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Civil Engineering

VISUAL AIR NAVIGATION SYSTEMS



COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

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This instruction implements AFR 32-10, *Installations and Facilities*. It defines requirements for visual air navigation systems. Use it when programming, designing, constructing, and installing these facilities. The complementing document which provides detailed information on standard configurations and equipment is AFMAN 32-1076, *Design Standards for Visual Air Navigation Facilities* (formerly AFR 88-14). Send all recommendations for changes or improvements to this instruction on AF Form 847, **Recommendation for Change of Publication**, through the MAJCOM and HQ AFCESA/ENE, 139 Barnes Drive, Suite 1, Tyndall AFB FL 32403-5319 to HQ USAF/CEO, 1260 Pentagon, Washington DC 20330-1260.

SUMMARY OF CHANGES

This revision aligns this instruction with AFR 32-10. Only information on responsibilities and basic requirements was retained. Detailed information is included in AFMAN 32-1076.

1. Purpose. This instruction defines requirements for all visual air navigation facilities at US Air Force facilities. See AFMAN 32-1076 for standard configurations and approved equipment characteristics.

2. Background. The term "visual air navigation facilities" refers to all the lights, signs, symbols, and other devices located on and in the vicinity of an airfield. They provide a visual reference and guidance to pilots when operating aircraft on the ground and in the air. They also supplement the guidance provided by markings and electronic aids such as Tactical Air Navigation (TACAN), Precision Approach Radar (PAR), and Instrument Landing System (ILS), for operating aircraft.

2.1. Visual facilities must be standardized for operational safety. Standardization means the configuration and color of the lights at each airfield are identical and have the same meaning. This enables a pilot to readily interpret the guidance information with assurance and to react to it with a minimum amount of mental concentration.

2.2. According to Public Law 85-726, The Federal Aviation Administration (FAA) regulates and promotes civil aviation to best foster its development and safety and to provide for the safe and efficient use of the airspace by both civil and military aircraft. The FAA develops, modifies, tests, and evaluates systems, procedures, facilities, and devices, and defines the performance characteristics needed for the safe and efficient navigation and traffic control of all civil and military aviation.

3. Application. Use this instruction and its complement, AFMAN 32-1076, for all major rehabilitation, replacement, or establishment of new visual air navigation facilities at US Air Force installations. Continue to use AFR 88-14, *Visual Air Navigation Facilities*, until the manual is published. Do not install visual air navigation facilities or equipment, other than those covered in these publications, except when an appropriate waiver has been obtained (refer to paragraph 8). Exceptions are:

- Where international military standards apply (refer to paragraph 5).
- Where Base Rights Agreements apply (refer to paragraph 6).
- Where existing facilities configured to prior standards and criteria continue to give satisfactory service (refer to paragraph 9).

4. FAA Standards. The Air Force generally follows FAA standards which are primarily published as advisory circulars, handbooks, and specifications. However, where they are in conflict with USAF requirements in this instruction or AFMAN 32-1076, the USAF requirements take precedence.

5. International Military Standards:

5.1. This instruction and the standards and criteria in AFMAN 32-1076 satisfy the requirements of international military standards whenever possible. Compliance in all respects has not been possible.

5.1.1. North Atlantic Treaty Organization (NATO) Standardization Agreements (STANAG) are promulgated by the NATO Military Agency for Standardization (MAS).

5.1.2. Air Standardization Coordinating Committee (ASCC) Air Standards (AIR STD) are promulgated by representatives of the military air forces of the United States, Canada, Australia, New Zealand, and the United Kingdom.

5.2. The applicable international military standard takes precedence over the standards in this instruction as follows:

- **NATO:** At USAF facilities in NATO theater countries except the United States and Canada, or wherever NATO funding is provided for the work, regardless of location.
- **ASCC:** At USAF facilities in New Zealand and Australia.

6. Base Rights. When the US Air Force constructs an airfield in a foreign country, the United States obtains a Base Rights Agreement. This is an agreement of the two over sovereign states, not by the Air Force. The provisions of the particular Base Rights Agreement must be observed and they may require that the construction be done according to the standards of the host country. Under such an agreement, and regardless of the conformity of international standards with the standards of the host country, the host country must approve all plans. It may also be desirable to use equipment produced in the host country.

7. Visual and Electronic Aids:

7.1. Provide visual air navigation aids appropriate for operational requirements and associated electronic aids. See tables 1 and 2. Except for Visual Flight Rules (VFR) operation, electronic aids are needed to provide initial positioning and direction information to an approaching aircraft. Visual aids ensure a timely and safe transition from the instrument phase to the visual phase of an approach. Failure to provide necessary visual aids on an instrument runway will negate to some degree the utility of the electronic systems; enhancing a runway with unnecessary visual aids wastes valuable resources with little operational advantage. Do not add or upgrade visual aids for a higher level of operations unless the runway, taxiway, or helipad is approved for the level and appropriate electronic aids have been or are programmed to be installed. Waivers are required for all deviations.

Table 1. Visual Landing Aids Requirements for Airfields.

FACILITY TYPE	NIGHT VFR	OPERATIONAL CATEGORY			
		NON-PRECI-SION	I	II	III
High Intensity Approach Light System (ALSF-1)	NR	NR	R	NA	NA
High Intensity Approach Light System (ALSF-2)	NR	NR	NR	R	R
Short Approach Lighting System (SALS)	NR	RS	NA	NA	NA
Simplified Short Approach System (SSALR)	NR	RS	RS	NA	NA
Runway End Identifier Lights (REIL)	OPT	OPT	OPT	NA	NA
Visual Approach Slope Indicator (VASI)	RS	RS	RS	NA	NA
Precision Approach Path Indicator (PAPI)	RS	RS	RS	NA	NA
Pulsed Light Approach Slope Indicator (PLASI)	RS	RS	RS	NA	NA
High Intensity Runway Edge Lights (HIRL)	RS	RS	R	R	R

FACILITY TYPE	NIGHT VFR	OPERATIONAL CATEGORY			
		NON-PRECISSION	I	II	III
Medium Intensity Runway Edge Lights (MIRL)	RS	RS	NA	NA	NA
Threshold Lights	RS	R	R	R	R
Runway End Lights	RS	R	R	R	R
Runway Distance Markers	RS	RS	R	R	R
Runway Centerline Lights	NR	NR	NR	R	R
Touchdown Zone (TDZ) Lights	NR	NR	NR	R	R
Taxiway Edge Lights	RS	RS	RS	RS	NA
Taxiway Centerline Lights	RS	RS	RS	RS	R
Runway Exit Lights	RS	RS	RS	RS	R
Taxiway Guidance Signs	RS	RS	RS	RS	RS
Airfield Identification Beacons	R	R	R	R	R
Wind Cones	RS	RS	RS	NA	NA
Obstruction Lights	R	R	R	R	R
Legend: R Required RS Required under special circumstances (see text) OPT Option as recommended by the wing commander and approved by the MAJCOM NR Not required NA Not applicable					

NOTES:

1. Do not install REILs on runways with PLASI.
2. Do not install PLASI as a new or replacement approach slope indicator system. Existing systems may remain in service.

Table 2. Visual Landing Aids Requirements for Helipads.

FACILITY TYPE	OPERATIONAL CATEGORY				
	NIGHT VFR	NON-PRECI-SION	I	II	III
Helipad Pe-rimeter Lights	R	-	-	-	-
Landing Di-rection Lights	RS	-	-	-	-
Approach Di-rection Lights	RS	-	-	-	-
Helipad Floodlights	R	-	-	-	-
Helipad Bea-cons	RS	-	-	-	-
Legend:					
R Required					
RS Required under special circumstances (see text)					
OPT Option as recommended by the wing commander and approved by the MAJCOM					
NR Not required					
NA Not applicable					

7.2. The determination of whether or not items designated as "required under special circumstances" are actually needed must be made by the operating authority having jurisdiction at the location and for the specific items in question. This is typically the wing commander. Special circumstances which must be considered include landing patterns, physical restrictions, weather patterns and anomalies, pilot and aircraft capabilities.

8. Waivers of Requirement. The major command (MAJCOM) may waive requirements of this instruction if compliance is not practical or feasible. In exercising this waiver authority, the MAJCOM must not adversely impact the effectiveness or safety of operations for any aircraft which may use the airfield. Funding or budgetary constraints normally are not adequate justification for granting a waiver. Each MAJCOM must establish and document procedures for processing waivers. They may use existing documented procedures, but all procedures must include the following:

8.1. The MAJCOM/CE has waiver authority which must not be redelegated.

8.2. Coordinate all waiver requests with the Operations/Airfield Management and Flying Safety Offices at the base, wing, and MAJCOM level. In accordance with AFI 13-213, *Airfield Management* (formerly AFR 55-48) and AFPD 13-2, *Air Traffic Control, Airspace, Airfield, and Range Management* (formerly AFR 55-48), the Operations/Airfield Management offices must coordinate as neces-

sary with local flying units and the air traffic control agencies (FAA) providing Terminal Instrument Procedures services for the affected locations.

8.3. Coordinate with the FAA on waiver requests involving facilities at joint-use airfields or subject to the provisions of Federal Aviation Regulation Part 77.

8.4. Document approved waivers and make them a part of the permanent facility records, available for examination during facility inspections.

8.5. Forward copies of the complete documentation, including detailed justification, of each approved waiver to HQ AFCEA/DMP/ENE, HQ USAF/CEVP, HQ USAF/XOOB, and SAF/IGAF. Send complete documentation to ANGRC/CEP for Air National Guard installations.

8.6. A waiver is not required where existing facilities meet prior standards and continue to give satisfactory service.

9. Existing Facilities. Do not use this instruction as a sole basis for advancing standards of existing facilities and equipment, except where necessary for a minimum acceptable level of safety, quality, and performance. You may continue to support existing systems with equipment fabricated to the original specifications until the system is upgraded. If commingling of new generation equipment with older equipment is required, make sure the difference in performance does not degrade the system in any way.

10. Alternative Equipment. You may consider equipment using new technologies but must make sure the standards in this instruction and AFMAN 32-1076 are met; that cost effectiveness, reliability, availability, maintainability, and service life are not compromised; and adequate training and logistic support for the substitute equipment is available. The waiver requirements of paragraph 8 apply.

11. Emergency Substitution. In emergency situations where facility restoration would be significantly delayed by nonavailability of replacement parts, equipment or devices not meeting the applicable specifications may be substituted. Base Civil Engineering, airfield operations, and flying safety offices must all coordinate on these substitutions and notify the MAJCOM. Remove the substitute equipment from service and replace it with approved equipment as soon as it becomes available.

12. Metrication of Dimension. Use the International Civil Aviation Organization's (ICAO) standard English or metric equivalents rounded off (for example, 30 meters equals 100 feet), even though they do not represent exact conversions. No change in standard dimensions, tolerances, or performance specifications is needed if they are applied consistently.

NOTE:

Executive Order 12770, Metric Usage in Federal Government Programs (July 25, 1991), requires use of metric units in procurement of supplies and services.

13. Acceptance Tests. Thoroughly test and inspect new systems before placing them into service. Make sure they are constructed as designed and operate properly. Have a commissioning flight inspection done on all light systems covered by AFI 13-213.

JAMES E. McCARTHY, Maj General, USAF
The Civil Engineer

Attachment 1

GLOSSARY OF REFERENCES, ABBREVIATIONS, AND ACRONYMS

References

AFPD 13-2, *Air Traffic Control, Airspace, Airfield, and Range Management*

AFI 13-213, *Airfield Management*

AFMAN 32-1076, *Design Standards for Visual Air Navigation Facilities*

AFR 88-14, *Visual Air Navigation Facilities*

FAR Part 77, *Objects Affecting Navigable Airspace*, Federal Aviation Administration, Utilization and Storage Section, Washington DC 20590

Abbreviations and Acronyms

AIR STD—Air Standard

ALSF-1—Approach Lighting System With Sequenced Flashing Lights for Category I Meteorological Conditions

ALSF-2—Approach Lighting System With Sequenced Flashing Lights for Category II Meteorological Conditions

ASCC—Air Standardization Coordinating Committee

FAA—Federal Aviation Administration

ICAO—International Civil Aviation Organization

ILS—Instrument Landing System

MAS—Military Agency for Standardization

NATO—North Atlantic Treaty Organization

PAR—Precision Approach Radar

RVR—Runway Visual Range

SSALR—Simplified Short Approach Lighting System With Runway Alignment Indicator Lights

STANAG—Standardization Agreement

TACAN—Tactical Air Navigation

VFR—Visual Flight Rules

Terms

Instrument Runway—A runway served by nonvisual aids giving directional guidance adequate for a straight-in approach. It may be further classified as:

Nonprecision Instrument Approach Runway—A runway served by a nonprecision aid (such as TACAN or Very High Frequency Omnidirectional Range with TACAN [VORTAC]) providing

directional guidance adequate for a straight-in approach.

Precision Approach Runway, Category I—A runway served by ILS, Microwave Landing System (MLS) or Precision Approach Radar (PAR) and visual aids intended for operations down to 60 meters (200 feet) decision height, and down to a runway visual range (RVR) on the order of 720 meters (2400 feet). These criteria also apply to visual lighting aids supporting U.S. Air Force precision approach radar approaches down to a decision height of 30 meters (100 feet) and an RVR on the order of 360 meters (1200 feet).

Precision Approach Runway, Category II—A runway served by ILS or MLS and visual aids intended for operations down to 100 feet (30 meters) decision height and down to an RVR on the order of 1200 feet (360 meters).

Precision Approach Runway, Category III—A runway served by ILS or MLS (no decision height being applicable) and:

Category IIIa:—By visual aids intended for operations down to an RVR on the order of 210 meters (700 feet).

Category IIIb:—By visual aids intended for operations down to an RVR on the order of 45 meters (150 feet).

Category IIIc:—Intended for operations without reliance on external visual reference.