

**BY ORDER OF THE
SECRETARY OF THE AIR FORCE**

AIR FORCE INSTRUCTION 32-1044

24 DECEMBER 2014

Civil Engineering

VISUAL AIR NAVIGATION SYSTEMS



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RELEASABILITY: There are no releasability restrictions on this publication.

OPR: AF/A4CX

Certified by: AF/A4CX
(Col Valerie L. Hasberry)

Pages: 9

Supersedes: AFI32-1044, 29 May 2013

This instruction implements Air Force policy directive (AFPD) 32-10, *Installations and Facilities*. It defines requirements and establishes standards for all visual air navigation facilities at U.S. Air Force facilities within the continental United States (CONUS) and at overseas locations supporting Air Force flight operations. The airfield lighting systems engineer at Air Force Civil Engineer Center, Operations Directorate (AFCEC/CO), is the primary point of contact for definitions and guidance contained within this instruction. Use this instruction when programming, designing, constructing, and installing visual air navigation systems and related facilities. Consult Unified Facilities Criteria (UFC) 3-535-01, *Visual Air Navigation Facilities*, for detailed information on standard configurations and equipment. This instruction applies to Air Force Reserve Command (AFRC) and Air National Guard (ANG) units. This publication may be supplemented at any level, but all direct Supplements must be routed to the Office of Primary Responsibility (OPR) of this publication for coordination prior to certification approval. The authorities to waive wing/unit level requirement in this publication are identified with a Tier (“T-0, T-1, T-2, T-3”) number following the compliance statement. See AFI 33-360, *Publications and Forms Management*, for a description of the authorities associated with the Tier numbers. Submit requests for waivers through the chain of command to the appropriate Tier waiver approval authority, or alternately, to the Publication OPR for non-tiered compliance items. Refer recommended changes and questions about this publication to the OPR using the AF Form 847, *Recommendation for Change of Publication*; route AF Forms 847 from the field through the appropriate functional chain of command. Ensure that all records created as a result of processes prescribed in this publication are maintained in accordance with Air Force Manual (AFMAN) 33-363, *Management of Records*, and disposed of in accordance with the Air Force

Records Disposition Schedule (RDS) located in the Air Force Records Information Management System (AFRIMS). The use of the name or mark of any specific manufacturer, commercial product, commodity, or service in this publication does not imply endorsement by the Air Force.

SUMMARY OF CHANGES

This document has been substantially revised and must be completely reviewed. Major changes include the addition of Tier levels as required by AFI 33-360. Guidance in this publication is based on requirements prescribed by 14 CFR Part 77, Safe, Efficient Use, and Preservation of the Navigable Airspace, and 14 CFR, Part 91, General Operating and Flight Rules.

1. PURPOSE. This instruction defines requirements for all visual air navigation systems at Air Force facilities. See UFC 3-535-01 for standard configurations and approved equipment characteristics.

2. BACKGROUND.

2.1. The term “visual air navigation systems” refers to lights, signs, symbols, and other devices and/or systems located on and in the vicinity of an airfield that provide visual reference and guidance to pilots when operating aircraft on the ground and in the air. They 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.

2.2. Visual air navigation systems must be standardized for operational safety. Standardization requires lights with the same intended use to be identical in color and configuration at each airfield (refer to UFC 3-535-01 for specific requirements) to enable pilots to interpret the guidance readily, with assurance of accuracy and minimal distraction.

3. APPLICATION. Use this instruction and its complement, UFC 3-535-01, for planning, design, construction, sustainment, restoration, and modernization of new visual air navigation systems at Air Force installations, fields, ranges, and expeditionary locations. Do not install visual air navigation equipment or configurations not covered in this instruction and UFC 3-535-01 without an appropriate waiver. **(T-0)**

4. RESPONSIBILITIES.

4.1. **Air Force Director of Civil Engineers (AF/A4C).** Establishes policies for visual air navigation systems at Air Force facilities.

4.2. **Air Force Civil Engineer Center (AFCEC).** Establishes technical requirements through unified facilities criteria (UFC), in accordance with mission requirements and enforces UFCs and AF policies for visual air navigation systems. Clarifies intent of AF policies and provides final interpretation of UFCs, as they apply to Air Force systems, for Air Force and Air National Guard installations. **(T-1)**

4.3. **Base Civil Engineer (BCE).** **(T-1)**

4.3.1. Maintains airfield lighting and associated grounding systems, in accordance with UFC, NEC and Federal Aviation Administration requirements. **(T-0)**

4.3.2. Performs required testing to validate condition of air navigation systems. Tests may be used as justification for replacement of systems or subsystems. **(T-1)**

4.3.3. Programs projects necessary to construct, maintain, or repair visual air navigation systems. **(T-1)**

4.3.4. Provides inspection of completed projects to validate contract compliance, prior to project acceptance. **(T-1)**

5. BASE RIGHTS. Construction of an airfield in a foreign country requires a grant of operational control which normally is accomplished pursuant to an international agreement (as defined in Department of Defense Directive (DODD) 5530.3, *International Agreements*) with the host nation. This agreement may take the form of a Defense Cooperation Agreement, a Base Rights Agreement, an Implementing Agreement, a Host Nation Funded (Construction) Agreement (HNFA), a Bilateral Infrastructure Agreement (BIA), or an agreement by a different title. Provisions of these agreements must be observed, but in instances where construction does not conform to international standards or standards of the host nation, seek legal advice. Many of these agreements require the United States to consult with and/or obtain approval from the host nation before beginning construction. An HNFA allocates the responsibilities for construction funding between the United States and the host nation. NATO members execute BIAs, which are financed by mutual agreement among the parties to the BIA. If it appears a new international agreement will be necessary, follow the procedures outlined in DODD 5530.3 and AFI 51-701, *Negotiating, Concluding, Reporting, and Maintaining International Agreements*. Seek legal advice prior to taking any action that could result in an international agreement. **(T-0)**

6. VISUAL AND ELECTRONIC AIDS. Air Force installations will use visual air navigation aids and associated electronic aids for operational categories outlined in Tables 1 and 2 within Attachment 2, Visual Landing Aids Requirements. **(T-0 for all “R” required aids and T-1 for all other aid determinations as noted within Tables 1 and 2)**

JUDITH A. FEDDER, Lieutenant General, USAF
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Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

14 CFR Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*, (last reviewed on 21 July 2010)

14 CFR Part 91, *General Operating and Flight Rules*, (last reviewed on 22 April 2014)

DODD 5530.3, *International Agreements*, 11 June 1987

AFI 13-213, *Airfield Management*, 29 January 2008

AFI 33-360, *Publications and Forms Management*, 25 September 2013

AFMAN 11-225_IP, *United States Standard Flight Inspection Manual*, 1 October 2005

AFMAN 33-363, *Management of Records*, 1 March 2008

AFPD 13-2, *Air Traffic, Airfield, Airspace, and Range Management*, 7 August 2007

AFPD 32-10, *Installations and Facilities*, 4 Mar 2010

UFC 3-535-01, *Visual Air Navigation Facilities*, 17 November 2005

Prescribed Forms

AF Form 847, *Recommendation for Change of Publication*, 22 September 2009

Adopted Forms

None.

Abbreviations and Acronyms

AC—advisory circular

AF/A3O—AOA—Director of Operations, Air Force Operations Group

AFCEC—Air Force Civil Engineer Center

AFCEC/CO—Air Force Civil Engineer Center, Operations Directorate

AFSA/A3A—Air Force Flight Standards Agency, Airspace Ranges and Airfield Operations

AFI—Air Force Instruction

AFMAN—Air Force Manual

AFPD—Air Force Policy Directive

AFRC—Air Force Reserve Command

AFRIMS—Air Force Records Information Management System

AFSEC/SEFF—Air Force Safety Center Aviation Safety Branch

AHJ—Authority Having Jurisdiction

AIR STD—Air and Space Interoperability Council 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

ANG—Air National Guard

ASIC—Air and Space Interoperability Council

BCE—Base Civil Engineer

BIA—Bilateral Infrastructure Agreement

CFR—Code of Federal Regulations

CONUS—continental United States

DODD—Department of Defense Directive

FAA—Federal Aviation Administration

HAPI—helicopter approach path indicator

HIRL—high intensity runway edge lights

HNFA—Host Nation Funded (Construction) Agreement

ICAO—International Civil Aviation Organization

IAW—in accordance with

ILS—instrument landing system

IMC—instrument meteorological conditions

IP—Interservice Publication

LED—light-emitting diode

MAJCOM—Major Command

MALSR—medium intensity approach light system

MAS—Military Agency for Standardization

MIRL—medium intensity runway edge lights

MLS—microwave landing system

NA—not applicable

NATO—North Atlantic Treaty Organization

OPR—Office of Primary Responsibility

OPT—optional

PAPI—precision approach path indicator

PAR—precision approach radar

R—required

RCL—runway centerline lights

RDM—runway distance markers (or distance remaining markers (DRM))

REIL—runway end identifier lights

RVR—runway visual range

SALS—short approach lighting system

SSALR—simplified short approach system

STANAG—Standardization Agreement

TACAN—tactical air navigation

TDZL—touchdown zone lights

TERPS—terminal instrument procedures

UFC—Unified Facilities Criteria

VFR—visual flight rules

VMC—visual meteorological conditions

VORTAC—Very High Frequency Omnidirectional Range with TACAN

Terms

Bilateral Infrastructure Agreement (BIA)—An agreement relative to infrastructure which concerns two NATO members and is financed by mutual agreement between them (e.g., facilities required for the use of forces of one NATO member in the territory of another).

Host Nation Funded Construction Agreement (HNFA)—An agreement between the United States and its host nation that outlines the responsibilities for funding construction on that installation.

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

Category I Precision Approach Runway—A runway served by an ILS, a Microwave Landing System (MLS), or a 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 Air Force PAR approaches down to a decision height of 30 meters (100 feet) and an RVR on the order of 360 meters (1200 feet).

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

Category III Precision Approach Runway—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.

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.

Joint—use Airfields—Military airfields that allow general aviation use or airfields for which a joint use agreement granting equal privileges has been executed by both parties.

Attachment 2

VISUAL LANDING AIDS REQUIREMENTS

Table 1. Visual Landing Aids Requirements for Airfields. Note: This table does not apply to expeditionary or contingency airfield lighting systems.

Facility	Operational Category				
	Night VMC	Non- Precision	I	II	III
APPROACH AIDS					
High Intensity Approach Light System (ALSF-1)	NA	NA	R(1)	NA	NA
High Intensity Approach Light System (ALSF-2)	NA	NA	NA	R	R
Short Approach Light (SALS)	NA	OPT	NA	NA	NA
Simplified Short Approach Light (SSALR) ⁽¹⁾	NA	OPT	OPT	NA	NA
Medium Intensity Approach Light System (MALSR) ⁽¹⁾	NA	NA	OPT	NA	NA
Precision Approach Path Indicator (PAPI)	R(2)	R(2)	OPT	NA	NA
RUNWAY AIDS					
High Intensity Runway Edge Lights (HIRL) ⁽⁸⁾	R	R	R	R	R
Medium Intensity Runway Edge Lights (MIRL) ⁽⁹⁾	OPT	OPT	OPT	NA	NA
Threshold Lights	R	R	R	R	R
Runway End Lights	R	R	R	R	R
Runway Distance Markers (RDM)	R	R	R	R	R
Runway Centerline Lights (RCL)	NA	NA	NA	R	R
Touchdown Zone Lights (TDZL)	NA	NA	NA	R	R
TAXIWAY AIDS					
Taxiway Edge Lights	R	R	R	R	R
Taxiway Centerline Lights	NA	NA	NA	OPT	R
Taxiway Clearance Bar (Hold Point)	NA	NA	NA	OPT	OPT
Runway Guard Lights – Elevated, FAA Type L-804	OPT	OPT	OPT	R	R
Runway Guard Lights – Inset, FAA Type L-852G	OPT	OPT	OPT	OPT	R
Runway Exit Lights	OPT	OPT	OPT	OPT	R
Runway Stop Bar	OPT	OPT	OPT	OPT	R
Guidance Signs (Information) ⁽⁶⁾	R	R	R	R	R
Guidance Signs (Mandatory) ⁽⁶⁾	R	R	R	R	R
MISCELLANEOUS AIDS					
Airfield Rotating Beacons	R	R	R	R	R
Wind Cones	OPT	OPT	OPT	NA	NA
Obstruction Lights ⁽¹⁾	R	R	R	R	R
Emergency Power ⁽³⁾	R	R	R	R	R
Apron Area Flood Lighting ⁽⁵⁾	R	R	R	R	R
Apron Edge Lights	R	R	R	R	R
Legend:					
R	Required.				
OPT	Option as recommended by the installation commander and approved by the MAJCOM.				
NA	Not applicable. Not part of the standard configuration for this system, IAW FAA requirements for this type system.				
(1)	MAJCOM approval is required to substitute MALSR or SSALR for an ALSF-1.				
(2)	Required only on primary runways.				

Facility	Operational Category				
	Night VMC	Non-Precision	I	II	III
(3)	Emergency power required for all “R” equipment.				
(4)	Wind direction indicators are required to meet ICAO Annex 14 (para. 5.1.1.1)				
(5)	Flood lighting is not required for night operations (refueling, loading, maintenance, etc.).				
(6)	All guidance signs are internally lighted.				
(7)	LED Obstruction Lights are not approved for use on Air Force installations				
(8)	High intensity LED Runway Edge Lights are not approved for use on AF installations				
(9)	Medium intensity LED Runway Edge Lights require AF approval prior to project programming and installation.				

Table 2. Visual Landing Aids Requirements for Helipads.

FACILITY	Helipad				Helicopter Runway Precision Instrument Category I
	VMC		IMC		
	Day Non-Instrument	Night No-Instrument	Non-Precision Instrument	Precision Instrument Category I	
Perimeter Lights	NA	R	-	-	-
Approach Direction Lights	NA	OPT	-	-	-
Landing Direction Lights	NA	OPT	-	-	-
Approach Lights Category I	NA	NA	-	-	-
Floodlights	NA	OPT	-	-	-
Visual Glide Slope Indicator System	NA	OPT	-	-	-
Obstruction Lighting	R	R	-	-	-
Identification Beacon	R	R	-	-	-
Apron Flood Lighting	NA	OPT	-	-	-
Apron Edge Lighting	NA	OPT	-	-	-
Wind Direction Indicator	R ⁽¹⁾	R	-	-	-
Emergency Power ⁽²⁾	NA	R	-	-	-
Legend:					
R	Required				
OPT	Optional				
NA	Not applicable. Not part of the standard configuration for this system, IAW FAA requirements for this type system.				
(1)	Not lighted for DAY VMC.				
(2)	Emergency power required for all “R” equipment.				