lieu of an ILS PRM approach to conduct approaches to parallel runways whose extended centerlines are separated by less than 4,300 feet and at least 3,000 feet, where closely spaced independent approaches are permitted. Also used in lieu of an ILS PRM and/or LDA PRM approach to conduct Simultaneous Offset Instrument Approach (SOIA) operations.

**ARINC**– An acronym for Aeronautical Radio, Inc., a corporation largely owned by a group of airlines. ARINC is licensed by the FCC as an aeronautical station and contracted by the FAA to provide communications support for air traffic control and meteorological services in portions of international airspace.

**ARMY AVIATION FLIGHT INFORMATION BULLETIN**– A bulletin that provides air operation data covering Army, National Guard, and Army Reserve aviation activities.

**ARO**–

(See AIRPORT RESERVATION OFFICE.)

**ARRESTING SYSTEM**– A safety device consisting of two major components, namely, engaging or catching devices and energy absorption devices for the purpose of arresting both tailhook and/or nontailhook-equipped aircraft. It is used to prevent aircraft from overrunning runways when the aircraft cannot be stopped after landing or during aborted

takeoff. Arresting systems have various names; e.g., arresting gear, hook device, wire barrier cable.

(See ABORT.)

(Refer to AIM.)

**ARRIVAL AIRCRAFT INTERVAL**– An internally generated program in hundredths of minutes based upon the AAR. AAI is the desired optimum interval between successive arrival aircraft over the vertex.

**ARRIVAL CENTER**– The ARTCC having jurisdiction for the impacted airport.

**ARRIVAL DELAY**– A parameter which specifies a period of time in which no aircraft will be metered for arrival at the specified airport.

**ARRIVAL SECTOR**– An operational control sector containing one or more meter fixes.

**ARRIVAL SECTOR ADVISORY LIST**– An ordered list of data on arrivals displayed at the PVD/MDM of the sector which controls the meter fix.

**ARRIVAL SEQUENCING PROGRAM**– The automated program designed to assist in sequencing aircraft destined for the same airport.

**ARRIVAL TIME**– The time an aircraft touches down on arrival.

**ARSR**–

(See AIR ROUTE SURVEILLANCE RADAR.)

**ARTCC**–

(See AIR ROUTE TRAFFIC CONTROL CENTER.)

**ARTS**–

(See AUTOMATED RADAR TERMINAL SYSTEMS.)

**ASDA**–

(See ACCELERATE-STOP DISTANCE AVAILABLE.)

**ASDA [ICAO]**–

(See ICAO Term ACCELERATE-STOP DISTANCE AVAILABLE.)

**ASDE**–

(See AIRPORT SURFACE DETECTION EQUIPMENT.)

**ASF**–

(See AIRPORT STREAM FILTER.)

**ASLAR**–

(See AIRCRAFT SURGE LAUNCH AND RECOVERY.)

**ASP**–

(See ARRIVAL SEQUENCING PROGRAM.)

**ASR**–

(See AIRPORT SURVEILLANCE RADAR.)

**ASR APPROACH**–

(See SURVEILLANCE APPROACH.)

**ASSOCIATED**– A radar target displaying a data block with flight identification and altitude information.

(See UNASSOCIATED.)

**ATC**–

(See AIR TRAFFIC CONTROL.)

**ATC ADVISES**– Used to prefix a message of noncontrol information when it is relayed to an aircraft by other than an air traffic controller.

(See ADVISORY.)

**ATC ASSIGNED AIRSPACE**– Airspace of defined vertical/lateral limits, assigned by ATC, for the purpose of providing air traffic segregation between the specified activities being conducted within the assigned airspace and other IFR air traffic.

(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**– URET 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 USER REQUEST EVALUATION 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.

**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 channelling 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.

**AUTOLAND APPROACH–** An autoland approach is a precision instrument approach to touchdown and, in some cases, through the landing rollout. An autoland approach is performed by the aircraft autopilot which is receiving position information and/or steering commands from onboard navigation equipment.

**Note:** Autoland and coupled approaches are flown in VFR and IFR. It is common for carriers to require their crews to fly coupled approaches and autoland approaches (if certified) when the weather conditions are less than approximately 4,000 RVR.

(See COUPLED APPROACH.)

**AUTOMATED INFORMATION TRANSFER–** A precoordinated process, specifically defined in facility directives, during which a transfer of altitude control and/or radar identification is accomplished without verbal coordination between controllers using information communicated in a full data block.

**AUTOMATED MUTUAL-ASSISTANCE VESSEL RESCUE SYSTEM–** A facility which can deliver, in a matter of minutes, a surface picture (SURPIC) of vessels in the area of a potential or actual search and rescue incident, including their predicted positions and their characteristics.

(See FAO 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 URET performs conflict detection.

(See USER REQUEST EVALUATION TOOL.)

**AUTOMATED PROBLEM DETECTION INHIBITED AREA (APDIA)–** Airspace surrounding a terminal area within which APD is inhibited for all flights within that airspace.

**AUTOMATED RADAR TERMINAL SYSTEMS (ARTS)–** A generic term for several tracking systems included in the Terminal Automation Systems (TAS). ARTS plus a suffix roman numeral denotes a major modification to that system.

**a. ARTS IIIA.** The Radar Tracking and Beacon Tracking Level (RT&BTL) of the modular, programmable automated radar terminal system. ARTS IIIA detects, tracks, and predicts primary as well as secondary radar-derived aircraft targets. This

more sophisticated computer-driven system upgrades the existing ARTS III system by providing improved tracking, continuous data recording, and fail-soft capabilities.

**b. Common ARTS.** Includes ARTS IIE, ARTS IIIE; and ARTS IIIE with ACD (see DTAS) which combines functionalities of the previous ARTS systems.

**c. Programmable Indicator Data Processor (PIDP).** The PIDP is a modification to the AN/TPX-42 interrogator system currently installed in fixed RAPCONs. The PIDP detects, tracks, and predicts secondary radar aircraft targets. These are displayed by means of computer-generated symbols and alphanumeric characters depicting flight identification, aircraft altitude, ground speed, and flight plan data. Although primary radar targets are not tracked, they are displayed coincident with the secondary radar targets as well as with the other symbols and alphanumerics. The system has the capability of interfacing with ARTCCs.

**AUTOMATED WEATHER SYSTEM–** Any of the automated weather sensor platforms that collect weather data at airports and disseminate the weather information via radio and/or landline. The systems currently consist of the Automated Surface Observing System (ASOS), Automated Weather Sensor System (AWSS) and Automated Weather Observation System (AWOS).

**AUTOMATED UNICOM–** Provides completely automated weather, radio check capability and airport advisory information on an Automated UNICOM system. These systems offer a variety of features, typically selectable by microphone clicks, on the UNICOM frequency. Availability will be published in the Airport/Facility Directory and approach charts.

**AUTOMATIC ALTITUDE REPORT–**  
(See ALTITUDE READOUT.)

**AUTOMATIC ALTITUDE REPORTING–** That function of a transponder which responds to Mode C interrogations by transmitting the aircraft's altitude in 100-foot increments.

**AUTOMATIC CARRIER LANDING SYSTEM–** U.S. Navy final approach equipment consisting of precision tracking radar coupled to a computer data link to provide continuous information to the aircraft, monitoring capability to the pilot, and a backup approach system.

**AUTOMATIC DEPENDENT SURVEILLANCE (ADS) [ICAO]–** A surveillance technique in which aircraft automatically provide, via a data link, data derived from on-board navigation and position fixing systems, including aircraft identification, four dimensional position and additional data as appropriate.

**AUTOMATIC DEPENDENT SURVEILLANCE–BROADCAST (ADS-B)–** A surveillance system in which an aircraft or vehicle to be detected is fitted with cooperative equipment in the form of a data link transmitter. The aircraft or vehicle periodically broadcasts its GPS-derived position and other information such as velocity over the data link, which is received by a ground-based transmitter/receiver (transceiver) for processing and display at an air traffic control facility.

(See GLOBAL POSITIONING SYSTEM.)

(See GROUND-BASED TRANSCEIVER.)

**AUTOMATIC DEPENDENT SURVEILLANCE–CONTRACT (ADS-C)–** A data link position reporting system, controlled by a ground station, that establishes contracts with an aircraft's avionics that occur automatically whenever specific events occur, or specific time intervals are reached.

**AUTOMATIC DIRECTION FINDER–** An aircraft radio navigation system which senses and indicates the direction to a L/MF nondirectional radio beacon (NDB) ground transmitter. Direction is indicated to the pilot as a magnetic bearing or as a relative bearing to the longitudinal axis of the aircraft depending on the type of indicator installed in the aircraft. In certain applications, such as military, ADF operations may be based on airborne and ground transmitters in the VHF/UHF frequency spectrum.

(See BEARING.)

(See NONDIRECTIONAL BEACON.)

**AUTOMATIC FLIGHT INFORMATION SERVICE (AFIS) – ALASKA FSSs ONLY–** The continuous broadcast of recorded non-control information at airports in Alaska where a FSS provides local airport advisory service. The AFIS broadcast automates the repetitive transmission of essential but routine information such as weather, wind, altimeter, favored runway, breaking action, airport NOTAMS, and other applicable information. The information is continuously broadcast over a discrete VHF radio frequency (usually the ASOS/AWSS/AWOS frequency.)

**AUTOMATIC TERMINAL INFORMATION SERVICE**– The continuous broadcast of recorded noncontrol information in selected terminal areas. Its purpose is to improve controller effectiveness and to relieve frequency congestion by automating the repetitive transmission of essential but routine information; e.g., “Los Angeles information Alfa. One three zero zero Coordinated Universal Time. Weather, measured ceiling two thousand overcast, visibility three, haze, smoke, temperature seven one, dew point five seven, wind two five zero at five, altimeter two niner niner six. I-L-S Runway Two Five Left approach in use, Runway Two Five Right closed, advise you have Alfa.”

(See ICAO term **AUTOMATIC TERMINAL INFORMATION SERVICE**.)

(Refer to AIM.)

**AUTOMATIC TERMINAL INFORMATION SERVICE [ICAO]**– The provision of current, routine information to arriving and departing aircraft by means of continuous and repetitive broadcasts throughout the day or a specified portion of the day.

**AUTOROTATION**– A rotorcraft flight condition in which the lifting rotor is driven entirely by action of the air when the rotorcraft is in motion.

**a. Autorotative Landing/Touchdown Autorotation.** Used by a pilot to indicate that the landing will be made without applying power to the rotor.

**b. Low Level Autorotation.** Commences at an altitude well below the traffic pattern, usually below

100 feet AGL and is used primarily for tactical military training.

**c. 180 degrees Autorotation.** Initiated from a downwind heading and is commenced well inside the normal traffic pattern. “Go around” may not be possible during the latter part of this maneuver.

**AVAILABLE LANDING DISTANCE (ALD)**– The portion of a runway available for landing and roll-out for aircraft cleared for LAHSO. This distance is measured from the landing threshold to the hold-short point.

**AVIATION WEATHER SERVICE**– A service provided by the National Weather Service (NWS) and FAA which collects and disseminates pertinent weather information for pilots, aircraft operators, and ATC. Available aviation weather reports and forecasts are displayed at each NWS office and FAA FSS.

(See **EN ROUTE FLIGHT ADVISORY SERVICE**.)

(See **TRANSCRIBED WEATHER BROADCAST**.)

(See **WEATHER ADVISORY**.)

(Refer to AIM.)

**AWW**–

(See **SEVERE WEATHER FORECAST ALERTS**.)

**AZIMUTH (MLS)**– A magnetic bearing extending from an MLS navigation facility.

Note: Azimuth bearings are described as magnetic and are referred to as “azimuth” in radio telephone communications.



**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.)

**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**– A coupled approach is an instrument approach performed by the aircraft autopilot which is receiving position information and/or steering commands from onboard navigation equipment. In general, coupled nonprecision approaches must be discontinued and flown manually at altitudes lower than 50 feet below the minimum descent altitude, and coupled precision approaches must be flown manually below 50 feet AGL.

Note: Coupled and autoland approaches are flown in VFR and IFR. It is common for carriers to require their crews to fly coupled approaches and autoland approaches (if certified) when the weather conditions are less than approximately 4,000 RVR.

(See AUTOLAND APPROACH.)

#### 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.

**c.** The intended track along a straight, curved, or segmented MLS path.

(See BEARING.)

(See INSTRUMENT LANDING SYSTEM.)

(See MICROWAVE LANDING SYSTEM.)

(See RADIAL.)

#### CPDLC–

(See CONTROLLER PILOT DATA LINK COMMUNICATIONS.)

#### CPL [ICAO]–

(See ICAO term CURRENT FLIGHT PLAN.)

**CRITICAL ENGINE–** The engine which, upon failure, would most adversely affect the performance or handling qualities of an aircraft.

**CROSS (FIX) AT (ALTITUDE)–** Used by ATC when a specific altitude restriction at a specified fix is required.

**CROSS (FIX) AT OR ABOVE (ALTITUDE)–** Used by ATC when an altitude restriction at a specified fix is required. It does not prohibit the aircraft from crossing the fix at a higher altitude than specified; however, the higher altitude may not be one that will violate a succeeding altitude restriction or altitude assignment.

(See ALTITUDE RESTRICTION.)

(Refer to AIM.)

**CROSS (FIX) AT OR BELOW (ALTITUDE)–** Used by ATC when a maximum crossing altitude at a specific fix is required. It does not prohibit the aircraft from crossing the fix at a lower altitude; however, it must be at or above the minimum IFR altitude.

(See ALTITUDE RESTRICTION.)

(See MINIMUM IFR ALTITUDES.)

(Refer to 14 CFR Part 91.)

#### CROSSWIND–

**a.** When used concerning the traffic pattern, the word means “crosswind leg.”

(See TRAFFIC PATTERN.)

**b.** When used concerning wind conditions, the word means a wind not parallel to the runway or the path of an aircraft.

(See CROSSWIND COMPONENT.)

**CROSSWIND COMPONENT–** The wind component measured in knots at 90 degrees to the longitudinal axis of the runway.

**CRUISE–** Used in an ATC clearance to authorize a pilot to conduct flight at any altitude from the minimum IFR altitude up to and including the altitude specified in the clearance. The pilot may level off at any intermediate altitude within this block of airspace. Climb/descent within the block is to be made at the discretion of the pilot. However, once the pilot starts descent and verbally reports leaving an altitude in the block, he/she may not return to that altitude without additional ATC clearance. Further, it is approval for the pilot to proceed to and make an approach at destination airport and can be used in conjunction with:

**a.** An airport clearance limit at locations with a standard/special instrument approach procedure. The CFRs require that if an instrument letdown to an airport is necessary, the pilot shall make the letdown in accordance with a standard/special instrument approach procedure for that airport, or

**b.** An airport clearance limit at locations that are within/below/outside controlled airspace and without a standard/special instrument approach procedure. Such a clearance is NOT AUTHORIZATION for the pilot to descend under IFR conditions below the applicable minimum IFR altitude nor does it imply that ATC is exercising control over aircraft in Class G airspace; however, it provides a means for the aircraft to proceed to destination airport, descend, and land in accordance with applicable CFRs governing VFR flight operations. Also, this provides search and rescue protection until such time as the IFR flight plan is closed.

(See INSTRUMENT APPROACH PROCEDURE.)

**CRUISE CLIMB–** A climb technique employed by aircraft, usually at a constant power setting, resulting in an increase of altitude as the aircraft weight decreases.

# D

**D-ATIS–**

(See DIGITAL-AUTOMATIC TERMINAL INFORMATION SERVICE.)

**DA [ICAO]–**

(See ICAO Term DECISION ALTITUDE/DECISION HEIGHT.)

**DAIR–**

(See DIRECT ALTITUDE AND IDENTITY READOUT.)

**DANGER AREA [ICAO]–** An airspace of defined dimensions within which activities dangerous to the flight of aircraft may exist at specified times.

Note: The term “Danger Area” is not used in reference to areas within the United States or any of its possessions or territories.

**DAS–**

(See DELAY ASSIGNMENT.)

**DATA BLOCK–**

(See ALPHANUMERIC DISPLAY.)

**DEAD RECKONING–** Dead reckoning, as applied to flying, is the navigation of an airplane solely by means of computations based on airspeed, course, heading, wind direction, and speed, groundspeed, and elapsed time.

**DECISION ALTITUDE/DECISION HEIGHT [ICAO]–** A specified altitude or height (A/H) in the precision approach at which a missed approach must be initiated if the required visual reference to continue the approach has not been established.

Note 1: Decision altitude [DA] is referenced to mean sea level [MSL] and decision height [DH] is referenced to the threshold elevation.

Note 2: The required visual reference means that section of the visual aids or of the approach area which should have been in view for sufficient time for the pilot to have made an assessment of the aircraft position and rate of change of position, in relation to the desired flight path.

**DECISION HEIGHT–** With respect to the operation of aircraft, means the height at which a decision must be made during an ILS, MLS, or PAR instrument

approach to either continue the approach or to execute a missed approach.

(See ICAO term DECISION ALTITUDE/DECISION HEIGHT.)

**DECODER–** The device used to decipher signals received from ATCRBS transponders to effect their display as select codes.

(See CODES.)

(See RADAR.)

**DEFENSE VISUAL FLIGHT RULES–** Rules applicable to flights within an ADIZ conducted under the visual flight rules in 14 CFR Part 91.

(See AIR DEFENSE IDENTIFICATION ZONE.)

(Refer to 14 CFR Part 91.)

(Refer to 14 CFR Part 99.)

**DELAY ASSIGNMENT (DAS)–** Delays are distributed to aircraft based on the traffic management program parameters. The delay assignment is calculated in 15-minute increments and appears as a table in Traffic Flow Management System (TFMS).

**DELAY INDEFINITE (REASON IF KNOWN) EXPECT FURTHER CLEARANCE (TIME)–** Used by ATC to inform a pilot when an accurate estimate of the delay time and the reason for the delay cannot immediately be determined; e.g., a disabled aircraft on the runway, terminal or center area saturation, weather below landing minimums, etc.

(See EXPECT FURTHER CLEARANCE (TIME).)

**DELAY TIME–** The amount of time that the arrival must lose to cross the meter fix at the assigned meter fix time. This is the difference between ACLT and VTA.

**DEPARTURE CENTER–** The ARTCC having jurisdiction for the airspace that generates a flight to the impacted airport.

**DEPARTURE CONTROL–** A function of an approach control facility providing air traffic control service for departing IFR and, under certain conditions, VFR aircraft.

(See APPROACH CONTROL FACILITY.)

(Refer to AIM.)

**DEPARTURE SEQUENCING PROGRAM–** A program designed to assist in achieving a specified interval over a common point for departures.

**DEPARTURE TIME**– The time an aircraft becomes airborne.

**DESCENT SPEED ADJUSTMENTS**– Speed deceleration calculations made to determine an accurate VTA. These calculations start at the transition point and use arrival speed segments to the vertex.

**DESIRED COURSE**–

a. True– A predetermined desired course direction to be followed (measured in degrees from true north).

b. Magnetic– A predetermined desired course direction to be followed (measured in degrees from local magnetic north).

**DESIRED TRACK**– The planned or intended track between two waypoints. It is measured in degrees from either magnetic or true north. The instantaneous angle may change from point to point along the great circle track between waypoints.

**DETRESFA (DISTRESS PHASE) [ICAO]**– The code word used to designate an emergency phase wherein there is reasonable certainty that an aircraft and its occupants are threatened by grave and imminent danger or require immediate assistance.

**DEVIATIONS**–

a. A departure from a current clearance, such as an off course maneuver to avoid weather or turbulence.

b. Where specifically authorized in the CFRs and requested by the pilot, ATC may permit pilots to deviate from certain regulations.

**DH**–

(See **DECISION HEIGHT**.)

**DH [ICAO]**–

(See ICAO Term **DECISION ALTITUDE/DECISION HEIGHT**.)

**DIGITAL-AUTOMATIC TERMINAL INFORMATION SERVICE (D-ATIS)**– The service provides text messages to aircraft, airlines, and other users outside the standard reception range of conventional ATIS via landline and data link communications to the cockpit. Also, the service provides a computer-synthesized voice message that can be transmitted to all aircraft within range of existing transmitters. The Terminal Data Link System (TDLS) D-ATIS application uses weather inputs from local automated weather sources or manually entered meteorological data together with preprogrammed menus to provide

standard information to users. Airports with D-ATIS capability are listed in the Airport/Facility Directory.

**DIGITAL TARGET**– A computer-generated symbol representing an aircraft's position, based on a primary return or radar beacon reply, shown on a digital display.

**DIGITAL TERMINAL AUTOMATION SYSTEM (DTAS)**– A system where digital radar and beacon data is presented on digital displays and the operational program monitors the system performance on a real-time basis.

**DIGITIZED TARGET**– A computer-generated indication shown on an analog radar display resulting from a primary radar return or a radar beacon reply.

**DIRECT**– Straight line flight between two navigational aids, fixes, points, or any combination thereof. When used by pilots in describing off-airway routes, points defining direct route segments become compulsory reporting points unless the aircraft is under radar contact.

**DIRECT ALTITUDE AND IDENTITY READ-OUT**– The DAIR System is a modification to the AN/TPX-42 Interrogator System. The Navy has two adaptations of the DAIR System-Carrier Air Traffic Control Direct Altitude and Identification Readout System for Aircraft Carriers and Radar Air Traffic Control Facility Direct Altitude and Identity Readout System for land-based terminal operations. The DAIR detects, tracks, and predicts secondary radar aircraft targets. Targets are displayed by means of computer-generated symbols and alphanumeric characters depicting flight identification, altitude, ground speed, and flight plan data. The DAIR System is capable of interfacing with ARTCCs.

**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 Airport/Facility Directory 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**– Equipment (airborne and ground) used to measure, in nautical miles, the slant range distance of an aircraft from the DME navigational aid.

(See MICROWAVE LANDING SYSTEM.)

(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.)

(See MICROWAVE LANDING SYSTEM.)

**DME SEPARATION**– Spacing of aircraft in terms of distances (nautical miles) determined by reference to distance measuring equipment (DME).

(See DISTANCE MEASURING EQUIPMENT.)

**DOD FLIP**– Department of Defense Flight Information Publications used for flight planning, en route, and terminal operations. FLIP is produced by the National Geospatial–Intelligence Agency (NGA) for world-wide use. United States Government Flight Information Publications (en route charts and instrument approach procedure charts) are incorporated in DOD FLIP for use in the National Airspace System (NAS).

**DOMESTIC AIRSPACE**– Airspace which overlies the continental land mass of the United States plus Hawaii and U.S. possessions. Domestic airspace extends to 12 miles offshore.

**DOWNBURST**– A strong downdraft which induces an outburst of damaging winds on or near the ground. Damaging winds, either straight or curved, are highly divergent. The sizes of downbursts vary from 1/2 mile or less to more than 10 miles. An intense downburst often causes widespread damage. Damaging winds, lasting 5 to 30 minutes, could reach speeds as high as 120 knots.

**DOWNWIND LEG**–

(See TRAFFIC PATTERN.)

**DP**–

(See INSTRUMENT DEPARTURE PROCEDURE.)

**DRAG CHUTE**– A parachute device installed on certain aircraft which is deployed on landing roll to assist in deceleration of the aircraft.

**DSP**–

(See DEPARTURE SEQUENCING PROGRAM.)

**DT**–

(See DELAY TIME.)

**DTAS**–

(See DIGITAL TERMINAL AUTOMATION SYSTEM.)

**DUE REGARD**– A phase of flight wherein an aircraft commander of a State-operated aircraft assumes responsibility to separate his/her aircraft from all other aircraft.

(See also FAAO JO 7110.65, Para 1–2–1, WORD MEANINGS.)

**DUTY RUNWAY**–

(See RUNWAY IN USE/ACTIVE RUNWAY/DUTY RUNWAY.)

**DVA**–

(See DIVERSE VECTOR AREA.)

**DVFR**–

(See DEFENSE VISUAL FLIGHT RULES.)

**DVFR FLIGHT PLAN**– A flight plan filed for a VFR aircraft which intends to operate in airspace within which the ready identification, location, and control of aircraft are required in the interest of national security.

**DVRSN**–

(See DIVERSION.)

**DYNAMIC**– Continuous review, evaluation, and change to meet demands.

**DYNAMIC RESTRICTIONS**– Those restrictions imposed by the local facility on an “as needed” basis to manage unpredictable fluctuations in traffic demands.

# G

**GATE HOLD PROCEDURES**– Procedures at selected airports to hold aircraft at the gate or other ground location whenever departure delays exceed or are anticipated to exceed 15 minutes. The sequence for departure will be maintained in accordance with initial call-up unless modified by flow control restrictions. Pilots should monitor the ground control/clearance delivery frequency for engine start/taxi advisories or new proposed start/taxi time if the delay changes.

**GBT**–

(See **GROUND-BASED TRANSCEIVER**.)

**GCA**–

(See **GROUND CONTROLLED APPROACH**.)

**GDP**–

(See **GROUND DELAY PROGRAM**.)

**GENERAL AVIATION**– That portion of civil aviation which encompasses all facets of aviation except air carriers holding a certificate of public convenience and necessity from the Civil Aeronautics Board and large aircraft commercial operators.

(See **ICAO term GENERAL AVIATION**.)

**GENERAL AVIATION [ICAO]**– All civil aviation operations other than scheduled air services and nonscheduled air transport operations for remuneration or hire.

**GEO MAP**– The digitized map markings associated with the ASR-9 Radar System.

**GLIDEPATH**–

(See **GLIDESLOPE**.)

**GLIDEPATH [ICAO]**– A descent profile determined for vertical guidance during a final approach.

**GLIDEPATH INTERCEPT ALTITUDE**–

(See **GLIDESLOPE INTERCEPT ALTITUDE**.)

**GLIDESLOPE**– Provides vertical guidance for aircraft during approach and landing. The glideslope/glidepath is based on the following:

**a.** Electronic components emitting signals which provide vertical guidance by reference to airborne instruments during instrument approaches such as ILS/MLS, or

**b.** Visual ground aids, such as VASI, which provide vertical guidance for a VFR approach or for the visual portion of an instrument approach and landing.

**c.** **PAR**. Used by ATC to inform an aircraft making a PAR approach of its vertical position (elevation) relative to the descent profile.

(See **ICAO term GLIDEPATH**.)

**GLIDESLOPE INTERCEPT ALTITUDE**– The minimum altitude to intercept the glideslope/path on a precision approach. The intersection of the published intercept altitude with the glideslope/path, designated on Government charts by the lightning bolt symbol, is the precision FAF; however, when the approach chart shows an alternative lower glideslope intercept altitude, and ATC directs a lower altitude, the resultant lower intercept position is then the FAF.

(See **FINAL APPROACH FIX**.)

(See **SEGMENTS OF AN INSTRUMENT APPROACH PROCEDURE**.)

**GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS) [ICAO]**– GNSS refers collectively to the worldwide positioning, navigation, and timing determination capability available from one or more satellite constellation in conjunction with a network of ground stations.

**GLOBAL NAVIGATION SATELLITE SYSTEM MINIMUM EN ROUTE IFR ALTITUDE (GNSS MEA)**– The minimum en route IFR altitude on a published ATS route or route segment which assures acceptable Global Navigation Satellite System reception and meets obstacle clearance requirements. (Refer to 14 CFR Part 91.) (Refer to 14 CFR Part 95.)

**GLOBAL POSITIONING SYSTEM (GPS)**– GPS refers to the worldwide positioning, navigation and timing determination capability available from the U.S. satellite constellation. The service provided by GPS for civil use is defined in the GPS Standard Positioning System Performance Standard. GPS is composed of space, control, and user elements.

**GNSS [ICAO]**–

(See **GLOBAL NAVIGATION SATELLITE SYSTEM**.)

**GNSS MEA–**

(See GLOBAL NAVIGATION SATELLITE SYSTEM MINIMUM EN ROUTE IFR ALTITUDE.)

**GO AHEAD–** Proceed with your message. Not to be used for any other purpose.

**GO AROUND–** Instructions for a pilot to abandon his/her approach to landing. Additional instructions may follow. Unless otherwise advised by ATC, a VFR aircraft or an aircraft conducting visual approach should overfly the runway while climbing to traffic pattern altitude and enter the traffic pattern via the crosswind leg. A pilot on an IFR flight plan making an instrument approach should execute the published missed approach procedure or proceed as instructed by ATC; e.g., “Go around” (additional instructions if required).

(See LOW APPROACH.)

(See MISSED APPROACH.)

**GPD–**

(See GRAPHIC PLAN DISPLAY.)

**GPS–**

(See GLOBAL POSITIONING SYSTEM.)

**GRAPHIC PLAN DISPLAY (GPD)–** A view available with URET that provides a graphic display of aircraft, traffic, and notification of predicted conflicts. Graphic routes for Current Plans and Trial Plans are displayed upon controller request.

(See USER REQUEST EVALUATION TOOL.)

**GROUND–BASED TRANSCEIVER (GBT)–** The ground–based transmitter/receiver (transceiver) receives automatic dependent surveillance–broadcast messages, which are forwarded to an air traffic control facility for processing and display with other radar targets on the plan position indicator (radar display).

(See AUTOMATIC DEPENDENT SURVEILLANCE–BROADCAST.)

**GROUND CLUTTER–** A pattern produced on the radar scope by ground returns which may degrade other radar returns in the affected area. The effect of ground clutter is minimized by the use of moving target indicator (MTI) circuits in the radar equipment resulting in a radar presentation which displays only targets which are in motion.

(See CLUTTER.)

**GROUND COMMUNICATION OUTLET (GCO)–**

An unstaffed, remotely controlled, ground/ground communications facility. Pilots at uncontrolled airports may contact ATC and FSS via VHF to a telephone connection to obtain an instrument clearance or close a VFR or IFR flight plan. They may also get an updated weather briefing prior to takeoff. Pilots will use four “key clicks” on the VHF radio to contact the appropriate ATC facility or six “key clicks” to contact the FSS. The GCO system is intended to be used only on the ground.

**GROUND CONTROLLED APPROACH–** A radar approach system operated from the ground by air traffic control personnel transmitting instructions to the pilot by radio. The approach may be conducted with surveillance radar (ASR) only or with both surveillance and precision approach radar (PAR). Usage of the term “GCA” by pilots is discouraged except when referring to a GCA facility. Pilots should specifically request a “PAR” approach when a precision radar approach is desired or request an “ASR” or “surveillance” approach when a nonprecision radar approach is desired.

(See RADAR APPROACH.)

**GROUND DELAY PROGRAM (GDP)–** A traffic management process administered by the ATCSCC; when aircraft are held on the ground. The purpose of the program is to support the TM mission and limit airborne holding. It is a flexible program and may be implemented in various forms depending upon the needs of the AT system. Ground delay programs provide for equitable assignment of delays to all system users.

**GROUND SPEED–** The speed of an aircraft relative to the surface of the earth.

**GROUND STOP (GS)–** The GS is a process that requires aircraft that meet a specific criteria to remain on the ground. The criteria may be airport specific, airspace specific, or equipment specific; for example, all departures to San Francisco, or all departures entering Yorktown sector, or all Category I and II aircraft going to Charlotte. GSs normally occur with little or no warning.

**GROUND VISIBILITY–**

(See VISIBILITY.)

**GS–**

(See GROUND STOP.)



# I

**I SAY AGAIN**– The message will be repeated.

**IAF**–

(See INITIAL APPROACH FIX.)

**IAP**–

(See INSTRUMENT APPROACH PROCEDURE.)

**IAWP**– Initial Approach Waypoint

**ICAO**–

(See ICAO Term INTERNATIONAL CIVIL AVIATION ORGANIZATION.)

**ICING**– The accumulation of airframe ice.

Types of icing are:

**a. Rime Ice**– Rough, milky, opaque ice formed by the instantaneous freezing of small supercooled water droplets.

**b. Clear Ice**– A glossy, clear, or translucent ice formed by the relatively slow freezing or large supercooled water droplets.

**c. Mixed**– A mixture of clear ice and rime ice.

Intensity of icing:

**a. Trace**– Ice becomes perceptible. Rate of accumulation is slightly greater than the rate of sublimation. Deicing/anti-icing equipment is not utilized unless encountered for an extended period of time (over 1 hour).

**b. Light**– The rate of accumulation may create a problem if flight is prolonged in this environment (over 1 hour). Occasional use of deicing/anti-icing equipment removes/prevents accumulation. It does not present a problem if the deicing/anti-icing equipment is used.

**c. Moderate**– The rate of accumulation is such that even short encounters become potentially hazardous and use of deicing/anti-icing equipment or flight diversion is necessary.

**d. Severe**– The rate of accumulation is such that deicing/anti-icing equipment fails to reduce or control the hazard. Immediate flight diversion is necessary.

**IDENT**– A request for a pilot to activate the aircraft transponder identification feature. This will help the

controller to confirm an aircraft identity or to identify an aircraft.

(Refer to AIM.)

**IDENT FEATURE**– The special feature in the Air Traffic Control Radar Beacon System (ATCRBS) equipment. It is used to immediately distinguish one displayed beacon target from other beacon targets.

(See IDENT.)

**IF**–

(See INTERMEDIATE FIX.)

**IFIM**–

(See INTERNATIONAL FLIGHT INFORMATION MANUAL.)

**IF NO TRANSMISSION RECEIVED FOR (TIME)**– Used by ATC in radar approaches to prefix procedures which should be followed by the pilot in event of lost communications.

(See LOST COMMUNICATIONS.)

**IFR**–

(See INSTRUMENT FLIGHT RULES.)

**IFR AIRCRAFT**– An aircraft conducting flight in accordance with instrument flight rules.

**IFR CONDITIONS**– Weather conditions below the minimum for flight under visual flight rules.

(See INSTRUMENT METEOROLOGICAL CONDITIONS.)

**IFR DEPARTURE PROCEDURE**–

(See IFR TAKEOFF MINIMUMS AND DEPARTURE PROCEDURES.)

(Refer to AIM.)

**IFR FLIGHT**–

(See IFR AIRCRAFT.)

**IFR LANDING MINIMUMS**–

(See LANDING MINIMUMS.)

**IFR MILITARY TRAINING ROUTES (IR)**– Routes used by the Department of Defense and associated Reserve and Air Guard units for the purpose of conducting low-altitude navigation and tactical training in both IFR and VFR weather conditions below 10,000 feet MSL at airspeeds in excess of 250 knots IAS.

**IFR TAKEOFF MINIMUMS AND DEPARTURE PROCEDURES**– Title 14 Code of Federal

Regulations Part 91, prescribes standard takeoff rules for certain civil users. At some airports, obstructions or other factors require the establishment of nonstandard takeoff minimums, departure procedures, or both to assist pilots in avoiding obstacles during climb to the minimum en route altitude. Those airports are listed in FAA/DOD Instrument Approach Procedures (IAPs) Charts under a section entitled "IFR Takeoff Minimums and Departure Procedures." The FAA/DOD IAP chart legend illustrates the symbol used to alert the pilot to nonstandard takeoff minimums and departure procedures. When departing IFR from such airports or from any airports where there are no departure procedures, DPs, or ATC facilities available, pilots should advise ATC of any departure limitations. Controllers may query a pilot to determine acceptable departure directions, turns, or headings after takeoff. Pilots should be familiar with the departure procedures and must assure that their aircraft can meet or exceed any specified climb gradients.

**IF/IAWP**– Intermediate Fix/Initial Approach Waypoint. The waypoint where the final approach course of a T approach meets the crossbar of the T. When designated (in conjunction with a TAA) this waypoint will be used as an IAWP when approaching the airport from certain directions, and as an IFWP when beginning the approach from another IAWP.

**IFWP**– Intermediate Fix Waypoint

**ILS**–

(See INSTRUMENT LANDING SYSTEM.)

**ILS CATEGORIES**– 1. Category I. An ILS approach procedure which provides for approach to a height above touchdown of not less than 200 feet and with runway visual range of not less than 1,800 feet.– 2. Special Authorization Category I. An ILS approach procedure which provides for approach to a height above touchdown of not less than 150 feet and with runway visual range of not less than 1,400 feet, HUD to DH. 3. Category II. An ILS approach procedure which provides for approach to a height above touchdown of not less than 100 feet and with runway visual range of not less than 1,200 feet (with autoland or HUD to touchdown and noted on authorization, RVR 1,000 feet).– 4. Special Authorization Category II with Reduced Lighting. An ILS approach procedure which provides for approach to a height above touchdown of not less

than 100 feet and with runway visual range of not less than 1,200 feet with autoland or HUD to touchdown and noted on authorization (no touchdown zone and centerline lighting are required).– 5. Category III:

**a. IIIA.**–An ILS approach procedure which provides for approach without a decision height minimum and with runway visual range of not less than 700 feet.

**b. IIIB.**–An ILS approach procedure which provides for approach without a decision height minimum and with runway visual range of not less than 150 feet.

**c. IIIC.**–An ILS approach procedure which provides for approach without a decision height minimum and without runway visual range minimum.

**ILS PRM APPROACH**– An instrument landing system (ILS) approach conducted to parallel runways whose extended centerlines are separated by less than 4,300 feet and at least 3,000 feet where closely spaced independent approaches are permitted. Also used in conjunction with an LDA PRM, or RNAV (GPS) PRM approach to conduct Simultaneous Offset Instrument Approach (SOIA) operations. No Transgression Zone (NTZ) monitoring is required to conduct these approaches. When the runway spacing is less than 3,600 feet, the NTZ must be monitored by a Precision Runway Monitor (PRM) or other high update rate surveillance system.

(Refer to AIM)

**IM**–

(See INNER MARKER.)

**IMC**–

(See INSTRUMENT METEOROLOGICAL CONDITIONS.)

**IMMEDIATELY**–Used by ATC or pilots when such action compliance is required to avoid an imminent situation.

**INCERFA (Uncertainty Phase) [ICAO]**– A situation wherein uncertainty exists as to the safety of an aircraft and its occupants.

**INCREASE SPEED TO (SPEED)**–

(See SPEED ADJUSTMENT.)

**INERTIAL NAVIGATION SYSTEM**– An RNAV system which is a form of self-contained navigation.

(See Area Navigation/RNAV.)

**INFLIGHT REFUELING**–

(See AERIAL REFUELING.)

**INFLIGHT WEATHER ADVISORY–**

(See WEATHER ADVISORY.)

**INFORMATION REQUEST–** A request originated by an FSS for information concerning an overdue VFR aircraft.

**INITIAL APPROACH FIX–** The fixes depicted on instrument approach procedure charts that identify the beginning of the initial approach segment(s).

(See FIX.)

(See SEGMENTS OF AN INSTRUMENT APPROACH PROCEDURE.)

**INITIAL APPROACH SEGMENT–**

(See SEGMENTS OF AN INSTRUMENT APPROACH PROCEDURE.)

**INITIAL APPROACH SEGMENT [ICAO]–** That segment of an instrument approach procedure between the initial approach fix and the intermediate approach fix or, where applicable, the final approach fix or point.

**INLAND NAVIGATION FACILITY–** A navigation aid on a North American Route at which the common route and/or the noncommon route begins or ends.

**INNER MARKER–** A marker beacon used with an ILS (CAT II) precision approach located between the middle marker and the end of the ILS runway, transmitting a radiation pattern keyed at six dots per second and indicating to the pilot, both aurally and visually, that he/she is at the designated decision height (DH), normally 100 feet above the touchdown zone elevation, on the ILS CAT II approach. It also marks progress during a CAT III approach.

(See INSTRUMENT LANDING SYSTEM.)

(Refer to AIM.)

**INNER MARKER BEACON–**

(See INNER MARKER.)

**INREQ–**

(See INFORMATION REQUEST.)

**INS–**

(See INERTIAL NAVIGATION SYSTEM.)

**INSTRUMENT APPROACH–**

(See INSTRUMENT APPROACH PROCEDURE.)

**INSTRUMENT APPROACH PROCEDURE–** A series of predetermined maneuvers for the orderly transfer of an aircraft under instrument flight conditions from the beginning of the initial approach

to a landing or to a point from which a landing may be made visually. It is prescribed and approved for a specific airport by competent authority.

(See SEGMENTS OF AN INSTRUMENT APPROACH PROCEDURE.)

(Refer to 14 CFR Part 91.)

(Refer to AIM.)

**a.** U.S. civil standard instrument approach procedures are approved by the FAA as prescribed under 14 CFR Part 97 and are available for public use.

**b.** U.S. military standard instrument approach procedures are approved and published by the Department of Defense.

**c.** Special instrument approach procedures are approved by the FAA for individual operators but are not published in 14 CFR Part 97 for public use.

(See ICAO term INSTRUMENT APPROACH PROCEDURE.)

**INSTRUMENT APPROACH PROCEDURE [ICAO]–** A series of predetermined maneuvers by reference to flight instruments with specified protection from obstacles from the initial approach fix, or where applicable, from the beginning of a defined arrival route to a point from which a landing can be completed and thereafter, if a landing is not completed, to a position at which holding or en route obstacle clearance criteria apply.

**INSTRUMENT APPROACH PROCEDURES CHARTS–**

(See AERONAUTICAL CHART.)

**INSTRUMENT DEPARTURE PROCEDURE (DP)–** A preplanned instrument flight rule (IFR) departure procedure published for pilot use, in graphic or textual format, that provides obstruction clearance from the terminal area to the appropriate en route structure. There are two types of DP, Obstacle Departure Procedure (ODP), printed either textually or graphically, and, Standard Instrument Departure (SID), which is always printed graphically.

(See IFR TAKEOFF MINIMUMS AND DEPARTURE PROCEDURES.)

(See OBSTACLE DEPARTURE PROCEDURES.)

(See STANDARD INSTRUMENT DEPARTURES.)

(Refer to AIM.)

**INSTRUMENT DEPARTURE PROCEDURE (DP) CHARTS–**

(See AERONAUTICAL CHART.)

**INSTRUMENT FLIGHT RULES–** Rules governing the procedures for conducting instrument flight. Also

a term used by pilots and controllers to indicate type of flight plan.

(See INSTRUMENT METEOROLOGICAL CONDITIONS.)

(See VISUAL FLIGHT RULES.)

(See VISUAL METEOROLOGICAL CONDITIONS.)

(See ICAO term INSTRUMENT FLIGHT RULES.)

(Refer to AIM.)

**INSTRUMENT FLIGHT RULES [ICAO]**– A set of rules governing the conduct of flight under instrument meteorological conditions.

**INSTRUMENT LANDING SYSTEM**– A precision instrument approach system which normally consists of the following electronic components and visual aids:

**a. Localizer.**

(See LOCALIZER.)

**b. Glideslope.**

(See GLIDESLOPE.)

**c. Outer Marker.**

(See OUTER MARKER.)

**d. Middle Marker.**

(See MIDDLE MARKER.)

**e. Approach Lights.**

(See AIRPORT LIGHTING.)

(Refer to 14 CFR Part 91.)

(Refer to AIM.)

**INSTRUMENT METEOROLOGICAL CONDITIONS**– Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling less than the minima specified for visual meteorological conditions.

(See INSTRUMENT FLIGHT RULES.)

(See VISUAL FLIGHT RULES.)

(See VISUAL METEOROLOGICAL CONDITIONS.)

**INSTRUMENT RUNWAY**– A runway equipped with electronic and visual navigation aids for which a precision or nonprecision approach procedure having straight-in landing minimums has been approved.

(See ICAO term INSTRUMENT RUNWAY.)

**INSTRUMENT RUNWAY [ICAO]**– One of the following types of runways intended for the

operation of aircraft using instrument approach procedures:

**a. Nonprecision Approach Runway**–An instrument runway served by visual aids and a nonvisual aid providing at least directional guidance adequate for a straight-in approach.

**b. Precision Approach Runway, Category I**–An instrument runway served by ILS and visual aids intended for operations down to 60 m (200 feet) decision height and down to an RVR of the order of 800 m.

**c. Precision Approach Runway, Category II**–An instrument runway served by ILS and visual aids intended for operations down to 30 m (100 feet) decision height and down to an RVR of the order of 400 m.

**d. Precision Approach Runway, Category III**–An instrument runway served by ILS to and along the surface of the runway and:

**1.** Intended for operations down to an RVR of the order of 200 m (no decision height being applicable) using visual aids during the final phase of landing;

**2.** Intended for operations down to an RVR of the order of 50 m (no decision height being applicable) using visual aids for taxiing;

**3.** Intended for operations without reliance on visual reference for landing or taxiing.

**Note 1:** See Annex 10 Volume I, Part I, Chapter 3, for related ILS specifications.

**Note 2:** Visual aids need not necessarily be matched to the scale of nonvisual aids provided. The criterion for the selection of visual aids is the conditions in which operations are intended to be conducted.

**INTEGRITY**– The ability of a system to provide timely warnings to users when the system should not be used for navigation.

**INTERMEDIATE APPROACH SEGMENT**–  
(See SEGMENTS OF AN INSTRUMENT APPROACH PROCEDURE.)

**INTERMEDIATE APPROACH SEGMENT [ICAO]**– That segment of an instrument approach procedure between either the intermediate approach fix and the final approach fix or point, or between the end of a reversal, race track or dead reckoning track procedure and the final approach fix or point, as appropriate.

**INTERMEDIATE FIX**– The fix that identifies the beginning of the intermediate approach segment of an instrument approach procedure. The fix is not normally identified on the instrument approach chart as an intermediate fix (IF).

(See SEGMENTS OF AN INSTRUMENT APPROACH PROCEDURE.)

**INTERMEDIATE LANDING**– On the rare occasion that this option is requested, it should be approved. The departure center, however, must advise the ATCSCC so that the appropriate delay is carried over and assigned at the intermediate airport. An intermediate landing airport within the arrival center will not be accepted without coordination with and the approval of the ATCSCC.

**INTERNATIONAL AIRPORT**– Relating to international flight, it means:

**a.** An airport of entry which has been designated by the Secretary of Treasury or Commissioner of Customs as an international airport for customs service.

**b.** A landing rights airport at which specific permission to land must be obtained from customs authorities in advance of contemplated use.

**c.** Airports designated under the Convention on International Civil Aviation as an airport for use by international commercial air transport and/or international general aviation.

(See ICAO term INTERNATIONAL AIRPORT.)

(Refer to AIRPORT/FACILITY DIRECTORY.)

(Refer to IFIM.)

**INTERNATIONAL AIRPORT [ICAO]**– Any airport designated by the Contracting State in whose territory it is situated as an airport of entry and departure for international air traffic, where the formalities incident to customs, immigration, public health, animal and plant quarantine and similar procedures are carried out.

**INTERNATIONAL CIVIL AVIATION ORGANIZATION [ICAO]**– A specialized agency of the United Nations whose objective is to develop the principles and techniques of international air navigation and to foster planning and development of international civil air transport.

**a.** Regions include:

1. African-Indian Ocean Region
2. Caribbean Region
3. European Region
4. Middle East/Asia Region
5. North American Region
6. North Atlantic Region
7. Pacific Region
8. South American Region

**INTERNATIONAL FLIGHT INFORMATION MANUAL**– A publication designed primarily as a pilot's preflight planning guide for flights into foreign airspace and for flights returning to the U.S. from foreign locations.

**INTERROGATOR**– The ground-based surveillance radar beacon transmitter-receiver, which normally scans in synchronism with a primary radar, transmitting discrete radio signals which repetitiously request all transponders on the mode being used to reply. The replies received are mixed with the primary radar returns and displayed on the same plan position indicator (radar scope). Also, applied to the airborne element of the TACAN/DME system.

(See TRANSPONDER.)

(Refer to AIM.)

**INTERSECTING RUNWAYS**– Two or more runways which cross or meet within their lengths.

(See INTERSECTION.)

**INTERSECTION**–

**a.** A point defined by any combination of courses, radials, or bearings of two or more navigational aids.

**b.** Used to describe the point where two runways, a runway and a taxiway, or two taxiways cross or meet.

**INTERSECTION DEPARTURE**– A departure from any runway intersection except the end of the runway.

(See INTERSECTION.)

**INTERSECTION TAKEOFF**–

(See INTERSECTION DEPARTURE.)

**IR**–

(See IFR MILITARY TRAINING ROUTES.)



# L

LAA–

(See LOCAL AIRPORT ADVISORY.)

LAAS–

(See LOW ALTITUDE ALERT SYSTEM.)

LAHSO– An acronym for “Land and Hold Short Operation.” These operations include landing and holding short of an intersecting runway, a taxiway, a predetermined point, or an approach/departure flightpath.

LAHSO-DRY– Land and hold short operations on runways that are dry.

LAHSO-WET– Land and hold short operations on runways that are wet (but not contaminated).

LAND AND HOLD SHORT OPERATIONS– Operations which include simultaneous takeoffs and landings and/or simultaneous landings when a landing aircraft is able and is instructed by the controller to hold-short of the intersecting runway/taxiway or designated hold-short point. Pilots are expected to promptly inform the controller if the hold short clearance cannot be accepted.

(See PARALLEL RUNWAYS.)

(Refer to AIM.)

LANDING AREA– Any locality either on land, water, or structures, including airports/heliports and intermediate landing fields, which is used, or intended to be used, for the landing and takeoff of aircraft whether or not facilities are provided for the shelter, servicing, or for receiving or discharging passengers or cargo.

(See ICAO term LANDING AREA.)

LANDING AREA [ICAO]– That part of a movement area intended for the landing or take-off of aircraft.

LANDING DIRECTION INDICATOR– A device which visually indicates the direction in which landings and takeoffs should be made.

(See TETRAHEDRON.)

(Refer to AIM.)

LANDING DISTANCE AVAILABLE (LDA)– The runway length declared available and suitable for a landing airplane.

(See ICAO term LANDING DISTANCE AVAILABLE.)

LANDING DISTANCE AVAILABLE [ICAO]– The length of runway which is declared available and suitable for the ground run of an aeroplane landing.

LANDING MINIMUMS– The minimum visibility prescribed for landing a civil aircraft while using an instrument approach procedure. The minimum applies with other limitations set forth in 14 CFR Part 91 with respect to the Minimum Descent Altitude (MDA) or Decision Height (DH) prescribed in the instrument approach procedures as follows:

a. Straight-in landing minimums. A statement of MDA and visibility, or DH and visibility, required for a straight-in landing on a specified runway, or

b. Circling minimums. A statement of MDA and visibility required for the circle-to-land maneuver.

Note: Descent below the established MDA or DH is not authorized during an approach unless the aircraft is in a position from which a normal approach to the runway of intended landing can be made and adequate visual reference to required visual cues is maintained.

(See CIRCLE-TO-LAND MANEUVER.)

(See DECISION HEIGHT.)

(See INSTRUMENT APPROACH PROCEDURE.)

(See MINIMUM DESCENT ALTITUDE.)

(See STRAIGHT-IN LANDING.)

(See VISIBILITY.)

(Refer to 14 CFR Part 91.)

LANDING ROLL– The distance from the point of touchdown to the point where the aircraft can be brought to a stop or exit the runway.

LANDING SEQUENCE– The order in which aircraft are positioned for landing.

(See APPROACH SEQUENCE.)

LAST ASSIGNED ALTITUDE– The last altitude/flight level assigned by ATC and acknowledged by the pilot.

(See MAINTAIN.)

(Refer to 14 CFR Part 91.)

LATERAL NAVIGATION (LNAV)– A function of area navigation (RNAV) equipment which calculates, displays, and provides lateral guidance to a profile or path.

**LATERAL SEPARATION**– The lateral spacing of aircraft at the same altitude by requiring operation on different routes or in different geographical locations.  
(See SEPARATION.)

**LDA**–  
(See LOCALIZER TYPE DIRECTIONAL AID.)  
(See LANDING DISTANCE AVAILABLE.)  
(See ICAO Term LANDING DISTANCE AVAILABLE.)

**LF**–  
(See LOW FREQUENCY.)

**LIGHTED AIRPORT**– An airport where runway and obstruction lighting is available.  
(See AIRPORT LIGHTING.)  
(Refer to AIM.)

**LIGHT GUN**– A handheld directional light signaling device which emits a brilliant narrow beam of white, green, or red light as selected by the tower controller. The color and type of light transmitted can be used to approve or disapprove anticipated pilot actions where radio communication is not available. The light gun is used for controlling traffic operating in the vicinity of the airport and on the airport movement area.  
(Refer to AIM.)

**LINE UP AND WAIT (LUAW)**– Used by ATC to inform a pilot to taxi onto the departure runway to line up and wait. It is not authorization for takeoff. It is used when takeoff clearance cannot immediately be issued because of traffic or other reasons.  
(See CLEARED FOR TAKEOFF.)

**LOCAL AIRPORT ADVISORY (LAA)**– A service provided by facilities, which are located on the landing airport, have a discrete ground-to-air communication frequency or the tower frequency when the tower is closed, automated weather reporting with voice broadcasting, and a continuous ASOS/AWSS/AWOS data display, other continuous direct reading instruments, or manual observations available to the specialist.  
(See AIRPORT ADVISORY AREA.)

**LOCAL TRAFFIC**– Aircraft operating in the traffic pattern or within sight of the tower, or aircraft known to be departing or arriving from flight in local practice areas, or aircraft executing practice instrument approaches at the airport.  
(See TRAFFIC PATTERN.)

**LOCALIZER**– The component of an ILS which provides course guidance to the runway.  
(See INSTRUMENT LANDING SYSTEM.)  
(See ICAO term LOCALIZER COURSE.)  
(Refer to AIM.)

**LOCALIZER COURSE [ICAO]**– The locus of points, in any given horizontal plane, at which the DDM (difference in depth of modulation) is zero.

**LOCALIZER OFFSET**– An angular offset of the localizer from the runway extended centerline in a direction away from the no transgression zone (NTZ) that increases the normal operating zone (NOZ) width. An offset requires a 50 foot increase in DH and is not authorized for CAT II and CAT III approaches.

**LOCALIZER TYPE DIRECTIONAL AID**– A NAVAID used for nonprecision instrument approaches with utility and accuracy comparable to a localizer but which is not a part of a complete ILS and is not aligned with the runway.  
(Refer to AIM.)

**LOCALIZER TYPE DIRECTIONAL AID (LDA) PRECISION RUNWAY MONITOR (PRM) APPROACH** – An approach, which includes a glidslope, used in conjunction with an ILS PRM or RNAV (GPS) PRM approach to an adjacent runway to conduct Simultaneous Offset Instrument Approaches (SOIA) to parallel runways whose centerlines are separated by less than 3,000 feet and at least 750 feet. NTZ monitoring is required to conduct these approaches. When the approach course spacing is less than 3,600 feet at the Missed Approach Point (MAP), the use of a PRM or other high update rate surveillance system in order to conduct simultaneous independent approaches is required.  
(See SIMULTANEOUS OFFSET INSTRUMENT APPROACH (SOIA).)  
(Refer to AIM)

**LOCALIZER USABLE DISTANCE**– The maximum distance from the localizer transmitter at a specified altitude, as verified by flight inspection, at which reliable course information is continuously received.  
(Refer to AIM.)

**LOCATOR [ICAO]**– An LM/MF NDB used as an aid to final approach.

**Note:** A locator usually has an average radius of rated coverage of between 18.5 and 46.3 km (10 and 25 NM).



**LONG RANGE NAVIGATION–**

(See LORAN.)

**LONGITUDINAL SEPARATION–** The longitudinal spacing of aircraft at the same altitude by a minimum distance expressed in units of time or miles.

(See SEPARATION.)

(Refer to AIM.)

**LORAN–** An electronic navigational system by which hyperbolic lines of position are determined by measuring the difference in the time of reception of synchronized pulse signals from two fixed transmitters. Loran A operates in the 1750-1950 kHz frequency band. Loran C and D operate in the 100-110 kHz frequency band. In 2010, the U.S. Coast Guard terminated all U.S. LORAN-C transmissions.

(Refer to AIM.)

**LOST COMMUNICATIONS–** Loss of the ability to communicate by radio. Aircraft are sometimes referred to as NORDO (No Radio). Standard pilot procedures are specified in 14 CFR Part 91. Radar controllers issue procedures for pilots to follow in the event of lost communications during a radar approach when weather reports indicate that an aircraft will likely encounter IFR weather conditions during the approach.

(Refer to 14 CFR Part 91.)

(Refer to AIM.)

**LOW ALTITUDE AIRWAY STRUCTURE–** The network of airways serving aircraft operations up to but not including 18,000 feet MSL.

(See AIRWAY.)

(Refer to AIM.)

***LOW ALTITUDE ALERT, CHECK YOUR ALTITUDE IMMEDIATELY–***

(See SAFETY ALERT.)

**LOW ALTITUDE ALERT SYSTEM–** An automated function of the TPX-42 that alerts the controller when a Mode C transponder equipped aircraft on an IFR flight plan is below a predetermined minimum safe altitude. If requested by the pilot, Low Altitude Alert System monitoring is also available to VFR Mode C transponder equipped aircraft.

**LOW APPROACH–** An approach over an airport or runway following an instrument approach or a VFR approach including the go-around maneuver where the pilot intentionally does not make contact with the runway.

(Refer to AIM.)

**LOW FREQUENCY–** The frequency band between 30 and 300 kHz.

(Refer to AIM.)

**LPV–** A type of approach with vertical guidance (APV) based on WAAS, published on RNAV (GPS) approach charts. This procedure takes advantage of the precise lateral guidance available from WAAS. The minima is published as a decision altitude (DA).

**LUAW–**

(See LINE UP AND WAIT.)



# N

**NAS–**

(See **NATIONAL AIRSPACE SYSTEM**.)

**NATIONAL AIRSPACE SYSTEM–** The common network of U.S. airspace; air navigation facilities, equipment and services, airports or landing areas; aeronautical charts, information and services; rules, regulations and procedures, technical information, and manpower and material. Included are system components shared jointly with the military.

**NATIONAL BEACON CODE ALLOCATION PLAN AIRSPACE–** Airspace over United States territory located within the North American continent between Canada and Mexico, including adjacent territorial waters outward to about boundaries of oceanic control areas (CTA)/Flight Information Regions (FIR).

(See **FLIGHT INFORMATION REGION**.)

**NATIONAL FLIGHT DATA CENTER–** A facility in Washington D.C., established by FAA to operate a central aeronautical information service for the collection, validation, and dissemination of aeronautical data in support of the activities of government, industry, and the aviation community. The information is published in the National Flight Data Digest.

(See **NATIONAL FLIGHT DATA DIGEST**.)

**NATIONAL FLIGHT DATA DIGEST–** A daily (except weekends and Federal holidays) publication of flight information appropriate to aeronautical charts, aeronautical publications, Notices to Airmen, or other media serving the purpose of providing operational flight data essential to safe and efficient aircraft operations.

**NATIONAL SEARCH AND RESCUE PLAN–** An interagency agreement which provides for the effective utilization of all available facilities in all types of search and rescue missions.

**NAVAID–**

(See **NAVIGATIONAL AID**.)

**NAVAID CLASSES–** VOR, VORTAC, and TACAN aids are classed according to their operational use. The three classes of NAVAIDs are:

- a. T– Terminal.
- b. L– Low altitude.

c. H– High altitude.

**Note:** The normal service range for T, L, and H class aids is found in the AIM. Certain operational requirements make it necessary to use some of these aids at greater service ranges than specified. Extended range is made possible through flight inspection determinations. Some aids also have lesser service range due to location, terrain, frequency protection, etc. Restrictions to service range are listed in Airport/Facility Directory.

**NAVIGABLE AIRSPACE–** Airspace at and above the minimum flight altitudes prescribed in the CFRs including airspace needed for safe takeoff and landing.

(Refer to 14 CFR Part 91.)

**NAVIGATION REFERENCE SYSTEM (NRS)–** The NRS is a system of waypoints developed for use within the United States for flight planning and navigation without reference to ground based navigational aids. The NRS waypoints are located in a grid pattern along defined latitude and longitude lines. The initial use of the NRS will be in the high altitude environment in conjunction with the High Altitude Redesign initiative. The NRS waypoints are intended for use by aircraft capable of point-to-point navigation.

**NAVIGATION SPECIFICATION [ICAO]–** A set of aircraft and flight crew requirements needed to support performance-based navigation operations within a defined airspace. There are two kinds of navigation specifications:

a. **RNP specification.** A navigation specification based on area navigation that includes the requirement for performance monitoring and alerting, designated by the prefix RNP; e.g., RNP 4, RNP APCH.

b. **RNAV specification.** A navigation specification based on area navigation that does not include the requirement for performance monitoring and alerting, designated by the prefix RNAV; e.g., RNAV 5, RNAV 1.

**Note:** The Performance-based Navigation Manual (Doc 9613), Volume II contains detailed guidance on navigation specifications.

**NAVIGATIONAL AID**– Any visual or electronic device airborne or on the surface which provides point-to-point guidance information or position data to aircraft in flight.

(See AIR NAVIGATION FACILITY.)

**NBCAP AIRSPACE**–

(See NATIONAL BEACON CODE ALLOCATION PLAN AIRSPACE.)

**NDB**–

(See NONDIRECTIONAL BEACON.)

**NEGATIVE**– “No,” or “permission not granted,” or “that is not correct.”

**NEGATIVE CONTACT**– Used by pilots to inform ATC that:

a. Previously issued traffic is not in sight. It may be followed by the pilot’s request for the controller to provide assistance in avoiding the traffic.

b. They were unable to contact ATC on a particular frequency.

**NFDC**–

(See NATIONAL FLIGHT DATA CENTER.)

**NFDD**–

(See NATIONAL FLIGHT DATA DIGEST.)

**NIGHT**– The time between the end of evening civil twilight and the beginning of morning civil twilight, as published in the Air Almanac, converted to local time.

(See ICAO term NIGHT.)

**NIGHT [ICAO]**– The hours between the end of evening civil twilight and the beginning of morning civil twilight or such other period between sunset and sunrise as may be specified by the appropriate authority.

Note: Civil twilight ends in the evening when the center of the sun’s disk is 6 degrees below the horizon and begins in the morning when the center of the sun’s disk is 6 degrees below the horizon.

**NO GYRO APPROACH**– A radar approach/vector provided in case of a malfunctioning gyro-compass or directional gyro. Instead of providing the pilot with headings to be flown, the controller observes the radar track and issues control instructions “turn right/left” or “stop turn” as appropriate.

(Refer to AIM.)

**NO GYRO VECTOR**–

(See NO GYRO APPROACH.)

**NO TRANSGRESSION ZONE (NTZ)**– The NTZ is a 2,000 foot wide zone, located equidistant between parallel runway final approach courses in which flight is not allowed.

**NONAPPROACH CONTROL TOWER**– Authorizes aircraft to land or takeoff at the airport controlled by the tower or to transit the Class D airspace. The primary function of a nonapproach control tower is the sequencing of aircraft in the traffic pattern and on the landing area. Nonapproach control towers also separate aircraft operating under instrument flight rules clearances from approach controls and centers. They provide ground control services to aircraft, vehicles, personnel, and equipment on the airport movement area.

**NONCOMMON ROUTE/PORTION**– That segment of a North American Route between the inland navigation facility and a designated North American terminal.

**NONCOMPOSITE SEPARATION**– Separation in accordance with minima other than the composite separation minimum specified for the area concerned.

**NONDIRECTIONAL BEACON**– An L/MF or UHF radio beacon transmitting nondirectional signals whereby the pilot of an aircraft equipped with direction finding equipment can determine his/her bearing to or from the radio beacon and “home” on or track to or from the station. When the radio beacon is installed in conjunction with the Instrument Landing System marker, it is normally called a Compass Locator.

(See AUTOMATIC DIRECTION FINDER.)

(See COMPASS LOCATOR.)

**NONMOVEMENT AREAS**– Taxiways and apron (ramp) areas not under the control of air traffic.

**NONPRECISION APPROACH**–

(See NONPRECISION APPROACH PROCEDURE.)

**NONPRECISION APPROACH PROCEDURE**– A standard instrument approach procedure in which no electronic glideslope is provided; e.g., VOR, TACAN, NDB, LOC, ASR, LDA, or SDF approaches.

**NONRADAR**– Precedes other terms and generally means without the use of radar, such as:

a. Nonradar Approach. Used to describe instrument approaches for which course guidance on final

**PRECISION APPROACH RADAR**– Radar equipment in some ATC facilities operated by the FAA and/or the military services at joint-use civil/military locations and separate military installations to detect and display azimuth, elevation, and range of aircraft on the final approach course to a runway. This equipment may be used to monitor certain nonradar approaches, but is primarily used to conduct a precision instrument approach (PAR) wherein the controller issues guidance instructions to the pilot based on the aircraft's position in relation to the final approach course (azimuth), the glidepath (elevation), and the distance (range) from the touchdown point on the runway as displayed on the radar scope.

Note: The abbreviation "PAR" is also used to denote preferential arrival routes in ARTCC computers.

(See GLIDEPATH.)

(See PAR.)

(See PREFERENTIAL ROUTES.)

(See ICAO term PRECISION APPROACH RADAR.)

(Refer to AIM.)

**PRECISION APPROACH RADAR [ICAO]**– Primary radar equipment used to determine the position of an aircraft during final approach, in terms of lateral and vertical deviations relative to a nominal approach path, and in range relative to touchdown.

Note: Precision approach radars are designed to enable pilots of aircraft to be given guidance by radio communication during the final stages of the approach to land.

**PRECISION OBSTACLE FREE ZONE (POFZ)**– An 800 foot wide by 200 foot long area centered on the runway centerline adjacent to the threshold designed to protect aircraft flying precision approaches from ground vehicles and other aircraft when ceiling is less than 250 feet or visibility is less than 3/4 statute mile (or runway visual range below 4,000 feet.)

**PRECISION RUNWAY MONITOR (PRM)**– Provides air traffic controllers monitoring the NTZ during simultaneous close parallel approaches with high precision secondary surveillance data. A PRM is required for simultaneous independent operations when runway centerlines, or in the case of SOIA, final approach courses, are separated by less than 3,600 feet. High resolution color monitoring display (FMA) present (NTZ) surveillance track data to

controllers along with detailed maps depicting approaches and no transgression zone.

(Refer to AIM)

**PREDICTIVE WIND SHEAR ALERT SYSTEM (PWS)**– A self-contained system used onboard some aircraft to alert the flight crew to the presence of a potential wind shear. PWS systems typically monitor 3 miles ahead and 25 degrees left and right of the aircraft's heading at or below 1200' AGL. Departing flights may receive a wind shear alert after they start the takeoff roll and may elect to abort the takeoff. Aircraft on approach receiving an alert may elect to go around or perform a wind shear escape maneuver.

**PREFERENTIAL ROUTES**– Preferential routes (PDRs, PARs, and PDARs) are adapted in ARTCC computers to accomplish inter/intrafacility controller coordination and to assure that flight data is posted at the proper control positions. Locations having a need for these specific inbound and outbound routes normally publish such routes in local facility bulletins, and their use by pilots minimizes flight plan route amendments. When the workload or traffic situation permits, controllers normally provide radar vectors or assign requested routes to minimize circuitous routing. Preferential routes are usually confined to one ARTCC's area and are referred to by the following names or acronyms:

**a. Preferential Departure Route (PDR).** A specific departure route from an airport or terminal area to an en route point where there is no further need for flow control. It may be included in an Instrument Departure Procedure (DP) or a Preferred IFR Route.

**b. Preferential Arrival Route (PAR).** A specific arrival route from an appropriate en route point to an airport or terminal area. It may be included in a Standard Terminal Arrival (STAR) or a Preferred IFR Route. The abbreviation "PAR" is used primarily within the ARTCC and should not be confused with the abbreviation for Precision Approach Radar.

**c. Preferential Departure and Arrival Route (PDAR).** A route between two terminals which are within or immediately adjacent to one ARTCC's area. PDARs are not synonymous with Preferred IFR Routes but may be listed as such as they do accomplish essentially the same purpose.

(See PREFERRED IFR ROUTES.)

**PREFERRED IFR ROUTES**– Routes established between busier airports to increase system efficiency and capacity. They normally extend through one or

more ARTCC areas and are designed to achieve balanced traffic flows among high density terminals. IFR clearances are issued on the basis of these routes except when severe weather avoidance procedures or other factors dictate otherwise. Preferred IFR Routes are listed in the Airport/Facility Directory. If a flight is planned to or from an area having such routes but the departure or arrival point is not listed in the Airport/Facility Directory, 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 AIRPORT/FACILITY DIRECTORY.)

(Refer to NOTICES TO AIRMEN PUBLICATION.)

**PRE-FLIGHT PILOT BRIEFING–**

(See PILOT BRIEFING.)

**PREVAILING VISIBILITY–**

(See VISIBILITY.)

**PRIMARY RADAR TARGET–** An analog or digital target, exclusive of a secondary radar target, presented on a radar display.

**PRM–**

(See ILS PRM APPROACH and PRECISION RUNWAY MONITOR.)

**PROCEDURE TURN–** The maneuver prescribed when it is necessary to reverse direction to establish an aircraft on the intermediate approach segment or final approach course. The outbound course, direction of turn, distance within which the turn must be completed, and minimum altitude are specified in the procedure. However, unless otherwise restricted, the point at which the turn may be commenced and the type and rate of turn are left to the discretion of the pilot.

(See ICAO term PROCEDURE TURN.)

**PROCEDURE TURN [ICAO]–** A maneuver in which a turn is made away from a designated track followed by a turn in the opposite direction to permit

the aircraft to intercept and proceed along the reciprocal of the designated track.

**Note 1:** Procedure turns are designated “left” or “right” according to the direction of the initial turn.

**Note 2:** Procedure turns may be designated as being made either in level flight or while descending, according to the circumstances of each individual approach procedure.

**PROCEDURE TURN INBOUND–** That point of a procedure turn maneuver where course reversal has been completed and an aircraft is established inbound on the intermediate approach segment or final approach course. A report of “procedure turn inbound” is normally used by ATC as a position report for separation purposes.

(See FINAL APPROACH COURSE.)

(See PROCEDURE TURN.)

(See SEGMENTS OF AN INSTRUMENT APPROACH PROCEDURE.)

**PROFILE DESCENT–** An uninterrupted descent (except where level flight is required for speed adjustment; e.g., 250 knots at 10,000 feet MSL) from cruising altitude/level to interception of a glideslope or to a minimum altitude specified for the initial or intermediate approach segment of a nonprecision instrument approach. The profile descent normally terminates at the approach gate or where the glideslope or other appropriate minimum altitude is intercepted.

**PROGRESS REPORT–**

(See POSITION REPORT.)

**PROGRESSIVE TAXI–** Precise taxi instructions given to a pilot unfamiliar with the airport or issued in stages as the aircraft proceeds along the taxi route.

**PROHIBITED AREA–**

(See SPECIAL USE AIRSPACE.)

(See ICAO term PROHIBITED AREA.)

**PROHIBITED AREA [ICAO]–** An airspace of defined dimensions, above the land areas or territorial waters of a State, within which the flight of aircraft is prohibited.

**PROMINENT OBSTACLE–** An obstacle that meets one or more of the following conditions:

**a.** An obstacle which stands out beyond the adjacent surface of surrounding terrain and immediately projects a noticeable hazard to aircraft in flight.

**b.** An obstacle, not characterized as low and close in, whose height is no less than 300 feet above the

departure end of takeoff runway (DER) elevation, is within 10NM from the DER, and that penetrates that airport/heliport's diverse departure obstacle clearance surface (OCS).

c. An obstacle beyond 10NM from an airport/heliport that requires an obstacle departure procedure (ODP) to ensure obstacle avoidance.

(See OBSTACLE.)

(See OBSTRUCTION.)

**PROPOSED BOUNDARY CROSSING TIME**– Each center has a PBCT parameter for each internal airport. Proposed internal flight plans are transmitted to the adjacent center if the flight time along the proposed route from the departure airport to the center boundary is less than or equal to the value of PBCT or if airport adaptation specifies transmission regardless of PBCT.

**PROPOSED DEPARTURE TIME**– The time that the aircraft expects to become airborne.

**PROTECTED AIRSPACE**– The airspace on either side of an oceanic route/track that is equal to one-half the lateral separation minimum except where reduction of protected airspace has been authorized.

**PROTECTED SEGMENT**– The protected segment is a segment on the amended TFM route that is to be

inhibited from automatic adapted route alteration by ERAM.

**PT**–

(See PROCEDURE TURN.)

**PTP**–

(See POINT-TO-POINT.)

**PTS**–

(See POLAR TRACK STRUCTURE.)

**PUBLISHED INSTRUMENT APPROACH PROCEDURE VISUAL SEGMENT**– A segment on an IAP chart annotated as “Fly Visual to Airport” or “Fly Visual.” A dashed arrow will indicate the visual flight path on the profile and plan view with an associated note on the approximate heading and distance. The visual segment should be flown as a dead reckoning course while maintaining visual conditions.

**PUBLISHED ROUTE**– A route for which an IFR altitude has been established and published; e.g., Federal Airways, Jet Routes, Area Navigation Routes, Specified Direct Routes.

**PWS**–

(See PREDICTIVE WIND SHEAR ALERT SYSTEM.)





# S

SAA–

(See SPECIAL ACTIVITY AIRSPACE.)

**SAFETY ALERT–** A safety alert issued by ATC to aircraft under their control if ATC is aware the aircraft is at an altitude which, in the controller's judgment, places the aircraft in unsafe proximity to terrain, obstructions, or other aircraft. The controller may discontinue the issuance of further alerts if the pilot advises he/she is taking action to correct the situation or has the other aircraft in sight.

**a. Terrain/Obstruction Alert–** A safety alert issued by ATC to aircraft under their control if ATC is aware the aircraft is at an altitude which, in the controller's judgment, places the aircraft in unsafe proximity to terrain/obstructions; e.g., "Low Altitude Alert, check your altitude immediately."

**b. Aircraft Conflict Alert–** A safety alert issued by ATC to aircraft under their control if ATC is aware of an aircraft that is not under their control at an altitude which, in the controller's judgment, places both aircraft in unsafe proximity to each other. With the alert, ATC will offer the pilot an alternate course of action when feasible; e.g., "Traffic Alert, advise you turn right heading zero niner zero or climb to eight thousand immediately."

**Note:** The issuance of a safety alert is contingent upon the capability of the controller to have an awareness of an unsafe condition. The course of action provided will be predicated on other traffic under ATC control. Once the alert is issued, it is solely the pilot's prerogative to determine what course of action, if any, he/she will take.

**SAFETY LOGIC SYSTEM–** A software enhancement to ASDE-3, ASDE-X, and ASDE-3X, that predicts the path of aircraft landing and/or departing, and/or vehicular movements on runways. Visual and aural alarms are activated when the safety logic projects a potential collision. The Airport Movement Area Safety System (AMASS) is a safety logic system enhancement to the ASDE-3. The Safety Logic System for ASDE-X and ASDE-3X is an integral part of the software program.

**SAFETY LOGIC SYSTEM ALERTS–**

**a. ALERT–** An actual situation involving two real safety logic tracks (aircraft/aircraft, aircraft/vehicle,

or aircraft/other tangible object) that safety logic has predicted will result in an imminent collision, based upon the current set of Safety Logic parameters.

**b. FALSE ALERT–**

**1.** Alerts generated by one or more false surface-radar targets that the system has interpreted as real tracks and placed into safety logic.

**2.** Alerts in which the safety logic software did not perform correctly, based upon the design specifications and the current set of Safety Logic parameters.

**3.** The alert is generated by surface radar targets caused by moderate or greater precipitation.

**c. NUISANCE ALERT–** An alert in which one or more of the following is true:

**1.** The alert is generated by a known situation that is not considered an unsafe operation, such as LAHSO or other approved operations.

**2.** The alert is generated by inaccurate secondary radar data received by the Safety Logic System.

**3.** One or more of the aircraft involved in the alert is not intending to use a runway (for example, helicopter, pipeline patrol, non-Mode C overflight, etc.).

**d. VALID NON-ALERT–** A situation in which the safety logic software correctly determines that an alert is not required, based upon the design specifications and the current set of Safety Logic parameters.

**e. INVALID NON-ALERT–** A situation in which the safety logic software did not issue an alert when an alert was required, based upon the design specifications.

**SAIL BACK–** A maneuver during high wind conditions (usually with power off) where float plane movement is controlled by water rudders/opening and closing cabin doors.

**SAME DIRECTION AIRCRAFT–** Aircraft are operating in the same direction when:

**a.** They are following the same track in the same direction; or

**b.** Their tracks are parallel and the aircraft are flying in the same direction; or

**c.** Their tracks intersect at an angle of less than 45 degrees.

**SAR–**

(See **SEARCH AND RESCUE**.)

**SAY AGAIN–** Used to request a repeat of the last transmission. Usually specifies transmission or portion thereof not understood or received; e.g., “Say again all after **ABRAM VOR**.”

**SAY ALTITUDE–** Used by ATC to ascertain an aircraft’s specific altitude/flight level. When the aircraft is climbing or descending, the pilot should state the indicated altitude rounded to the nearest 100 feet.

**SAY HEADING–** Used by ATC to request an aircraft heading. The pilot should state the actual heading of the aircraft.

**SCHEDULED TIME OF ARRIVAL (STA)–** A STA is the desired time that an aircraft should cross a certain point (landing or metering fix). It takes other traffic and airspace configuration into account. A STA time shows the results of the TMA scheduler that has calculated an arrival time according to parameters such as optimized spacing, aircraft performance, and weather.

**SDF–**

(See **SIMPLIFIED DIRECTIONAL FACILITY**.)

**SEA LANE–** A designated portion of water outlined by visual surface markers for and intended to be used by aircraft designed to operate on water.

**SEARCH AND RESCUE–** A service which seeks missing aircraft and assists those found to be in need of assistance. It is a cooperative effort using the facilities and services of available Federal, state and local agencies. The U.S. Coast Guard is responsible for coordination of search and rescue for the Maritime Region, and the U.S. Air Force is responsible for search and rescue for the Inland Region. Information pertinent to search and rescue should be passed through any air traffic facility or be transmitted directly to the Rescue Coordination Center by telephone.

(See **FLIGHT SERVICE STATION**.)

(See **RESCUE COORDINATION CENTER**.)

(Refer to **AIM**.)

**SEARCH AND RESCUE FACILITY–** A facility responsible for maintaining and operating a search and rescue (SAR) service to render aid to persons and property in distress. It is any SAR unit, station, NET, or other operational activity which can be usefully

employed during an SAR Mission; e.g., a Civil Air Patrol Wing, or a Coast Guard Station.

(See **SEARCH AND RESCUE**.)

**SECNOT–**

(See **SECURITY NOTICE**.)

**SECONDARY RADAR TARGET–** A target derived from a transponder return presented on a radar display.

**SECTIONAL AERONAUTICAL CHARTS–**

(See **AERONAUTICAL CHART**.)

**SECTOR LIST DROP INTERVAL–** A parameter number of minutes after the meter fix time when arrival aircraft will be deleted from the arrival sector list.

**SECURITY NOTICE (SECNOT) –** A SECNOT is a request originated by the Air Traffic Security Coordinator (ATSC) for an extensive communications search for aircraft involved, or suspected of being involved, in a security violation, or are considered a security risk. A SECNOT will include the aircraft identification, search area, and expiration time. The search area, as defined by the ATSC, could be a single airport, multiple airports, a radius of an airport or fix, or a route of flight. Once the expiration time has been reached, the SECNOT is considered to be cancelled.

**SECURITY SERVICES AIRSPACE –** Areas established through the regulatory process or by NOTAM, issued by the Administrator under title 14, CFR, sections 99.7, 91.141, and 91.139, which specify that ATC security services are required; i.e., ADIZ or temporary flight rules areas.

**SEE AND AVOID–** When weather conditions permit, pilots operating IFR or VFR are required to observe and maneuver to avoid other aircraft. Right-of-way rules are contained in 14 CFR Part 91.

**SEGMENTED CIRCLE–** A system of visual indicators designed to provide traffic pattern information at airports without operating control towers.

(Refer to **AIM**.)

**SEGMENTS OF AN INSTRUMENT APPROACH PROCEDURE–** An instrument approach procedure may have as many as four separate segments depending on how the approach procedure is structured.

**a. Initial Approach–** The segment between the initial approach fix and the intermediate fix or the

point where the aircraft is established on the intermediate course or final approach course.

(See ICAO term INITIAL APPROACH SEGMENT.)

**b. Intermediate Approach**– The segment between the intermediate fix or point and the final approach fix.

(See ICAO term INTERMEDIATE APPROACH SEGMENT.)

**c. Final Approach**– The segment between the final approach fix or point and the runway, airport, or missed approach point.

(See ICAO term FINAL APPROACH SEGMENT.)

**d. Missed Approach**– The segment between the missed approach point or the point of arrival at decision height and the missed approach fix at the prescribed altitude.

(Refer to 14 CFR Part 97.)

(See ICAO term MISSED APPROACH PROCEDURE.)

**SEPARATION**– In air traffic control, the spacing of aircraft to achieve their safe and orderly movement in flight and while landing and taking off.

(See SEPARATION MINIMA.)

(See ICAO term SEPARATION.)

**SEPARATION [ICAO]**– Spacing between aircraft, levels or tracks.

**SEPARATION MINIMA**– The minimum longitudinal, lateral, or vertical distances by which aircraft are spaced through the application of air traffic control procedures.

(See SEPARATION.)

**SERVICE**– A generic term that designates functions or assistance available from or rendered by air traffic control. For example, Class C service would denote the ATC services provided within a Class C airspace area.

**SEVERE WEATHER AVOIDANCE PLAN**– An approved plan to minimize the affect of severe weather on traffic flows in impacted terminal and/or ARTCC areas. SWAP is normally implemented to provide the least disruption to the ATC system when flight through portions of airspace is difficult or impossible due to severe weather.

**SEVERE WEATHER FORECAST ALERTS**– Preliminary messages issued in order to alert users that a Severe Weather Watch Bulletin (WW) is being issued. These messages define areas of possible severe thunderstorms or tornado activity. The messages are unscheduled and issued as required by the Storm Prediction Center (SPC) at Norman, Oklahoma.

(See AIRMET.)

(See CONVECTIVE SIGMET.)

(See CWA.)

(See SIGMET.)

**SFA**–

(See SINGLE FREQUENCY APPROACH.)

**SFO**–

(See SIMULATED FLAMEOUT.)

**SHF**–

(See SUPER HIGH FREQUENCY.)

**SHORT RANGE CLEARANCE**– A clearance issued to a departing IFR flight which authorizes IFR flight to a specific fix short of the destination while air traffic control facilities are coordinating and obtaining the complete clearance.

**SHORT TAKEOFF AND LANDING AIRCRAFT**– An aircraft which, at some weight within its approved operating weight, is capable of operating from a runway in compliance with the applicable STOL characteristics, airworthiness, operations, noise, and pollution standards.

(See VERTICAL TAKEOFF AND LANDING AIRCRAFT.)

**SIAP**–

(See STANDARD INSTRUMENT APPROACH PROCEDURE.)

**SID**–

(See STANDARD INSTRUMENT DEPARTURE.)

**SIDESTEP MANEUVER**– A visual maneuver accomplished by a pilot at the completion of an instrument approach to permit a straight-in landing on a parallel runway not more than 1,200 feet to either side of the runway to which the instrument approach was conducted.

(Refer to AIM.)

**SIGMET**– A weather advisory issued concerning weather significant to the safety of all aircraft.

SIGMET advisories cover severe and extreme turbulence, severe icing, and widespread dust or sandstorms that reduce visibility to less than 3 miles.

(See AIRMET.)

(See AWW.)

(See CONVECTIVE SIGMET.)

(See CWA.)

(See ICAO term SIGMET INFORMATION.)

(Refer to AIM.)

**SIGMET INFORMATION [ICAO]**– Information issued by a meteorological watch office concerning the occurrence or expected occurrence of specified en-route weather phenomena which may affect the safety of aircraft operations.

**SIGNIFICANT METEOROLOGICAL INFORMATION–**

(See SIGMET.)

**SIGNIFICANT POINT**– A point, whether a named intersection, a NAVAID, a fix derived from a NAVAID(s), or geographical coordinate expressed in degrees of latitude and longitude, which is established for the purpose of providing separation, as a reporting point, or to delineate a route of flight.

**SIMPLIFIED DIRECTIONAL FACILITY**– A NAVAID used for nonprecision instrument approaches. The final approach course is similar to that of an ILS localizer except that the SDF course may be offset from the runway, generally not more than 3 degrees, and the course may be wider than the localizer, resulting in a lower degree of accuracy.

(Refer to AIM.)

**SIMULATED FLAMEOUT**– A practice approach by a jet aircraft (normally military) at idle thrust to a runway. The approach may start at a runway (high key) and may continue on a relatively high and wide downwind leg with a continuous turn to final. It terminates in landing or low approach. The purpose of this approach is to simulate a flameout.

(See FLAMEOUT.)

**SIMULTANEOUS ILS APPROACHES**– An approach system permitting simultaneous ILS/MLS approaches to airports having parallel runways separated by at least 4,300 feet between centerlines. Integral parts of a total system are ILS/MLS, radar, communications, ATC procedures, and appropriate airborne equipment.

(See PARALLEL RUNWAYS.)

(Refer to AIM.)

**SIMULTANEOUS MLS APPROACHES–**

(See SIMULTANEOUS ILS APPROACHES.)

**SIMULTANEOUS OFFSET INSTRUMENT APPROACH (SOIA)** – An instrument landing system comprised of an ILS PRM or RNAV (GPS) PRM approach to one runway and an offset LDA PRM with glideslope or an RNAV (GPS) PRM approach utilizing vertical guidance to another where parallel runway spaced less than 3,000 feet and at least 750 feet apart. The approach courses converge by 2.5 to 3 degrees. Closely spaced independent approach procedures apply up to the point where the approach course separation becomes 3,000 feet, at the offset MAP. From the offset MAP to the runway threshold, visual separation by the aircraft conducting the offset LDA PRM or GPS PRM approach is utilized.

(Refer to AIM)

**SINGLE DIRECTION ROUTES**– Preferred IFR Routes which are sometimes depicted on high altitude en route charts and which are normally flown in one direction only.

(See PREFERRED IFR ROUTES.)

(Refer to AIRPORT/FACILITY DIRECTORY.)

**SINGLE FREQUENCY APPROACH**– A service provided under a letter of agreement to military single-piloted turbojet aircraft which permits use of a single UHF frequency during approach for landing. Pilots will not normally be required to change frequency from the beginning of the approach to touchdown except that pilots conducting an en route descent are required to change frequency when control is transferred from the air route traffic control center to the terminal facility. The abbreviation “SFA” in the DOD FLIP IFR Supplement under “Communications” indicates this service is available at an aerodrome.

**SINGLE-PILOTED AIRCRAFT**– A military turbojet aircraft possessing one set of flight controls, tandem cockpits, or two sets of flight controls but operated by one pilot is considered single-piloted by ATC when determining the appropriate air traffic service to be applied.

(See SINGLE FREQUENCY APPROACH.)

**SKYSPOTTER**– A pilot who has received specialized training in observing and reporting inflight weather phenomena.

**SLASH**– A radar beacon reply displayed as an elongated target.

**SLDI–**

(See SECTOR LIST DROP INTERVAL.)

**SLOT TIME–**

(See METER FIX TIME/SLOT TIME.)

**SLOW TAXI–** To taxi a float plane at low power or low RPM.

**SN–**

(See SYSTEM STRATEGIC NAVIGATION.)

**SPEAK SLOWER–** Used in verbal communications as a request to reduce speech rate.

**SPECIAL ACTIVITY AIRSPACE (SAA)–** Any airspace with defined dimensions within the National Airspace System wherein limitations may be imposed upon aircraft operations. This airspace may be restricted areas, prohibited areas, military operations areas, air ATC assigned airspace, and any other designated airspace areas. The dimensions of this airspace are programmed into URET and can be designated as either active or inactive by screen entry. Aircraft trajectories are constantly tested against the dimensions of active areas and alerts issued to the applicable sectors when violations are predicted.

(See USER REQUEST EVALUATION TOOL.)

**SPECIAL EMERGENCY–** A condition of air piracy or other hostile act by a person(s) aboard an aircraft which threatens the safety of the aircraft or its passengers.

**SPECIAL INSTRUMENT APPROACH PROCEDURE–**

(See INSTRUMENT APPROACH PROCEDURE.)

**SPECIAL USE AIRSPACE–** Airspace of defined dimensions identified by an area on the surface of the earth wherein activities must be confined because of their nature and/or wherein limitations may be imposed upon aircraft operations that are not a part of those activities. Types of special use airspace are:

**a. Alert Area–** Airspace which may contain a high volume of pilot training activities or an unusual type of aerial activity, neither of which is hazardous to aircraft. Alert Areas are depicted on aeronautical charts for the information of nonparticipating pilots. All activities within an Alert Area are conducted in accordance with Federal Aviation Regulations, and pilots of participating aircraft as well as pilots transiting the area are equally responsible for collision avoidance.

**b. Controlled Firing Area–** Airspace wherein activities are conducted under conditions so controlled as to eliminate hazards to nonparticipating aircraft and to ensure the safety of persons and property on the ground.

**c. Military Operations Area (MOA)–** A MOA is airspace established outside of Class A airspace area to separate or segregate certain nonhazardous military activities from IFR traffic and to identify for VFR traffic where these activities are conducted.

(Refer to AIM.)

**d. Prohibited Area–** Airspace designated under 14 CFR Part 73 within which no person may operate an aircraft without the permission of the using agency.

(Refer to AIM.)

(Refer to En Route Charts.)

**e. Restricted Area–** Airspace designated under 14 CFR Part 73, within which the flight of aircraft, while not wholly prohibited, is subject to restriction. Most restricted areas are designated joint use and IFR/VFR operations in the area may be authorized by the controlling ATC facility when it is not being utilized by the using agency. Restricted areas are depicted on en route charts. Where joint use is authorized, the name of the ATC controlling facility is also shown.

(Refer to 14 CFR Part 73.)

(Refer to AIM.)

**f. Warning Area–** A warning area is airspace of defined dimensions extending from 3 nautical miles outward from the coast of the United States, that contains activity that may be hazardous to nonparticipating aircraft. The purpose of such warning area is to warn nonparticipating pilots of the potential danger. A warning area may be located over domestic or international waters or both.

**SPECIAL VFR CONDITIONS–** Meteorological conditions that are less than those required for basic VFR flight in Class B, C, D, or E surface areas and in which some aircraft are permitted flight under visual flight rules.

(See SPECIAL VFR OPERATIONS.)

(Refer to 14 CFR Part 91.)

**SPECIAL VFR FLIGHT [ICAO]–** A VFR flight cleared by air traffic control to operate within Class B, C, D, and E surface areas in meteorological conditions below VMC.

**SPECIAL VFR OPERATIONS**– Aircraft operating in accordance with clearances within Class B, C, D, and E surface areas in weather conditions less than the basic VFR weather minima. Such operations must be requested by the pilot and approved by ATC.

(See SPECIAL VFR CONDITIONS.)

(See ICAO term SPECIAL VFR FLIGHT.)

**SPEED**–

(See AIRSPEED.)

(See GROUND SPEED.)

**SPEED ADJUSTMENT**– An ATC procedure used to request pilots to adjust aircraft speed to a specific value for the purpose of providing desired spacing. Pilots are expected to maintain a speed of plus or minus 10 knots or 0.02 Mach number of the specified speed. Examples of speed adjustments are:

a. “Increase/reduce speed to Mach point (number.)”

b. “Increase/reduce speed to (speed in knots)” or “Increase/reduce speed (number of knots) knots.”

**SPEED BRAKES**– Moveable aerodynamic devices on aircraft that reduce airspeed during descent and landing.

**SPEED SEGMENTS**– Portions of the arrival route between the transition point and the vertex along the optimum flight path for which speeds and altitudes are specified. There is one set of arrival speed segments adapted from each transition point to each vertex. Each set may contain up to six segments.

**SQUAWK (Mode, Code, Function)**– Activate specific modes/codes/functions on the aircraft transponder; e.g., “Squawk three/alpha, two one zero five, low.”

(See TRANSPONDER.)

**STA**–

(See SCHEDULED TIME OF ARRIVAL.)

**STAGING/QUEUEING**– The placement, integration, and segregation of departure aircraft in designated movement areas of an airport by departure fix, EDCT, and/or restriction.

**STAND BY**– Means the controller or pilot must pause for a few seconds, usually to attend to other duties of a higher priority. Also means to wait as in “stand by for clearance.” The caller should reestablish contact if a delay is lengthy. “Stand by” is not an approval or denial.

**STANDARD INSTRUMENT APPROACH PROCEDURE (SIAP)**–

(See INSTRUMENT APPROACH PROCEDURE.)

**STANDARD INSTRUMENT DEPARTURE (SID)**–

A preplanned instrument flight rule (IFR) air traffic control (ATC) departure procedure printed for pilot/controller use in graphic form to provide obstacle clearance and a transition from the terminal area to the appropriate en route structure. SIDs are primarily designed for system enhancement to expedite traffic flow and to reduce pilot/controller workload. ATC clearance must always be received prior to flying a SID.

(See IFR TAKEOFF MINIMUMS AND DEPARTURE PROCEDURES.)

(See OBSTACLE DEPARTURE PROCEDURE.)

(Refer to AIM.)

**STANDARD RATE TURN**– A turn of three degrees per second.

**STANDARD TERMINAL ARRIVAL**– A preplanned instrument flight rule (IFR) air traffic control arrival procedure published for pilot use in graphic and/or textual form. STARs provide transition from the en route structure to an outer fix or an instrument approach fix/arrival waypoint in the terminal area.

**STANDARD TERMINAL ARRIVAL CHARTS**–

(See AERONAUTICAL CHART.)

**STANDARD TERMINAL AUTOMATION REPLACEMENT SYSTEM (STARS)**–

(See DTAS.)

**STAR**–

(See STANDARD TERMINAL ARRIVAL.)

**STATE AIRCRAFT**– Aircraft used in military, customs and police service, in the exclusive service of any government, or of any political subdivision, thereof including the government of any state, territory, or possession of the United States or the District of Columbia, but not including any government-owned aircraft engaged in carrying persons or property for commercial purposes.

**STATIC RESTRICTIONS**– Those restrictions that are usually not subject to change, fixed, in place, and/or published.

**STATIONARY RESERVATIONS**– Altitude reservations which encompass activities in a fixed area. Stationary reservations may include activities,

such as special tests of weapons systems or equipment, certain U.S. Navy carrier, fleet, and anti-submarine operations, rocket, missile and drone operations, and certain aerial refueling or similar operations.

**STEP TAXI**– To taxi a float plane at full power or high RPM.

**STEP TURN**– A maneuver used to put a float plane in a planing configuration prior to entering an active sea lane for takeoff. The STEP TURN maneuver should only be used upon pilot request.

**STEPDOWN FIX**– A fix permitting additional descent within a segment of an instrument approach procedure by identifying a point at which a controlling obstacle has been safely overflown.

**STEREO ROUTE**– A routinely used route of flight established by users and ARTCCs identified by a coded name; e.g., ALPHA 2. These routes minimize flight plan handling and communications.

**STOL AIRCRAFT**–

(See SHORT TAKEOFF AND LANDING AIRCRAFT.)

**STOP ALTITUDE SQUAWK**– Used by ATC to inform an aircraft to turn-off the automatic altitude reporting feature of its transponder. It is issued when the verbally reported altitude varies 300 feet or more from the automatic altitude report.

(See ALTITUDE READOUT.)

(See TRANSPONDER.)

**STOP AND GO**– A procedure wherein an aircraft will land, make a complete stop on the runway, and then commence a takeoff from that point.

(See LOW APPROACH.)

(See OPTION APPROACH.)

**STOP BURST**–

(See STOP STREAM.)

**STOP BUZZER**–

(See STOP STREAM.)

**STOP SQUAWK (Mode or Code)**– Used by ATC to tell the pilot to turn specified functions of the aircraft transponder off.

(See STOP ALTITUDE SQUAWK.)

(See TRANSPONDER.)

**STOP STREAM**– Used by ATC to request a pilot to suspend electronic attack activity.

(See JAMMING.)

**STOPOVER FLIGHT PLAN**– A flight plan format which permits in a single submission the filing of a sequence of flight plans through interim full-stop destinations to a final destination.

**STOPWAY**– An area beyond the takeoff runway no less wide than the runway and centered upon the extended centerline of the runway, able to support the airplane during an aborted takeoff, without causing structural damage to the airplane, and designated by the airport authorities for use in decelerating the airplane during an aborted takeoff.

**STRAIGHT-IN APPROACH IFR**– An instrument approach wherein final approach is begun without first having executed a procedure turn, not necessarily completed with a straight-in landing or made to straight-in landing minimums.

(See LANDING MINIMUMS.)

(See STRAIGHT-IN APPROACH VFR.)

(See STRAIGHT-IN LANDING.)

**STRAIGHT-IN APPROACH VFR**– Entry into the traffic pattern by interception of the extended runway centerline (final approach course) without executing any other portion of the traffic pattern.

(See TRAFFIC PATTERN.)

**STRAIGHT-IN LANDING**– A landing made on a runway aligned within 30° of the final approach course following completion of an instrument approach.

(See STRAIGHT-IN APPROACH IFR.)

**STRAIGHT-IN LANDING MINIMUMS**–

(See LANDING MINIMUMS.)

**STRAIGHT-IN MINIMUMS**–

(See STRAIGHT-IN LANDING MINIMUMS.)

**STRATEGIC PLANNING**– Planning whereby solutions are sought to resolve potential conflicts.

**SUBSTITUTE ROUTE**– A route assigned to pilots when any part of an airway or route is unusable because of NAVAID status. These routes consist of:

a. Substitute routes which are shown on U.S. Government charts.

b. Routes defined by ATC as specific NAVAID radials or courses.

c. Routes defined by ATC as direct to or between NAVAIDs.

**SUNSET AND SUNRISE**– The mean solar times of sunset and sunrise as published in the Nautical Almanac, converted to local standard time for the locality concerned. Within Alaska, the end of evening civil twilight and the beginning of morning civil twilight, as defined for each locality.

**SUPER HIGH FREQUENCY**– The frequency band between 3 and 30 gigahertz (GHz). The elevation and azimuth stations of the microwave landing system operate from 5031 MHz to 5091 MHz in this spectrum.

**SUPPLEMENTAL WEATHER SERVICE LOCATION**– Airport facilities staffed with contract personnel who take weather observations and provide current local weather to pilots via telephone or radio. (All other services are provided by the parent FSS.)

**SUPPS**– Refers to ICAO Document 7030 Regional Supplementary Procedures. SUPPS contain procedures for each ICAO Region which are unique to that Region and are not covered in the worldwide provisions identified in the ICAO Air Navigation Plan. Procedures contained in Chapter 8 are based in part on those published in SUPPS.

**SURFACE AREA**– The airspace contained by the lateral boundary of the Class B, C, D, or E airspace designated for an airport that begins at the surface and extends upward.

**SURPIC**– A description of surface vessels in the area of a Search and Rescue incident including their predicted positions and their characteristics.

(Refer to FAAO JO 7110.65, Para 10–6–4, INFLIGHT CONTINGENCIES.)

**SURVEILLANCE APPROACH**– An instrument approach wherein the air traffic controller issues instructions, for pilot compliance, based on aircraft position in relation to the final approach course (azimuth), and the distance (range) from the end of the runway as displayed on the controller's radar scope. The controller will provide recommended altitudes on final approach if requested by the pilot.

(Refer to AIM.)

**SWAP**–

(See SEVERE WEATHER AVOIDANCE PLAN.)

**SWSL**–

(See SUPPLEMENTAL WEATHER SERVICE LOCATION.)

**SYSTEM STRATEGIC NAVIGATION**– Military activity accomplished by navigating along a preplanned route using internal aircraft systems to maintain a desired track. This activity normally requires a lateral route width of 10 NM and altitude range of 1,000 feet to 6,000 feet AGL with some route segments that permit terrain following.



# U

## ■ UHF–

(See ULTRAHIGH FREQUENCY.)

**ULTRAHIGH FREQUENCY**– The frequency band between 300 and 3,000 MHz. The bank of radio frequencies used for military air/ground voice communications. In some instances this may go as low as 225 MHz and still be referred to as UHF.

**ULTRALIGHT VEHICLE**– An aeronautical vehicle operated for sport or recreational purposes which does not require FAA registration, an airworthiness certificate, nor pilot certification. They are primarily single occupant vehicles, although some two-place vehicles are authorized for training purposes. Operation of an ultralight vehicle in certain airspace requires authorization from ATC.

(Refer to 14 CFR Part 103.)

**UNABLE**– Indicates inability to comply with a specific instruction, request, or clearance.

**UNASSOCIATED**– A radar target that does not display a data block with flight identification and altitude information.

(See ASSOCIATED.)

**UNDER THE HOOD**– Indicates that the pilot is using a hood to restrict visibility outside the cockpit while simulating instrument flight. An appropriately rated pilot is required in the other control seat while this operation is being conducted.

(Refer to 14 CFR Part 91.)

**UNFROZEN**– The Scheduled Time of Arrival (STA) tags, which are still being rescheduled by traffic management advisor (TMA) calculations. The aircraft will remain unfrozen until the time the corresponding estimated time of arrival (ETA) tag passes the preset freeze horizon for that aircraft's stream class. At this point the automatic rescheduling will stop, and the STA becomes "frozen."

**UNICOM**– A nongovernment communication facility which may provide airport information at certain

airports. Locations and frequencies of UNICOMs are shown on aeronautical charts and publications.

(See AIRPORT/FACILITY DIRECTORY.)

(Refer to AIM.)

**UNPUBLISHED ROUTE**– A route for which no minimum altitude is published or charted for pilot use. It may include a direct route between NAVAIDs, a radial, a radar vector, or a final approach course beyond the segments of an instrument approach procedure.

(See PUBLISHED ROUTE.)

(See ROUTE.)

**UNRELIABLE (GPS/WAAS)**– An advisory to pilots indicating the expected level of service of the GPS and/or WAAS may not be available. Pilots must then determine the adequacy of the signal for desired use.

**UPWIND LEG**–

(See TRAFFIC PATTERN.)

**URET**–

(See USER REQUEST EVALUATION TOOL.)

**URGENCY**– A condition of being concerned about safety and of requiring timely but not immediate assistance; a potential distress condition.

(See ICAO term URGENCY.)

**URGENCY [ICAO]**– A condition concerning the safety of an aircraft or other vehicle, or of person on board or in sight, but which does not require immediate assistance.

**USAFIB**–

(See ARMY AVIATION FLIGHT INFORMATION BULLETIN.)

**USER REQUEST EVALUATION TOOL (URET)**– User Request Evaluation Tool is an automated tool provided at each Radar Associate position in selected En Route facilities. This tool utilizes flight and radar data to determine present and future trajectories for all active and proposal aircraft and provides enhanced, automated flight data management. ■



# V

VASI–

(See VISUAL APPROACH SLOPE INDICATOR.)

VCOA–

(See VISUAL CLIMB OVER AIRPORT.)

VDP–

(See VISUAL DESCENT POINT.)

VECTOR– A heading issued to an aircraft to provide navigational guidance by radar.

(See ICAO term RADAR VECTORING.)

**VERIFY**– Request confirmation of information; e.g., “verify assigned altitude.”

**VERIFY SPECIFIC DIRECTION OF TAKEOFF (OR TURNS AFTER TAKEOFF)**– Used by ATC to ascertain an aircraft’s direction of takeoff and/or direction of turn after takeoff. It is normally used for IFR departures from an airport not having a control tower. When direct communication with the pilot is not possible, the request and information may be relayed through an FSS, dispatcher, or by other means.

(See IFR TAKEOFF MINIMUMS AND DEPARTURE PROCEDURES.)

VERTEX– The last fix adapted on the arrival speed segments. Normally, it will be the outer marker of the runway in use. However, it may be the actual threshold or other suitable common point on the approach path for the particular runway configuration.

VERTEX TIME OF ARRIVAL– A calculated time of aircraft arrival over the adapted vertex for the runway configuration in use. The time is calculated via the optimum flight path using adapted speed segments.

VERTICAL NAVIGATION (VNAV)– A function of area navigation (RNAV) equipment which calculates, displays, and provides vertical guidance to a profile or path.

VERTICAL SEPARATION– Separation between aircraft expressed in units of vertical distance.

(See SEPARATION.)

VERTICAL TAKEOFF AND LANDING AIRCRAFT– Aircraft capable of vertical climbs and/or

descents and of using very short runways or small areas for takeoff and landings. These aircraft include, but are not limited to, helicopters.

(See SHORT TAKEOFF AND LANDING AIRCRAFT.)

VERY HIGH FREQUENCY– The frequency band between 30 and 300 MHz. Portions of this band, 108 to 118 MHz, are used for certain NAVAIDs; 118 to 136 MHz are used for civil air/ground voice communications. Other frequencies in this band are used for purposes not related to air traffic control.

VERY HIGH FREQUENCY OMNIDIRECTIONAL RANGE STATION–

(See VOR.)

VERY LOW FREQUENCY– The frequency band between 3 and 30 kHz.

VFR–

(See VISUAL FLIGHT RULES.)

VFR AIRCRAFT– An aircraft conducting flight in accordance with visual flight rules.

(See VISUAL FLIGHT RULES.)

**VFR CONDITIONS**– Weather conditions equal to or better than the minimum for flight under visual flight rules. The term may be used as an ATC clearance/instruction only when:

a. An IFR aircraft requests a climb/descent in VFR conditions.

b. The clearance will result in noise abatement benefits where part of the IFR departure route does not conform to an FAA approved noise abatement route or altitude.

c. A pilot has requested a practice instrument approach and is not on an IFR flight plan.

Note: All pilots receiving this authorization must comply with the VFR visibility and distance from cloud criteria in 14 CFR Part 91. Use of the term does not relieve controllers of their responsibility to separate aircraft in Class B and Class C airspace or TRSAs as required by FAAO JO 7110.65. When used as an ATC clearance/instruction, the term may be abbreviated “VFR;” e.g., “MAINTAIN VFR,” “CLIMB/DESCEND VFR,” etc.

VFR FLIGHT–

(See VFR AIRCRAFT.)

**VFR MILITARY TRAINING ROUTES**– Routes used by the Department of Defense and associated Reserve and Air Guard units for the purpose of conducting low-altitude navigation and tactical training under VFR below 10,000 feet MSL at airspeeds in excess of 250 knots IAS.

**VFR NOT RECOMMENDED**– An advisory provided by a flight service station to a pilot during a preflight or inflight weather briefing that flight under visual flight rules is not recommended. To be given when the current and/or forecast weather conditions are at or below VFR minimums. It does not abrogate the pilot's authority to make his/her own decision.

**VFR-ON-TOP**– ATC authorization for an IFR aircraft to operate in VFR conditions at any appropriate VFR altitude (as specified in 14 CFR and as restricted by ATC). A pilot receiving this authorization must comply with the VFR visibility, distance from cloud criteria, and the minimum IFR altitudes specified in 14 CFR Part 91. The use of this term does not relieve controllers of their responsibility to separate aircraft in Class B and Class C airspace or TRSAs as required by FAAO JO 7110.65.

**VFR TERMINAL AREA CHARTS**–  
(See AERONAUTICAL CHART.)

**VFR WAYPOINT**–  
(See WAYPOINT.)

**VHF**–  
(See VERY HIGH FREQUENCY.)

**VHF OMNIDIRECTIONAL RANGE/TACTICAL AIR NAVIGATION**–  
(See VORTAC.)

**VIDEO MAP**– An electronically displayed map on the radar display that may depict data such as airports, heliports, runway centerline extensions, hospital emergency landing areas, NAVAIDs and fixes, reporting points, airway/route centerlines, boundaries, handoff points, special use tracks, obstructions, prominent geographic features, map alignment indicators, range accuracy marks, minimum vectoring altitudes.

**VISIBILITY**– The ability, as determined by atmospheric conditions and expressed in units of

distance, to see and identify prominent unlighted objects by day and prominent lighted objects by night. Visibility is reported as statute miles, hundreds of feet or meters.

(Refer to 14 CFR Part 91.)

(Refer to AIM.)

**a. Flight Visibility**– The average forward horizontal distance, from the cockpit of an aircraft in flight, at which prominent unlighted objects may be seen and identified by day and prominent lighted objects may be seen and identified by night.

**b. Ground Visibility**– Prevailing horizontal visibility near the earth's surface as reported by the United States National Weather Service or an accredited observer.

**c. Prevailing Visibility**– The greatest horizontal visibility equaled or exceeded throughout at least half the horizon circle which need not necessarily be continuous.

**d. Runway Visibility Value (RVV)**– The visibility determined for a particular runway by a transmissometer. A meter provides a continuous indication of the visibility (reported in miles or fractions of miles) for the runway. RVV is used in lieu of prevailing visibility in determining minimums for a particular runway.

**e. Runway Visual Range (RVR)**– An instrumentally derived value, based on standard calibrations, that represents the horizontal distance a pilot will see down the runway from the approach end. It is based on the sighting of either high intensity runway lights or on the visual contrast of other targets whichever yields the greater visual range. RVR, in contrast to prevailing or runway visibility, is based on what a pilot in a moving aircraft should see looking down the runway. RVR is horizontal visual range, not slant visual range. It is based on the measurement of a transmissometer made near the touchdown point of the instrument runway and is reported in hundreds of feet. RVR is used in lieu of RVV and/or prevailing visibility in determining minimums for a particular runway.

**1. Touchdown RVR**– The RVR visibility readout values obtained from RVR equipment serving the runway touchdown zone.

**2. Mid-RVR**– The RVR readout values obtained from RVR equipment located midfield of the runway.

# INDEX

[References are to page numbers]

## A

- Accident, Aircraft, Reporting, 7-6-1
- Accident Cause Factors, 7-5-1
- Adherence to Clearance, 4-4-5
- ADIZ. *See* Air Defense Identification Zones
- ADS-B. *See* Automatic Dependent Broadcast Services
- ADS-R. *See* Automatic Dependent Surveillance-Rebroadcast
- Advisories
  - Braking Action, 4-3-11
  - Inflight Aviation Weather, 7-1-9
  - Minimum Fuel, 5-5-6
  - Runway Friction, 4-3-11
  - Traffic, 5-5-4
- Aerobatic Flight, 8-1-8
- Aerodrome Forecast (TAF), 7-1-70, 7-1-71
- Aeronautical
  - Charts, 9-1-1
  - Publications, 9-1-1
- Aeronautical Light Beacons, 2-2-1
- AFIS. *See* Automatic Flight Information Service
- AHRS. *See* Attitude Heading Reference System
- Air Ambulance Flights, 4-2-4
- Air Defense Identification Zone, Land-Based, 5-6-1
- Air Defense Identification Zones, 5-6-1, 5-6-8
- Air Route Surveillance Radar, 4-5-7
- Air Route Traffic Control Centers, 4-1-1
- Air Traffic Control
  - Aircraft Separation, 4-4-1
  - Clearances, 4-4-1
  - Pilot Services, 4-1-1
    - Air Route Traffic Control Centers, 4-1-1
    - Airport Reservations, 4-1-21
    - Approach Control Service, Arriving VFR Aircraft, 4-1-2
    - Automatic Terminal Information Service, 4-1-7
    - Communications, Release of IFR Aircraft, Airports without Operating Control Tower, 4-1-1
    - Control Towers, 4-1-1
    - Flight Service Stations, 4-1-1
    - Ground Vehicle Operations, 4-1-6
    - Hazardous Area Reporting Service, 4-1-18
    - IFR Approaches, 4-1-6
    - Operation Raincheck, 4-1-2
    - Operation Take-off, 4-1-2
    - Radar Assistance to VFR Aircraft, 4-1-11
    - Radar Traffic Information Service, 4-1-8
    - Recording and Monitoring, 4-1-1
    - Safety Alert, 4-1-10
    - Terminal Radar Services for VFR Aircraft, 4-1-12
    - Tower En Route Control, 4-1-14
    - Traffic Advisory Practices, Airports Without Operating Control Towers, 4-1-2
    - Transponder Operation, 4-1-15
    - Unicom, Use for ATC Purposes, 4-1-7
    - Unicom/Multicom, 4-1-6
- Air Traffic Control Radar Beacon System, 4-1-15, 4-5-2
- Aircraft
  - Arresting Devices, 2-3-30
  - Call Signs, 4-2-3
  - Lights, Use in Airport Operations, 4-3-23
  - Unmanned, 7-5-2
  - VFR, Emergency Radar Service, 6-2-1
- Aircraft Conflict Alert, 4-1-11
- Airport
  - Aids, Marking, 2-3-1
    - Holding Position, 2-3-12
    - Pavement, 2-3-1
      - Holding Position, 2-3-1
      - Other, 2-3-1
      - Runway, 2-3-1
      - Taxiway, 2-3-1
  - Airport Advisory/Information Services, 3-5-1
  - Lighting Aids, 2-1-1
  - Local Airport Advisory (LAA), 4-1-3
  - Operations, 4-3-1
    - Communications, 4-3-16
    - Exiting the Runway, After Landing, 4-3-21
    - Flight Check Aircraft, In Terminal Areas, 4-3-24
    - Flight Inspection, 4-3-24
    - Gate Holding, Departure Delays, 4-3-17
    - Intersection Takeoffs, 4-3-12
    - Low Approach, 4-3-15
    - Low Level Wind Shear/Microburst Detection Systems, 4-3-11
    - Option Approach, 4-3-23
    - Signals, Hand, 4-3-24
    - Taxi During Low Visibility, 4-3-20
    - Traffic Control Light Signals, 4-3-15
    - Traffic Patterns, 4-3-1, 4-3-2
    - Use of Aircraft Lights, 4-3-23

**[References are to page numbers]**

- Use of Runways, 4-3-6
- VFR Flights in Terminal Areas, 4-3-17
- VFR Helicopter at Controlled Airports, 4-3-17
  - With Operating Control Tower, 4-3-1
  - Without Operating Control Tower, 4-3-5
- Remote Airport Advisory (RAA), 3-5-1, 4-1-4
- Remote Airport Information Service (RAIS), 3-5-1, 4-1-4
- Signs, 2-3-1, 2-3-19
  - Destination, 2-3-28
  - Direction, 2-3-25
  - Information, 2-3-29
  - Location, 2-3-23
  - Mandatory Instruction, 2-3-20
  - Runway Distance Remaining, 2-3-29
- Airport Reservations, 4-1-21
- Airport Surface Detection Equipment – Model X, 4-5-7
- Airport Surveillance Radar, 4-5-7
- Airspace, 3-1-1
  - Basic VFR Weather Minimums, 3-1-1
  - Class D, 3-2-8
  - Class E, 3-2-9
  - Class G, 3-3-1
  - Controlled, 3-2-1
    - Advisories, Traffic, 3-2-1
    - Alerts, Safety, 3-2-1
    - Class A, 3-2-2
    - Class B, 3-2-2
    - Class C, 3-2-4
    - IFR Requirements, 3-2-1
    - IFR Separation, 3-2-1
    - Parachute Jumps, 3-2-2
    - Ultralight Vehicles, 3-2-2
    - Unmanned Free Balloons, 3-2-2
    - VFR Requirements, 3-2-1
  - Flight Levels, 3-1-2
  - General Dimensions, Segments, 3-1-1
  - Military Training Routes, 3-5-1
  - Other Areas, 3-5-1
  - Parachute Jumping, 3-5-5
  - Special Use, 3-4-1
  - Temporary Flight Restrictions, 3-5-2
  - Terminal Radar Service Areas, 3-5-9
  - VFR Cruising Altitudes, 3-1-2
  - VFR Routes, Published, 3-5-5
    - Class B Airspace, VFR Transition Routes, 3-5-7
    - VFR Corridors, 3-5-7
    - VFR Flyways, 3-5-5
- Airway, 5-3-5
- Airways, Course Changes, 5-3-7
- Alcohol, 8-1-1
- Alert, Safety, 4-1-10, 5-5-3
- Alert Areas, 3-4-2
- Alignment of Elements Approach Slope Indicator, 2-1-5
- Alphabet, Phonetic, 4-2-5
- ALS. *See* Approach Light Systems
- Altimeter
  - Density Altitude, 7-5-4
  - Errors, 7-2-3
  - Setting, 7-2-1
    - High Barometric Pressure, 7-2-4
    - Low Barometric Pressure, 7-2-4
- Altitude
  - Automatic Reporting, 4-1-15
  - Effects, 8-1-3
    - Hypoxia, 8-1-3
  - High Altitude Destinations, 5-1-29
  - Mandatory, 5-4-6
  - Maximum, 5-4-6
  - Minimum, 5-4-6
- Ambulance, Air, 4-2-4
- Amended Clearances, 4-4-2
- Approach
  - Advance Information, Instrument Approach, 5-4-3
  - Approach Control, 5-4-3
  - Clearance, 5-4-25
  - Contact, 5-4-61, 5-5-2
  - Instrument, 5-5-2
  - Instrument Approach Procedure, Charts, 5-4-4
  - Instrument Approach Procedures, 5-4-27
  - Low, 4-3-15
  - Minimums, 5-4-51
  - Missed, 5-4-54, 5-5-2
  - No-Gyro, 5-4-36
  - Option, 4-3-23
  - Overhead Approach Maneuver, 5-4-61
  - Precision, 5-4-35
  - Surveillance, 5-4-35
  - Visual, 5-4-59, 5-5-5
- Approach Control Service, VFR Arriving Aircraft, 4-1-2
- Approach Light Systems, 2-1-1
- Approaches
  - IFR, 4-1-6
  - Parallel Runways, ILS/MLS, 5-4-37
  - Radar, 5-4-35

**[References are to page numbers]**

Timed, 5-4-32

Area Navigation (RNAV), 1-2-1, 5-1-15, 5-3-6,  
5-5-7

Area Navigation (RNAV) Routes, 5-3-6

Area Navigation (RNAV) Standard Terminal Arrival  
(STAR), 5-4-1

ARFF (Aircraft Rescue and Fire Fighting) Emergency  
Hand Signals, 6-5-1

ARFF (Aircraft Rescue and Fire Fighting) Radio Call  
Sign, 6-5-1

Arresting Devices, Aircraft, 2-3-30

ARSR. *See* Air Route Surveillance Radar

ARTCC. *See* Air Route Traffic Control Centers

ASDE-X. *See* Airport Surface Detection  
Equipment-Model X

Ash, Volcanic, 7-5-7

ASOS. *See* Automated Surface Observing System

ASR. *See* Airport Surveillance Radar; Surveillance  
Approach

ATCRBS. *See* Air Traffic Control Radar Beacon  
System

ATCT. *See* Control Towers

ATIS. *See* Automatic Terminal Information Service

Attitude Heading Reference System (AHRS), 1-1-17

Authority, Statutory, 1-1-1

Automated Surface Observing System (ASOS), 4-3-28,  
7-1-29

Automated Weather Observing System (AWOS),  
4-3-28, 7-1-27

Automated Weather Sensor System (AWSS), 4-3-28

Automated Weather Sensor System (AWSS), 7-1-29

Automatic Altitude Reporting, 4-1-15

Automatic Dependent Surveillance-Broadcast Services,  
4-5-14

Automatic Dependent Surveillance-Rebroadcast,  
4-5-20

Automatic Flight Information Service (AFIS) – Alaska  
FSSs Only, 4-1-8

Automatic Terminal Information Service, 4-1-7

AWOS. *See* Automated Weather Observing System

**B**

Balloons, Unmanned, 7-5-2  
Free, 3-2-2

Beacon

Aeronautical Light, 2-2-1

Code, 2-2-1

Marker, 1-1-9

Nondirectional Radio, 1-1-1

Beacons, Airport/Heliport, 2-1-14

Bird

Bird Strike

Reduction, 7-4-1

Reporting, 7-4-1

Hazards, 7-4-1

Migratory, 7-4-1

Bird/Other Wildlife Strike Reporting, Form. *See*  
Appendix 1

Block Island Reporting Service, 4-1-19

Braking Action Advisories, 4-3-11

Braking Action Reports, 4-3-11

Briefing, Preflight, 7-1-6

**C**

Call Signs

Aircraft, 4-2-3

Ground Station, 4-2-4

Cape Code Radar Overwater Flight Following, 4-1-19

Carbon Monoxide Poisoning, 8-1-5

CAT. *See* Clear Air Turbulence

CDR. *See* Coded Departure Route

Changeover Points, 5-3-8

Charted Visual Flight Procedures, 5-4-60

Charts, Aeronautical, 9-1-1

Class A Airspace, 3-2-2

Definition, 3-2-2

Operating Rules, 3-2-2

Pilot/Equipment Requirements, 3-2-2

Class B Airspace, 3-2-2

ATC Clearances, 3-2-3

Definition, 3-2-2

Flight Procedures, 3-2-3

Mode C Veil, 3-2-3

Operating Rules, 3-2-2

**[References are to page numbers]**

- Pilot/Equipment Requirements, VFR Operations, 3-2-2
- Proximity Operations, 3-2-4
- Separation, 3-2-3
- VFR Transition Routes, 3-5-7
- Class C Airspace, 3-2-4
  - Air Traffic Services, 3-2-5
  - Aircraft Separation, 3-2-5
  - Definition, 3-2-4
  - Operating Rules, 3-2-4
  - Outer Area, 3-2-5
  - Pilot/Equipment Requirements, 3-2-4
  - Secondary Airports, 3-2-6
- Class D Airspace, 3-2-8
  - Definition, 3-2-8
  - Operating Rules, 3-2-8
  - Pilot/Equipment Requirements, 3-2-8
  - Separation for VFR Aircraft, 3-2-8
- Class E Airspace, 3-2-9
  - Definition, 3-2-9
  - Operating Rules, 3-2-9
  - Pilot/Equipment Requirements, 3-2-9
  - Separation for VFR Aircraft, 3-2-9
  - Types, 3-2-9
  - Vertical Limits, 3-2-9
- Class G Airspace, 3-3-1
  - IFR Requirements, 3-3-1
  - VFR Requirements, 3-3-1
- Clear Air Turbulence, 7-1-49
- Clearance
  - Abbreviated IFR Departure, 5-2-2
  - Adherence, 4-4-5
  - Air Traffic, 5-5-1
  - Air Traffic Control, 4-4-1
  - Amended, 4-4-2
  - Approach, 5-4-25
  - IFR, VFR-on-Top, 4-4-4
  - IFR Flights, 4-4-5
  - Issuance, Pilot Responsibility, 4-4-4
  - Items, 4-4-1
    - Altitude Data, 4-4-2
    - Clearance Limit, 4-4-1
    - Departure Procedure, 4-4-1
    - Holding Instructions, 4-4-2
    - Route of Flight, 4-4-1
  - Pre-Taxi, 5-2-1
  - Prefix, 4-4-1
  - Taxi, 5-2-1
  - VFR Flights, 4-4-5
  - Void Times, 5-2-4
- Clearances, Special VFR Clearances, 4-4-3
- Clearing Procedures, Visual, 4-4-10
- CNF. *See* Computer Navigation Fix
- Coded Depature Route, 4-4-3
- Collision, Avoidance, Judgment, 8-1-8
- Communication, Radio
  - Contact, Reestablishing, 6-4-2
  - Two-way Failure, 6-4-1
    - IFR Conditions, 6-4-1
    - Transponder Usage, 6-4-2
    - VFR Conditions, 6-4-1
- Communications
  - ARTCC, 5-3-1
    - Additional Reports, 5-3-4
    - Position Reporting, 5-3-3
  - Distress, 6-3-1
  - Radio, 4-2-1
    - Phonetic Alphabet, 4-2-5
  - Release, 4-1-1
  - Urgency, 6-3-1
- Computer Navigation Fix (CNF), 1-1-27
- Conflict Alert, Aircraft, 4-1-11
- Contact Approach, 5-4-61
- Contact Procedures, 4-2-1
  - Initial Contact, 4-2-1
- Control of Lighting Systems, 2-1-11
- Control Towers, 4-1-1
- Controlled Firing Areas, 3-4-2
- Controller, Responsibility, 5-3-8, 5-4-60, 5-5-1
- COP. *See* Changeover Points
- CORONA, 7-5-9
- Course Lights, 2-2-1
- CVFP. *See* Charted Visual Flight Procedures

**D**

- Decompression Sickness, 8-1-4
- Density Altitude, Effects, 7-5-4
- Departure, Restrictions, 5-2-4
- Departure Control, 5-2-5
- Departures, Instrument, 5-5-6
- Direct User Access Terminal System, 7-1-3
- Discrete Emergency Frequency, 6-5-1



**[References are to page numbers]**

Distance Measuring Equipment, 1-1-3, 1-1-9, 5-3-12  
 Distress, 6-3-1

Ditching Procedures, 6-3-3

DME. *See* Distance Measuring Equipment

Doppler Radar, 1-1-18

DUATS. *See* Direct User Access System

**E**

Ear Block, 8-1-4

EFAS. *See* En Route Flight Advisory Service

EFVS. *See* Enhanced Flight Vision Systems

ELT. *See* Emergency Locator Transmitters

Emergency, 6-1-1

Air Piracy, 6-3-6

Airborne Aircraft Inspection, 7-5-8

Aircraft, Overdue, 6-2-5

Body Signals, 6-2-6

Ditching Procedures, 6-3-3

Explosives Detection, FAA K-9 Team Program,  
 6-2-3

Fuel Dumping, 6-3-7

Inflight Monitoring and Reporting, 6-2-3

Intercept and Escort, 6-2-1

Locator Transmitters, 6-2-2

Obtaining Assistance, 6-3-2

Pilot Authority, 6-1-1

Pilot Responsibility, 6-1-1

Request Assistance Immediately, 6-1-1

Search and Rescue, 6-2-4

Services, 6-2-1

Radar Service for VFR Aircraft in Difficulty,  
 6-2-1

Survival Equipment, 6-2-6

Transponder Operation, 6-2-1

VFR Search and Rescue Protection, 6-2-5

Emergency Locator Transmitter, 6-2-2

En Route Flight Advisory Service, 7-1-8

Enhanced Flight Vision Systems, 5-4-57

Escort, 6-2-1

Explosives, FAA K-9 Detection Team Program, 6-2-3

**F**

FAROS. *See* Final Approach Runway Occupancy  
 Signal (FAROS)

Final Approach Runway Occupancy Signal (FAROS),  
 2-1-9

Final Guard, 3-5-1

FIS-B. *See* Flight Information Service-Broadcast

Fitness, Flight

Alcohol, 8-1-1

Emotion, 8-1-2

Fatigue, 8-1-2

Hypoxia, 8-1-3

Stress, 8-1-2

Flight

Aerobatic, 8-1-8

Fitness, 8-1-1

Illusions, 8-1-5

Over National Forests, 7-4-1

Over National Parks, 7-4-1

Over National Refuges, 7-4-1

Safety, Meteorology, 7-1-1

Vision, 8-1-6

Flight Check Aircraft, 4-3-24

Flight Information Service-Broadcast, 4-5-18

Flight Information Services, 7-1-23

Flight Inspections Aircraft, 4-3-24

Flight Management System, 1-2-3, 5-1-13

Flight Management System Procedures, 5-4-1

Flight Plan

Change, 5-1-32

Proposed Departure Time, 5-1-32

Closing

DVFR, 5-1-32

VFR, 5-1-32

Composite, VFR/IFR, 5-1-11

DVFR Flights, 5-1-10

Explanation of IFR, 5-1-16

Explanation of VFR, 5-1-9

Form 7233-1, 5-1-9, 5-1-17

IFR, Canceling, 5-1-32

IFR Flights, Domestic, 5-1-11

VFR Flights, 5-1-7

Flight Restrictions, Temporary, 3-5-2

Flight Service Stations, 4-1-1

Flights, Outside the United States, 5-1-30

Fly Visual to Airport, 5-4-19

**[References are to page numbers]**

Flying, Mountain, 7-5-3

FMS. *See* Flight Management System

FMS. *See* Flight Management System Procedures

Forms

Bird Strike Incident/Ingestion Report, Appendix 1-1

Volcanic Activity Reporting Form, Appendix 2-1

Frequency, Instrument Landing System, 1-1-10

FSS. *See* Flight Service Stations

Fuel Dumping, 6-3-7

## G

Gate Holding, 4-3-17

GBAS. *See* Ground Based Augmentation System

Glideslope, Visual Indicators, 2-1-1

Global Navigation Satellite System, 1-1-17, 1-1-35,  
5-1-13

Global Positioning System, 1-1-18

Database, 1-1-25

Equipment, 1-1-25

GPS Approach Procedures, 1-1-25

GNSS. *See* Global Navigation Satellite System

GPS. *See* Global Positioning System

GPS Approach Procedures, 1-1-25

Ground Based Augmentation System (GBAS), 1-1-36

Ground Based Augmentation System (GBAS) Landing  
System (GLS), 1-1-35

Ground Station, Call Signs, 4-2-4

Ground Vehicle Operations, 4-1-6

Gulf of Mexico Grid System, 10-1-6

## H

Half-Way Signs, 7-5-5

Hand Signals, 4-3-24

Hazard

Antenna Tower, 7-5-1

Bird, 7-4-1

Flight

Obstructions to Flight, 7-5-1

Potential, 7-5-1

VFR in Congested Areas, 7-5-1

Ground Icing Conditions, 7-5-12

Mountain Flying, 7-5-3

Overhead Wires, 7-5-2

Thermal Plumes, 7-5-13

Unmanned Balloons, 7-5-2

Volcanic Ash, 7-5-7

Hazardous Area Reporting Service, 4-1-18

HDTA. *See* High Density Traffic Airports

Helicopter

IFR Operations, 10-1-1

Landing Area Markings, 2-3-19

VFR Operations at Controlled Airports, 4-3-17

Special Operations, 10-2-1

Wake Turbulence, 7-3-6

High Density Traffic Airports, 4-1-21

Hold, For Release, 5-2-4

Holding, 5-3-8

Holding Position Markings, 2-3-1, 2-3-12

for Instrument Landing Systems, 2-3-12

for Taxiway/Taxiway Intersections, 2-3-12

Holding Position Signs, Surface Painted, 2-3-12

Hypoxia, 8-1-3

## I

Icing Terms, 7-1-45

IFR, 4-4-4

Operations, To High Altitude Destinations, 5-1-29

Procedures, Use When Operating VFR, 5-1-2

IFR

Approaches, 4-1-6

Military Training Routes, 3-5-2

Separation Standards, 4-4-7

ILS. *See* Instrument Landing System

In-Runway Lighting, 2-1-6

Taxiway Centerline Lead-off Lights, 2-1-6

Taxiway Centerline Lead-On Lights, 2-1-6

Touchdown Zone Lighting, 2-1-6

Incident, Aircraft, Reporting, 7-6-1

Inertial Navigation System, 1-1-17

Inertial Reference Unit (IRU), 1-1-17, 5-1-13

Initial Contact, 4-2-1

INS. *See* Internal Navigation System

Instrument Departure Procedures (DP), 5-2-5

**[References are to page numbers]**

Instrument Landing System, 1-1-7  
 Category, 1-1-10  
 Compass Locator, 1-1-10  
 Course, Distortion, 1-1-11  
 Distance Measuring Equipment, 1-1-9  
 Frequency, 1-1-10  
 Glide Path, 1-1-9  
 Glide Slope, 1-1-9  
     Critical Area, 1-1-11  
 Holding Position Markings, 2-3-12  
 Inoperative Components, 1-1-11  
 Localizer, 1-1-8  
     Critical Area, 1-1-11  
 Locators, Compass, 1-1-7  
 Marker Beacon, 1-1-9  
 Minimums, 1-1-10  
 Instrument Meteorological Conditions (IMC), 5-2-6  
 Integrated Terminal Weather System, 4-3-11  
 Intercept, 6-2-1  
 Interception  
     Procedures, 5-6-2  
     Signals, 5-6-6  
 Interchange Aircraft, 4-2-4  
 International Flight Plan, IFR, Domestic, International,  
     5-1-18  
 International Flight Plan (FAA Form 7233-4)- IFR  
     Flights (For Domestic or International Flights),  
     5-1-18  
 Intersection Takeoffs, 4-3-12  
 IR. *See* IFR Military Training Routes  
 IRU. *See* Inertial Reference Unit  
 ITWS. *See* Integrated Terminal Weather System

**K**

K-9 Explosives Detection Team, 6-2-3

**L**

LAHSO. *See* Land and Hold Short Operations  
 Land and Hold Short Lights, 2-1-6  
 Land and Hold Short Operations (LAHSO), 4-3-13  
 Landing

Minimums, 5-4-51  
 Priority, 5-4-61  
 Laser Operations, 7-5-10  
 Law Enforcement Operations  
     Civil, 5-6-5  
     Military, 5-6-5  
 LDA. *See* Localizer-Type Directional Aid  
 Leased Aircraft, 4-2-4  
 Lifeguard, 4-2-4  
 Light Signals, Traffic Control, 4-3-15  
 Lighting  
     Aeronautical Light Beacons, 2-2-1  
     Aids  
         Airport, 2-1-1  
         Approach Light Systems, 2-1-1  
         Control of Lighting Systems, 2-1-11  
         In-Runway Lighting, 2-1-6  
         Pilot Control of Airport Lighting, 2-1-11  
         Runway End Identifier Lights, 2-1-6  
         Taxiway Lights, 2-1-15  
         Airport/Heliport Beacons, 2-1-14  
     Airport, Radio Control, 4-1-6  
     Code Beacon, 2-2-1  
     Course, 2-2-1  
     Navigation, 2-2-1  
     Obstruction, 2-2-1  
 Line Up and Wait , 5-2-1  
 LLWAS. *See* Low Level Wind Shear Alert System  
 Local Airport Advisory (LAA), 3-5-1, 4-1-3  
 Local Flow Traffic Management Program, 5-4-2  
 Localizer Performance with Vertical Guidance, 1-1-32  
 Localizer-Type Directional Aid, 1-1-8  
 Locator, Compass, 1-1-10  
 Long Island Sound Reporting Service, 4-1-18  
 Long Range Navigation, 1-1-17  
 LORAN. *See* Long Range Navigation  
 Low Approach, 4-3-15  
 Low Level Wind Shear Alert System (LLWAS),  
     4-3-11, 7-1-53  
 Low Level Wind Shear/Microburst Detection Systems,  
     4-3-11  
 LPV. *See* Localizer Performance with Vertical Guidance  
 LUAW. *See* Line Up and Wait

**[References are to page numbers]****M**

MAYDAY, 6-3-1

Medical

- Carbon Monoxide Poisoning, 8-1-5
- Decompression Sickness, 8-1-4
- Facts, Pilots, 8-1-1
- Flight, Ear Block, 8-1-4
- Illness, 8-1-1
- Medication, 8-1-1
- Sinus Block, 8-1-4

Meteorology, 7-1-1

- ATC InFlight Weather Avoidance, 7-1-38
- Automated Surface Observing System, 7-1-29
- Categorical Outlooks, 7-1-19
- Clear Air Turbulence, 7-1-49
- Cloud Heights, Reporting, 7-1-42
- Direct User Access Terminal System, 7-1-3
- Drizzle, Intensity, 7-1-43
- En Route Flight Advisory Service, 7-1-8
- FAA Weather Services, 7-1-1
- ICAO, Weather Formats, 7-1-64
- Icing, Airframe, 7-1-44
- Inflight Aviation Weather Advisories, 7-1-9
- Inflight Weather Broadcasts, 7-1-20
- Microbursts, 7-1-49
- National Weather Service, Aviation Products, 7-1-1
- Pilot Weather Reports, 7-1-43
- Precipitation, Intensity, 7-1-42
- Preflight Briefing, 7-1-6
- Runway Visual Range, 7-1-40
- Telephone Information Briefing Service, 7-1-20
- Thunderstorms, 7-1-59
  - Flying, 7-1-60
- Transcribed Weather Broadcast, 7-1-20
- Turbulence, 7-1-48
- Visibility, Reporting, 7-1-42
- Weather, Radar Services, 7-1-34
- Weather Observing Programs, 7-1-27
- Wind Shear, 7-1-49

Microwave Landing System, 1-1-14

- Approach Azimuth Guidance, 1-1-14
- Data Communications, 1-1-15
- Elevation Guidance, 1-1-15
- Operational Flexibility, 1-1-16
- Range Guidance, 1-1-15

Military NOTAMs, 5-1-3

Military Operations Areas, 3-4-2

Military Training Routes, 3-5-1

IFR, 3-5-2

VFR, 3-5-2

Minimum, Fuel Advisory, 5-5-6

Minimum Safe Altitudes, 5-4-7

Minimum Turning Altitude (MTA), 5-3-8

Minimum Vectoring Altitudes, 5-4-18

Minimums

- Approach, 5-4-51
- Instrument Landing Systems, 1-1-10
- Landing, 5-4-51

Missed Approach, 5-4-54

MLS. *See* Microwave Landing System

MOA. *See* Military Operations Areas

Mode C, 4-1-15

Mountain Flying, 7-5-3

Mountain Wave, 7-5-4

Mountainous Areas, 5-6-8

MSA. *See* Minimum Safe Altitudes

MTA. *See* Minimum Turning Altitude (MTA)

Multicom, 4-1-6

MVA. *See* Minimum Vectoring Altitudes

**N**

National Forests, 7-4-1

National Geospatial-Intelligence Agency (NGA),  
5-4-6

National Parks, 7-4-1

National Refuges, 7-4-1

National Security Areas, 3-4-2

National Weather Service, Aviation Products, 7-1-1

NAVAID

- Identifier Removal During Maintenance, 1-1-16
- Maintenance, 1-1-16
- Performance, User Report, 1-1-17
- Service Volumes, 1-1-4
- with Voice, 1-1-17

Navigation, Aids, 1-1-1

Nondirectional Radio Beacon, 1-1-1

Radio, VHF Omni-directional Range, 1-1-1

Navigation Reference System (NRS), 5-1-16

**[References are to page numbers]**

## Navigational

## Aids, Radio

- Distance Measuring Equipment, 1-1-3
- Doppler Radar, 1-1-18
- Identifier Removal During Maintenance, 1-1-16
- Instrument Landing System, 1-1-7
- Localizer-Type Directional Aid, 1-1-8
- Long Range Navigation, 1-1-17
- Microwave Landing System, 1-1-14
- Navaid Service Volumes, 1-1-4
- NAVAIDs with Voice, 1-1-17
- Performance, User Report, 1-1-17
- Simplified Directional Facility, 1-1-12
- Tactical Air Navigation, 1-1-3
- VHF Omni-directional Range/Tactical Air Navigation, 1-1-3
- Inertial Navigation System, 1-1-17

NDB. *See* Nondirectional Radio Beacon

Near Midair Collision, 7-6-2

NGA. *See* National Geospatial-Intelligence Agency

NMAC. *See* Near Midair Collision

Nondirectional Radio Beacon, 1-1-1

Nonmovement Area Boundary Markings, 2-3-18

NOTAM. *See* Notice to Airmen

Notice to Airmen, 5-1-2

FDC NOTAM, 5-1-3

NOTAM Contractions, 5-1-6

NOTAM D, 5-1-3

Notice to Airmen System, 5-1-2

Notices to Airmen Publication, NTAP, 5-1-3

**O**

Obstacle Departure Procedures, 5-2-5

Obstruction Alert, 4-1-10

Operation Raincheck, 4-1-2

Operation Take-off, 4-1-2

Operational Information System (OIS), 5-1-10

Option Approach, 4-3-23

**P**

P-static, 7-5-9

PAN-PAN, 6-3-1

PAPI. *See* Precision Approach Path Indicator

PAR. *See* Precision Approach; Precision Approach Radar

Parachute Jumps, 3-2-2, 3-5-5

Phonetic Alphabet, 4-2-5

## Pilot

Authority, 6-1-1

Responsibility, 4-1-14, 4-4-1, 4-4-4, 5-4-60, 5-5-1, 6-1-1, 7-3-6

Pilot Control of Airport Lighting, 2-1-11

Pilot Visits to Air Traffic Facilities, 4-1-1

Pilot Weather Reports, 7-1-43

Piracy, Air, Emergency, 6-3-6

PIREPs. *See* Pilot Weather Reports

Pointer NOTAMs, 5-1-3

Position Reporting, 5-3-3

Pre-departure Clearance Procedures, 5-2-1

Precipitation Static, 7-5-9

Precision Approach, 5-4-35

Precision Approach Path Indicator, 2-1-4

Precision Approach Radar, 4-5-7

Precision Approach Systems, 1-1-36

Preflight, Preparation, 5-1-1

Priority, Landing, 5-4-61

Procedure Turn, 5-4-29

Limitations, 5-4-32

## Procedures

Arrival, 5-4-1

En Route, 5-3-1

Instrument Approach, 5-4-27

Interception, 5-6-2

Prohibited Areas, 3-4-1

Publications, Aeronautical, 9-1-1

Published Instrument Approach Procedure Visual Segment, 5-4-19

Pulsating Visual Approach Slope Indicator, 2-1-5

**R**

## Radar

Air Traffic Control Radar Beacon System, 4-5-2

Airport Route Surveillance Radar, 4-5-7

Airport Surveillance Radar, 4-5-7

**[References are to page numbers]**

- Approach Control, 5-4-3
- Approaches, 5-4-35
- Capabilities, 4-5-1
- Doppler, 1-1-18
- Limitations, 4-5-1
- Monitoring of Instrument Approaches, 5-4-36
- Precision Approach, 4-5-7
- Precision Approach Radar, 4-5-7
- Surveillance, 4-5-7
- Vector, 5-5-3
- Radar Assistance to VFR Aircraft, 4-1-11
- Radar Beacon, Phraseology, 4-1-17
- Radar Sequencing and Separation, VFR Aircraft, TRSA, 4-1-13
- Radar Traffic Information Service, 4-1-8
- Radio, Communications, 4-2-1
  - Altitudes, 4-2-6
  - Contact Procedures, 4-2-1
  - Directions, 4-2-6
  - Inoperative Transmitter, 4-2-7
  - Phonetic Alphabet, 4-2-5
  - Receiver Inoperative, 4-2-7
  - Speeds, 4-2-6
  - Student Pilots, 4-2-4
  - Technique, 4-2-1
  - Time, 4-2-6
  - Transmitter and Receiver Inoperative, 4-2-7
  - VFR Flights, 4-2-8
- RCLS. *See* Runway Centerline Lighting
- Receiver, VOR, Check, 1-1-2
- REIL. *See* Runway End Identifier Lights
- REL. *See* Runway Entrance Lights
- Release Time, 5-2-4
- Remote Airport Advisory (RAA), 3-5-1, 4-1-4
- Remote Airport Information Service (RAIS), 3-5-1, 4-1-4
- Required Navigation Performance (RNP), 1-2-1, 5-4-23
- Required Navigation Performance (RNP) Operations, 5-1-32, 5-5-7
- Rescue Coordination Center
  - Air Force, 6-2-5
  - Alaska, 6-2-5
  - Coast Guard, 6-2-4
  - Joint Rescue, Hawaii, 6-2-5
- Reservations, Airport, 4-1-21
- Responsibility
  - Controller, 5-3-8, 5-4-60, 5-5-1
  - Pilot, 4-1-14, 4-4-1, 4-4-4, 5-4-60, 5-5-1, 6-1-1, 7-3-6
- Restricted Areas, 3-4-1
- Restrictions
  - Departure, 5-2-4
  - Flight, Temporary, 3-5-2
- RIL. *See* Runway Intersection Lights (RIL)
- RNAV. *See* Area Navigation
- RNP. *See* Required Navigation Performance
- Route
  - Coded Departure Route, 4-4-3
  - Course Changes, 5-3-7
- Route System, 5-3-5
- Runway
  - Friction Reports, 4-3-11
  - Aiming Point Markings, 2-3-2
  - Centerline Markings, 2-3-2
  - Closed
    - Lighting, 2-3-18
    - Marking, 2-3-18
  - Demarcation Bar, 2-3-4
  - Designators, 2-3-2
  - Friction Advisories, 4-3-11
  - Holding Position Markings, 2-3-12
  - Markings, 2-3-1
  - Separation, 4-4-9
  - Shoulder Markings, 2-3-3
  - Side Stripe Markings, 2-3-3
  - Signs, Distance Remaining, 2-3-29
  - Threshold Bar, 2-3-4
  - Threshold Markings, 2-3-3
  - Touchdown Zone Markers, 2-3-2
- Runway
  - Edge Light Systems, 2-1-6
  - End Identifier Lights, 2-1-6
  - Entrance Lights, 2-1-7
  - Centerline Lighting System, 2-1-6
  - Status Light (RWSL) System, 2-1-7, 2-1-8
- Runway Intersection Lights (RIL), 2-1-9
- RWSL System, Runway Status Light (RWSL) System.
  - See* Runway Status Light (RWSL) System
- Runway, Visual Range, 7-1-40
- Runways, Use, 4-3-6
- RVR. *See* Runway Visual Range

**[References are to page numbers]****S****Safety**

- Alert, 5-5-3
- Alerts, 3-2-1
  - Aircraft Conflict, 3-2-1
  - Mode C Intruder, 3-2-1
  - Terrain/Obstruction, 3-2-1
- Aviation, Reporting, 7-6-1
- Seaplane, 7-5-6

**Safety Alert, 4-1-10**

- Aircraft Conflict Alert, 4-1-11
- Obstruction Alert, 4-1-10
- Terrain Alert, 4-1-10

**SAR. *See* Search and Rescue****SCAT-I DGPS. *See* Special Category I Differential GPS****Scuba Diving, Decompression Sickness, 8-1-4****SDF. *See* Simplified Directional Facility****Seaplane, Safety, 7-5-6****Search and Rescue, 6-2-1, 6-2-4****Security, National, 5-6-1****Security Identification Display Area, 2-3-31****See and Avoid, 5-5-4****Separation**

- IFR, Standards, 4-4-7
- Runway, 4-4-9
- Visual, 4-4-9, 5-5-5
- Wake Turbulence, 7-3-7

**Sequenced flashing lights (SFL), 2-1-11****SFL. *See* Sequenced flashing lights****SIDA. *See* Security Identifications Display Area****Side-Step Maneuver, 5-4-51****Signs**

- Airport, 2-3-1
- Half-Way, 7-5-5

**Simplified Directional Facility, 1-1-12****Sinus Block, 8-1-4****Special Category I Differential GPS (SCAT-I DGPS), 1-1-36****Special Instrument Approach Procedures, 1-1-36, 5-4-28****Special Traffic Management Programs, 4-1-21****Special Use Airspace, 3-4-1****Alert Areas, 3-4-2****Controlled Firing Areas, 3-4-2****Military Operations Areas, 3-4-2****Prohibited Areas, 3-4-1****Restricted Areas, 3-4-1****Warning Areas, 3-4-1****Special Use Airspace (SUA) NOTAMs, 5-1-3****Special VFR Clearances, 4-4-3****Speed, Adjustments, 4-4-7, 5-5-4****Standard Instrument Departures, 5-2-5****Standard Terminal Arrival, 5-4-1****STAR. *See* Standard Terminal Arrival****Surface Painted Holding Position Signs, 2-3-12****Surveillance Approach, 5-4-35****Surveillance Radar, 4-5-7****Surveillance Systems, 4-5-1****T****TACAN. *See* Tactical Air Navigation****Tactical Air Navigation, 1-1-3****TAF. *See* Aerodrome Forecast****Takeoff Hold Lights (THL), 2-1-8****Takeoffs, Intersection, 4-3-12****Taxi**

- Clearance, 5-2-1
- During Low Visibility, 4-3-20

**Taxiway**

- Centerline Markings, 2-3-7
- Closed
  - Lighting, 2-3-18
  - Marking, 2-3-18
- Edge Markings, 2-3-7
- Geographic Position Markings, 2-3-10
- Holding Position Markings, 2-3-12
- Markings, 2-3-1, 2-3-7
- Shoulder Markings, 2-3-7
- Surface Painted Direction Signs, 2-3-10
- Surface Painted Location Signs, 2-3-10

**Taxiway Centerline Lead-Off Lights, 2-1-6****Taxiway Lights, 2-1-15**

- Centerline, 2-1-15
- Clearance Bar, 2-1-15
- Edge, 2-1-15

**[References are to page numbers]**

Runway Guard, 2-1-15  
 Stop Bar, 2-1-15  
 TCAS. *See* Traffic Alert and Collision Avoidance System  
 TDWR. *See* Terminal Doppler Weather Radar  
 TDZL. *See* Touchdown Zone Lights  
 TEC. *See* Tower En Route Control  
 Telephone Information Briefing Service, 7-1-20  
 Temporary Flight Restrictions, 3-5-2  
 Terminal Arrival Area (TAA), 5-4-7  
 Terminal Doppler Weather Radar (TDWR), 4-3-11, 7-1-54  
 Terminal Radar Service Areas, 3-5-9  
 Terminal Radar Services for VFR Aircraft, 4-1-12  
 Terminal Weather Information For Pilots System (TWIP), 7-1-59  
 Terrain Alert, 4-1-10  
 THL. *See* Takeoff Hold Lights  
 TIBS. *See* Telephone Information Briefing Service  
 Time  
   Clearance Void, 5-2-4  
   Release, 5-2-4  
 TIS. *See* Traffic Information Service  
 TIS-B. *See* Traffic Information Service-Broadcast  
 TLS. *See* Transponder Landing System  
 Touchdown Zone Lights (TDZL), 2-1-6  
 Tower, Antenna, 7-5-1  
 Tower En Route Control, 4-1-14  
 Traffic  
   Advisories, 5-5-4  
   Local Flow Traffic Management Program, 5-4-2  
 Traffic Advisory Practices, Airports Without Operating Control Towers, 4-1-2  
 Traffic Alert and Collision Avoidance System, 4-4-10  
 Traffic Control Light Signals, 4-3-15  
 Traffic Information Service, 4-5-8  
 Traffic Information Service (TIS), 4-4-10  
 Traffic Information Service-Broadcast, 4-5-17  
 Traffic Patterns, 4-3-2  
 Transcribed Weather Broadcast, 7-1-20  
 Transponder Landing System (TLS), 1-1-36

Transponder Operation, 4-1-15  
   Automatic Altitude Reporting, 4-1-15  
   Code Changes, 4-1-16  
   Emergency, 6-2-1  
   Ident Feature, 4-1-16  
   Mode C, 4-1-15  
   Under Visual Flight Rules, 4-1-17  
   VFR, 4-1-17  
 Tri-Color Visual Approach Slope Indicator, 2-1-4  
 TRSA. *See* Terminal Radar Service Areas  
 Turbulence, Wake, 7-3-1  
   Air Traffic Separation, 7-3-7  
   Helicopters, 7-3-6  
   Pilot Responsibility, 7-3-6  
   Vortex Behavior, 7-3-2  
   Vortex Generation, 7-3-1  
   Vortex Strength, 7-3-1  
 TWEB. *See* Transcribed Weather Broadcast  
 TWIP. *See* Terminal Weather Information For Pilots System

**U**

Ultralight Vehicles, 3-2-2  
 Unicom, 4-1-6  
 Unidentified Flying Object (UFO) Reports, 7-6-3  
 Unmanned Aircraft, 7-5-2  
 Urgency, 6-3-1

**V**

VASI. *See* Visual Approach Slope Indicator  
 VCOA. *See* Visual Climb Over the Airport  
 VDP. *See* Visual Descent Points  
 Vector, Radar, 5-5-3  
 Vehicle Roadway Markings, 2-3-16  
 Vertical Navigation, 5-1-13  
 VFR Corridors, 3-5-7  
 VFR Flights in Terminal Areas, 4-3-17  
 VFR Flyways, 3-5-5  
 VFR Military Training Routes, 3-5-2  
 VFR Transition Routes, 3-5-7



**[References are to page numbers]**

VFR-on-Top, 5-5-6

VHF Omni-directional Range, 1-1-1

VHF Omni-directional Range/Tactical Air Navigation,  
1-1-3

Visual

Approach, 5-4-59, 5-5-5

Clearing Procedures, 4-4-10

Glideslope Indicators, 2-1-1

Separation, 4-4-9, 5-5-5

Visual Approach Slope Indicator, 2-1-1

Visual Climb Over the Airport (VCOA), 5-2-8

Visual Descent Points, 5-4-18

Visual Meteorological Conditions (VMC), 5-2-6

Visual Segment, 5-4-19

VNAV. *See* Vertical Navigation

Void Times, Clearance, 5-2-4

Volcanic, Ash, 7-5-7

Volcanic Activity Reporting, Forms. *See* Appendix 2

VOR *See also* VHF Omni-directional Range  
Receiver Check, 1-1-2

VOR Receiver Checkpoint Markings, 2-3-16

VORTAC. *See* VHF Omni-directional Range/Tactical  
Air Navigation

VR. *See* VFR Military Training Routes

**W**

Waivers, 4-1-23

Wake, Turbulence, 7-3-1

Warning Areas, 3-4-1

Weather

Deviations in Oceanic Controlled Airspace, 7-1-39

ICAO, Weather Formats, 7-1-64

Weather System Processor (WSP), 4-1-23, 4-3-11,  
7-1-55

WSP. *See* Weather System Processor

