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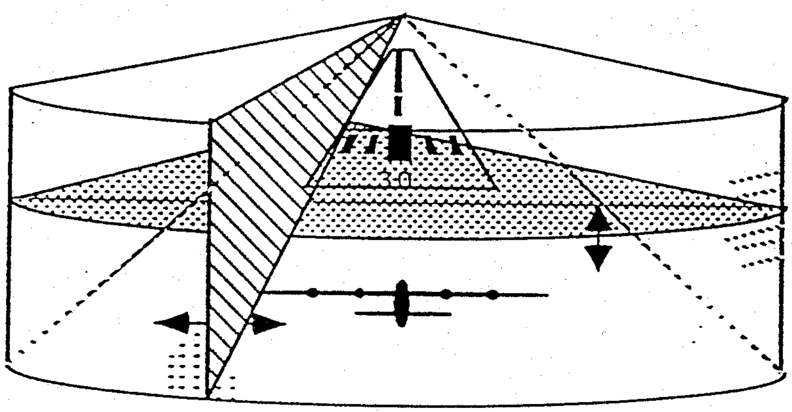
1 September 1993

SYSTEM SPECIFICATION
for the
MOBILE MICROWAVE LANDING SYSTEM
REVISION A

CONTRACT NO. F19628-88-C-0062

MOBILE
MLS



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1 SCOPE

1.1 Identification. This System Specification establishes the requirements for the Mobile Microwave Landing System (MMLS).

1.2 Purpose. The MMLS is a precision approach guidance system that will provide a landing capability for operations in adverse weather. This capability will support initial deployment of ground forces, forward area resupply, medical evacuation, special operations missions, and other missions not suited for the larger fixed microwave landing systems (MLS). MMLS will also be used to restore landing services to bases that have lost their fixed base capability. The MMLS will be interoperable with civil and military MLS avionics complying with International Civil Aviation Organization (ICAO) standards and recommended practices (SARPS). The MMLS design will allow the equipment to be deployed to meet a number of different siting and mission scenarios.

1.3 Introduction. This document establishes the performance, design, development, and test requirements for the MMLS.

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2 APPLICABLE DOCUMENTS

2.1 Government Documents. The following documents of the exact issue shown form a part of this specification to the extent specified herein. In the event of conflict between the documents referenced herein and the contents of this specification, the contents of this specification shall be considered a superseding requirement.

SPECIFICATIONS:

Military

MIL-B-82117D 25 July 1983	Battery, Storage: Silver-Zinc, Rechargeable; General Specification for
MIL-C-38999H 27 February 1981 Supplement 1 21 September 1981 Amendment 2 30 September 1986	General Specification for Connector, Electrical
MIL-C-4150J 29 November 1989	Cases, Transit and Storage, Waterproof and Water-Vapor Proof
MIL-C-45150J 17 September 1986	Chassis, Trailer 2-Wheel Cart Type 1/4 to 3 1/2 Ton.
MIL-C-46168D 21 May 1987 Amendment 1 5 August 1987	Coating, Aliphatic Polyurethane, Chemical Agent Resistant
MIL-C-55302E 9 April 1986	Connector, Printed Circuit Subassembly and Accessories
MIL-C-13294C 22 November 1966 Amendment 3 18 December 1975	Cables, Telephone, Electrical (Infantry Field Wire, Twisted Pair, Wire WD-1/TT and WD-1A/TT)
MIL-C-83723D 27 December 1977 Supplement 1 27 December 1977	Connector, Electrical
MIL-C-83733C 28 July 1986 Supplement 1 28 July 1986	Connector, Electrical

MIL-E-4158E 2 January 1973 Amendment 3 31 December 1985	Electronic Equipment, Ground, General Requirements for
MIL-E-5400T 16 November 1979 Amendment 2 9 May 1986	Electronic Equipment, Aerospace, General Specification for
MIL-F-14072C 16 August 1984 Amendment 1 1 June 1986	Finishes for Ground Electronic Equipment
MIL-I-81550C 14 July 1983	Insulating Compound, Electrical, Embedding, Reversion Resistant Silicone
MIL-M-87033 23 November 1977	Mitten Set, Extreme Cold Weather
MIL-P-9024G 6 June 1972	Packaging, Handling, and Transportability for System/Equipment Acquisition
MIL-P-85582A 8 February 1988	Primer Coatings: Epoxy, Waterborne
MIL-S-8516E 30 July 1971 Amendment 2 29 September 1972	Sealing Compound, Polysulfide Rubber, Electric Connectors and Electric Systems, Chemically Cured
MIL-S-23586E 10 July 1987	Sealing Compound, Electrical, Silicone Rubber, Accelerator Required
MIL-T-10579H 17 February 1988	Trailers, Cargo: 2 Wheel, 1/4 Ton to 1-1/2 Ton
S.N. 5684571001 9 September 1974	System Segment Specification for TACAN Navigation Set AN/ARN-118(v)
S.N. 404L-50464-S-109 5 August 1987	System Specification for the Commercial Microwave Landing Systems Avionics

Other Government Agency

DOD-P-15328D Amendment 1 11 April 1983	Primer (Wash), Pretreatment (Formula No.117 for Metals) (Metric)
FAA-E-2721/11 19 June 1986	Microwave Landing System Ground Equipment, General Requirements

Federal

FED-STD-595A 2 January 1968 Notice 9 29 May 1985	Color (Requirements for Individual Color Chips)

Military

MIL-STD-129J 25 September 1984 Notice 1 5 November 1986	Marking for Shipment and Storage
MIL-STD-130F 21 May 1982 Notice 2 1 May 1986	Identification Marking of U.S. Military Property
MIL-STD-210C 9 January 1987	Climatic Extremes for Military Equipment
MIL-STD-454K 14 February 1986	Standard General Requirements for Electronic Equipment
MIL-STD-490A 4 June 1985	Specification Practices
MIL-STD-633E 22 February 1980	Mobile Electric Power Engine Generator Standard Family Characteristics
MIL-STD-810D 19 July 1983 Notice 1 31 July 1986	Environmental Test Methods and Engineering Guidelines
MIL-STD-883C 25 August 1983 Notice 4 29 November 1985 Notice 6 17 August 1987	Test Methods and Procedures for Microelectronics
MIL-STD-1472C 2 May 1981 Notice 2 10 May 1984 Notice 3 17 March 1987	Human Engineering Design Criteria for Military Systems, Equipment and Facilities

MIL-STD-1629A 24 November 1980 Notice 2 28 November 1984	Procedures for Performing a Failure Mode Effects and Criticality Analysis
MIL-STD-1815A 22 January 1983	ADA Programming Language
MIL-STD-2073A-1A 16 July 1984	DOD Material Procedures for Development and Application of Packaging Requirements

Other Government Agency

DOD-STD-2167 4 June 1985	Defense System Software Development

OTHER PUBLICATIONS:

Manuals

AFM 55-8 Revised May 1963	U.S. Flight Inspection Manual Procedures
Change 44 24 April 1986	
AFM 55-9 July 1976 Changes 1 through 6	U.S. Standard for Terminal Instrument Procedures
AFM 88-14 17 September 1979	Visual Air Navigation Facilities
DOD 5000.39 17 November 1983	Acquisition and Management of Integrated Logistics Support for Systems and Equipment
DM 7.2 May 1982	U.S. Navy Facilities Design Manual
TM 5-803-4 15 July 1983	Planning of Army Aviation Facilities

Regulations

AFR 66-1 21 April 1983	Maintenance Management Policy
AFR 66-14 15 November 1978	Equipment Maintenance Policies, Objectives and Responsibilities

AFR 86-5 1 September 1983	Planning Criteria and Waivers for Airfield Support Facilities
AFR 86-14 12 May 1981	Airfield and Heliport Planning Criteria

Handbooks

GFB Issue 01 Revision E 7 March 1986	Government Furnished Baseline Electrical/Electronic Parts
GFB Issue 01 March 1986	Government Furnished Baseline Mechanical Parts
MIL-HDBK-300L 1 October 1983	Technical Information File of Ground Support Equipment
ESD-TR-85-148 March 1985	Derated Application of Parts for ESD Systems Development

Pamphlets

DA 700-21-1 March 83 Change 1	Department of the Army Pamphlet Test, Measurement, and Diagnostic Equipment Preferred Item List

Reports

ARCSL-CR-81053 November 1981	Chemical and Biological Protective Equipment Guidelines for Modular Collective Protection Equipment Use Systems

Orders

FAA Order 8240.50 2 January 1990	Flight Inspection of Microwave Landing Systems (MLS)

2.2 Non-Government Documents. The following documents of the exact issue shown form a part of this specification to the extent specified herein.

In the event of conflict between the documents referenced herein and the contents of this specification, the contents of this specification shall be considered a superseding requirement.

STANDARDS:

RTCA DO-177 17 July 1981 Airborne Receiving Equipment	Minimum Operational Performance Standard for Microwave Landing System (MLS)

RTCA DO-189 20 September 1985 Operating within the Radio Frequency Range of 960-1215 Megahertz	Minimum Operational Performance Standards for Airborne Distance Measuring Equipment
RTCA DO-198 18 March 1988	Minimum Operational Performance Standard for Airborne MLS Area Navigation Equipment
ICAO SARPS Annex 10 April 1985 Amendment 67 22 October 1987	International Civil Aviation Organization International Standards, Recommended Practices and Procedures or Air Navigation Services, Annex 10: Aeronautical Telecommunications
ICAO Doc. 8071 Volume II 1972	Manual on Testing of Radio Navigation Aids, Volume II, ILS

3 REQUIREMENTS

3.1 System Definition. The MMLS will consist of ground-based precision approach equipment that generates microwave guidance signals that enable MLS-equipped aircraft to continuously display aircraft position relative to a selected course and glidepath. MMLS shall provide an all weather range of 15 nautical miles, usable guidance signals for approaches on glidepaths ranging from 2.5° to 12.5° in elevation, and courses of ±40° in azimuth. Azimuth and elevation angle information will be provided by a time reference scanning beam (TRSB) technique, and distance information will be provided by precision distance measuring equipment (DME/P). Both angle and distance signals will be transmitted in accordance with ICAO SARPS to ensure interoperability with international standard civil MLS. MMLS shall include approach azimuth equipment, approach elevation equipment, a DME/P transponder, internal power sources, signal monitoring equipment, control and display equipment, and detachable obstruction lights. The equipment may be set up in different configurations including the collocated and split-site configurations shown in figure 1.

3.1.1 Missions. The MMLS will provide a precision approach capability for a variety of tactical missions. A description of major missions by military organization follows.

3.1.1.1 U.S. Air Force. The MMLS will be used at bases that have lost precision approach capabilities. In other cases, the MMLS, accompanied by an installation and maintenance team with a readiness spares package (RSP), will be transported to the affected base to provide interim mission support (IMS). Maintenance personnel at the deployment base supply will requisition spares as necessary to back-fill the RSP as it is depleted. Once installed, MMLS will operate for periods of up to one year. The system will also be used for Combat Communications Group (CCG) operations. CCGs may deploy MMLS to replace Combat Control Teams (CCT) and to support other quick-reaction precision approach and landing needs.

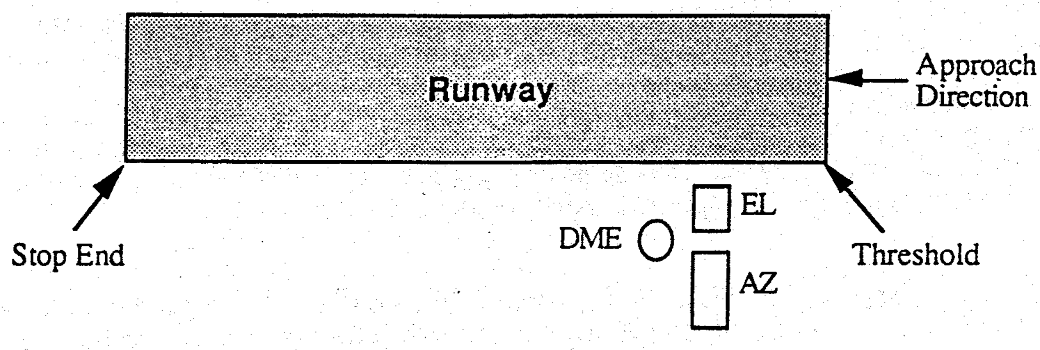
3.1.1.2 U.S. Army. The MMLS will be used to service landing areas and airfields at corps and echelons above corps with a precision landing capability. Three-to-five person teams will set up and operate the equipment.

3.1.2 Threat. MMLS may operate in environments which may be targeted by the enemy for physical and electronic disruption and in which chemical agents may be used. However, there is no requirement to design the MMLS for survivability.

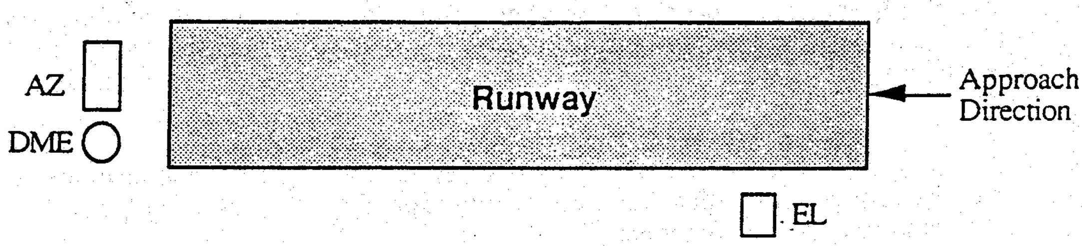
3.1.3 Modes and States. MMLS approach azimuth equipment, approach elevation equipment and DME/P equipment shall have the following modes: OFF, STANDBY, MAINTENANCE, SERVICE-DEMAND, and ON. MMLS shall exist in two states, deployed and stored. When in a deployed state, all modes shall be possible.

3.1.3.1 MMLS Modes.

3.1.3.1.1 OFF Mode. When OFF, primary power shall be removed and the system shall be inoperative.



a. Collocated Configuration



b. Split-Site Configuration

Figure 1. MMLS Configurations

3.1.3.1.2 STANDBY Mode. When STANDBY is selected, primary power shall be applied for the purpose of equipment setup and stabilization but the equipment shall not radiate. All leveling and calibration circuits, data entry and display, and built-in test (BIT) functions shall be enabled. After a maximum of five minutes in STANDBY, MMLS shall be stabilized and capable of operating at specified performance levels when switched to the SERVICE-DEMAND or ON modes.

3.1.3.1.3 MAINTENANCE Mode. When MAINTENANCE is selected, MMLS shall continue to radiate but the monitor shall be inhibited from shutting down the equipment. When initially selected, the parity of all preamble codes shall be changed from even to odd, the Morse code identification shall be suppressed, and Basic Data Word 6 shall be inhibited from radiation. By explicit action, it shall be possible to continue to radiate with valid parity and/or to transmit identification in Morse code and Basic Data Word 6. When in MAINTENANCE mode, BIT shall be enabled to detect and isolate faults and perform diagnostic testing. All leveling and alignment circuits shall be enabled and end-to-end integrity checks shall be possible.

3.1.3.1.4 SERVICE-DEMAND Mode. When SERVICE-DEMAND is selected, MMLS shall operate in a radio-silent demand mode. In this mode there shall be no MMLS transmissions until a correctly coded DME interrogation is received, after which full transmission shall continue as long as DME interrogations are received and MMLS transmissions are within monitor limits. The delay between receipt of a DME interrogation and activation of the angle guidance radiation shall not exceed five seconds. The delay between cessation of DME interrogations and deactivation of the angle guidance radiation shall be selectable as 10 seconds, 30 seconds, or 2 minutes.

3.1.3.1.5 ON Mode. When ON is selected, MMLS shall radiate as specified herein as long as the system remains within monitor limits.

3.1.3.2 MMLS States.

3.1.3.2.1 Deployed State. MMLS shall be considered in the deployed state when all equipment is set up and capable of generating microwave guidance signals.

3.1.3.2.2 Stored State. In a stored state, MMLS shall be disassembled and packaged for transport.

3.1.4 System Functions. MMLS shall perform angle guidance and data transmission, ranging, monitoring, and control and display functions. MMLS shall provide high-rate approach azimuth guidance.

3.1.4.1 Angle Guidance and Data Transmission Functions.

3.1.4.1.1 Channeling. The angle and data functions shall operate on any one of the 200 channels specified in 3.11.4.1.1, including referenced tables, of ICAO SARPS Annex 10. Any channel shall be selectable without alignment, replacement, or rewiring of components.

3.1.4.1.1.1 Frequency Tolerance. MMLS operating frequency tolerance shall be as specified in 3.11.4.1.3 of ICAO SARPS Annex 10.

3.1.4.1.1.2 Radio Frequency Signal Spectrum. The MMLS frequency signal spectrum shall be as specified in 3.11.4.1.4 of ICAO SARPS Annex 10.

3.1.4.1.2 Polarization. The radio frequency transmissions from MMLS shall be vertically polarized.

3.1.4.1.3 Signal Organization. Both angle information and data shall be transmitted by time-division-multiplex (TDM) on a single radio frequency channel.

3.1.4.1.3.1 Function Rates. Function rates for high-rate approach azimuth guidance, approach elevation guidance, and basic data functions shall be as specified in 3.11.4.3.3, including referenced tables, of ICAO SARPS Annex 10. Auxiliary data functions shall be transmitted at a rate of at least 1 Hz within the timing constraints of the ICAO Annex 10 sequence.

3.1.4.1.3.2 Function Timing. Timing standards for preamble, high-rate approach azimuth, approach elevation, basic data, and auxiliary data functions shall be as specified in 3.11.4.3.4, including referenced tables, of ICAO SARPS Annex 10.

3.1.4.1.3.3 Function Sequence. Function sequences shall be as specified in 3.11.4.3.5 of ICAO SARPS Annex 10.

3.1.4.1.3.4 Synchronization. Angle and data transmissions shall be time synchronized to prevent overlap on the selected operational channel. It shall be possible to synchronize transmissions between approach azimuth and approach elevation equipment separated by up to 15,000 ft. MMLS shall maintain specified performance for a period of at least 2 minutes after loss of synchronization. The elevation function shall cease transmission 2 minutes after loss of synchronization.

3.1.4.1.4 Preamble. A preamble signal shall be transmitted as specified in 3.11.4.4.1, including referenced tables, of ICAO SARPS Annex 10.

3.1.4.1.4.1 Carrier Acquisition. Carrier acquisition shall be as specified in 3.11.4.4.2, including referenced tables, of ICAO SARPS Annex 10.

3.1.4.1.4.2 Modulation. Preamble information shall be modulated and encoded as specified in 3.11.4.4.3.1, including referenced paragraphs, of ICAO SARPS Annex 10.

3.1.4.1.4.3 Receiver Reference Time Code. A receiver reference time code shall be transmitted as specified in 3.11.4.4.3.2 of ICAO SARPS Annex 10.

3.1.4.1.4.4 Function Identification. The codes for function identification shall be as specified in 3.11.4.4.3.3, including referenced tables, of ICAO SARPS Annex 10.

3.1.4.1.5 Angle Guidance Encoding. Angle guidance information shall be encoded as specified in 3.11.4.5 of ICAO SARPS Annex 10.

3.1.4.1.5.1 Angle Guidance Parameters. Angle guidance parameters for high-rate approach azimuth and approach elevation functions shall be as specified in 3.11.4.5.1, including referenced tables, of ICAO SARPS Annex 10.

3.1.4.1.5.2 Angle Guidance Parameter Tolerances. The tolerances on the scanning beam velocity and the time separation between TO and FRO pulses corresponding to 0° shall be sufficient to satisfy the accuracy requirements specified in 3.1.4.1.9.

3.1.4.1.5.3 Scan Transmission Symmetry. The TO and FRO scan transmissions for the high-rate approach azimuth and approach elevation functions shall be as specified in 3.11.4.5.3, including referenced tables, of ICAO SARPS Annex 10.

3.1.4.1.6 Azimuth Guidance Functions.

3.1.4.1.6.1 Scanning Convention. The conventions for transmission of azimuth angle guidance shall be as specified in 3.11.4.6.1, and the accompanying note, of ICAO SARPS Annex 10.

3.1.4.1.6.2 Sector Signals. The sector signal format for azimuth shall be as specified in 3.11.4.6.2 of ICAO SARPS Annex 10.

3.1.4.1.6.2.1 Morse Code Equipment Identification. The approach azimuth equipment shall transmit Morse code identifications as specified in 3.11.4.6.2.1 of ICAO SARPS Annex 10.

3.1.4.1.6.2.2 Airborne Antenna Selection Signal. The approach azimuth equipment shall transmit an airborne antenna select signal as specified in paragraph 3.11.4.6.2.2 of ICAO SARPS Annex 10.

3.1.4.1.7 Elevation Guidance Functions.

3.1.4.1.7.1 Scanning Conventions. The elevation guidance scanning beam shall be as specified in 3.11.4.7.1 of ICAO SARPS Annex 10.

3.1.4.1.7.2 Sector Signals. The sector signal format for elevation shall be as specified in 3.11.4.7.2, including referenced paragraphs and tables, of ICAO SARPS Annex 10.

3.1.4.1.8 Data Functions. The MMLS signal format shall provide for the transmission of basic and auxiliary data as specified in 3.1.4.1.4.2.

3.1.4.1.8.1 Basic Data. The MMLS basic data content shall be as specified in Appendix C of RTCA DO-198.

3.1.4.1.8.2 Auxiliary Data. The MMLS auxiliary data shall be as specified in Appendix C of RTCA DO-198. MMLS shall provide storage in the auxiliary data word data base for 192 words.

3.1.4.1.9 System Accuracy. MMLS shall be capable of providing Category I and Category II operational performance under the respective setup and siting conditions specified herein. System accuracy requirements shall be met with the inclusion of errors from all sources, including those from the ground equipment, propagation effects, and airborne equipment. Avionics that meet the requirements of S.N. 404L-50564-S-109 and S.N. 5684571001 should be assumed.

3.1.4.1.9.1 Azimuth Accuracy.

3.1.4.1.9.1.1 Mean Course Error. The mean course error shall not exceed the following values under the specified conditions on a 95 percent probability basis:

a. Category I. ±40 ft at the approach reference datum and ±185 ft at ILS Point "A" with the equipment set up as specified in 3.2.10.1.1 and 3.2.10.1.2.1 and sited as specified in 3.2.10.2.1 and 3.2.10.2.2.1.

b. Category II. ±17 ft at the approach reference datum with the equipment set up as specified in 3.2.10.1.2.2 and sited as specified in 3.2.10.2.2.2.

3.1.4.1.9.1.2 Azimuth Path Following Noise (PFN). The azimuth PFN shall not be greater than the following values under the specified conditions on a 95 percent probability basis:

a. Category I. ±42 ft at the 200 ft decision height along a 3° glidepath with the equipment set up as specified in 3.2.10.1.1 and 3.2.10.1.2.1 and sited as specified in 3.2.10.2.1 and 3.2.10.2.2.1.

b. Category II. ±11.4 ft at the 100 ft decision height along a 3° glidepath with the equipment set up as specified in 3.2.10.1.2.2 and sited as specified in 3.2.10.2.2.2.

3.1.4.1.9.1.3 Azimuth Degradation Allowance. The approach azimuth angular PFN should be allowed to degrade linearly to the limits of coverage as follows:

a. With Distance. The PFN shall not exceed 1.75 times the value specified.

b. With Azimuth angle. The PFN at ±40° azimuth angle shall not exceed one-half times the value of the extended runway centerline at the same distance from the approach reference datum.

c. With Elevation Angle. The PFN shall not degrade up to an elevation angle of 9°. The PFN limit at an elevation angle of 15° shall not exceed two times the value permitted below 9° at the same distance from the approach reference datum and the same azimuth angle.

3.1.4.1.9.1.4 Azimuth Control Motion Noise (CMN). The azimuth CMN shall not be greater than ±10.5 ft or 0.1°, whichever is less, when measured at the approach reference datum under the specified conditions on a 95 percent basis.

3.1.4.1.9.1.5 Azimuth CMN Degradation Allowance. The approach azimuth angular CMN shall be allowed to degrade as specified in paragraph 3.11.4.9.4.3 of ICAO SARPS Annex 10.

3.1.4.1.9.2 Elevation Accuracy.

3.1.4.1.9.2.1 Mean Glidepath Error. The mean glidepath error shall not exceed the following values under the specified conditions on a 95 percent probability basis:

a. Category I. ±0.168° at the approach reference datum with the equipment set up as specified in 3.2.10.1.1 and 3.2.10.1.2.1 and sited as specified in 3.2.10.2.1 and 3.2.10.2.2.1.

b. Category II. ±0.12° at the approach reference datum with the equipment set up as specified in 3.2.10.1.2.2 and sited as specified in 3.2.10.2.2.2.

3.1.4.1.9.2.2 Elevation PFN. The elevation PFN shall not be greater than the following values under the specified conditions on a 95 percent probability basis:

a. Category I. ±0.144° at the 200 ft decision height along a 3° glidepath with the equipment set up as specified in 3.2.10.1.1 and 3.2.10.1.2.1 and sited as specified in 3.2.10.2.1 and 3.2.10.2.2.1.

b. Category II. ±0.053° at the 100 ft decision height along a 3° glidepath with the equipment set up as specified in 3.2.10.1.2.2 and sited as specified in 3.2.10.2.2.2.

3.1.4.1.9.2.3 Elevation Degradation Allowance. The approach elevation angular PFN shall be allowed to degrade linearly to the limits of coverage as follows:

a. With Distance. The PFN shall not exceed 0.175°.

b. With Elevation Angle. For elevation angles from 3° to 15°, the PFN limit shall be allowed to increase linearly to two times the value specified in 3.1.4.1.9.2.2. For elevation angles below 2.5° to the lower limit of coverage, the PFN limit shall be allowed to increase linearly to six times the value specified in 3.1.4.1.9.2.2. No degradation is allowed from 2.5 to 3.0° elevation angle.

c. With Azimuth Angle. The PFN at ±40° azimuth about the elevation antenna phase center shall not exceed the value on the extended runway center line at the same distance from the approach reference datum.

3.1.4.1.9.2.4 Elevation CMN. The elevation CMN shall not be greater than ±1 ft at the approach reference datum for equipment sited to provide a minimum glidepath of nominally 3° or lower.

3.1.4.1.9.2.5 Elevation CMN Degradation Allowance. The approach elevation angular CMN shall be allowed to degrade linearly to the limits of coverage as follows:

a. With Distance and Angle. The limits shall be specified in 3.11.4.9.6.1 (a) and (b) of ICAO SARPS Annex 10.

b. For elevation angles from 3° to 15°, the CMN limit shall be allowed to increase linearly to 2 times the value specified in 3.1.4.1.9.2.4. For elevation angles below 2.5° to the lower limit of coverage, the CMN limit shall be allowed to increase linearly to 6 times the value specified in 3.1.4.1.9.2.4. No degradation is allowed from 2.5° to 3.0° elevation angle. CMN shall not exceed 0.4° at any elevation angle.

3.1.4.1.10 Power Density. The power density for data functions shall be as specified in 3.11.4.10.1 of ICAO SARPS Annex 10, including the referenced table. The power density for angle guidance functions shall be as specified in figure G-12 and 3.11.4.10.2.a of ICAO SARPS Annex 10.

3.1.4.1.11 Residual Radiation. The residual radiation from MMLS transmissions shall be as specified in 3.11.5.1.1 of ICAO SARPS Annex 10.

3.1.4.1.12 Coverage. The MMLS shall provide azimuth, elevation, preamble, and data information at the specified power densities in the following sectors (see figures 2 and 3):

a. Azimuth coverage is to extend 40° to either side of the antenna boresight.

b. Elevation coverage is required between the following two conical surfaces. Each defining cone has its vertex at the elevation antenna phase center and axis lying along the vertical. The cone defining the lower surface of coverage is inclined at 0.9° relative to the horizontal. The cone defining the upper surface limit is inclined at an angle of 15°. Coverage is only required to 20,000 ft above threshold.

c. Coverage in range is required to 17 nautical miles (nmi) from the azimuth antenna.

d. For Category I service, coverage is only required above a horizontal cutoff 150 feet above threshold and beyond a vertical plane oriented perpendicular to the runway centerline located to contain the point on a 3° glideslope 150 ft above threshold.

e. For Category II service, coverage is only required above a horizontal cutoff 50 ft above threshold and beyond a vertical plane oriented perpendicular to the runway centerline located to contain the point on a 3° glideslope 50 ft above threshold.

3.1.4.1.12.1 Azimuth Scan Adjustment. The azimuth scan coverage shall be adjustable from 10° to the maximum scan angle in two degree increments on both sides, independently, of the antenna boresight. Adjustments in scan coverage shall automatically update the basic data words.

3.1.4.1.12.2 Elevation Scan Adjustment. The minimum elevation scan coverage limit shall be adjustable from minus 0.4° to at least plus 6.0° in 0.1° increments. Adjustments above 0.75θ (where θ is the minimum glidepath angle identified in the basic data word and the range of minimum glidepaths is from 2.5° to 12.5°) shall be precluded.

3.1.4.1.13. Azimuth Scanning Beam Characteristics. Azimuth equipment antennas shall produce a beam as specified in 3.11.5.2.1 of ICAO SARPS Annex 10.

3.1.4.1.13.1 Beamwidth. The antenna beamwidth shall be as specified in 3.11.5.2.1.2, including the accompanying note, of ICAO SARPS Annex 10.

3.1.4.1.13.2 Scanning Beam Shape. The minus 10 dB points on the beam envelope shall be displaced from the beam center by at least 0.76 beamwidth, but not more than 0.96 beamwidth.

3.1.4.1.13.3 Dynamic Sidelobes. The dynamic sidelobes shall not exceed the values necessary to satisfy the accuracy specifications in 3.1.4.1.9.1. Furthermore, the dynamic sidelobes or any spurious signal generated by the azimuth equipment shall be at least 10 dB below the main lobe level. This requirement shall apply throughout the proportional guidance sector.

3.1.4.1.14 Elevation Scanning Beam Characteristics. elevation equipment antennas shall produce a beam as specified in 3.11.5.3.1 of ICAO SARPS Annex 10.

3.1.4.1.14.1 Beamwidth. The antenna beamwidth shall be as specified in 3.11.5.3.1.2 of ICAO SARPS Annex 10.

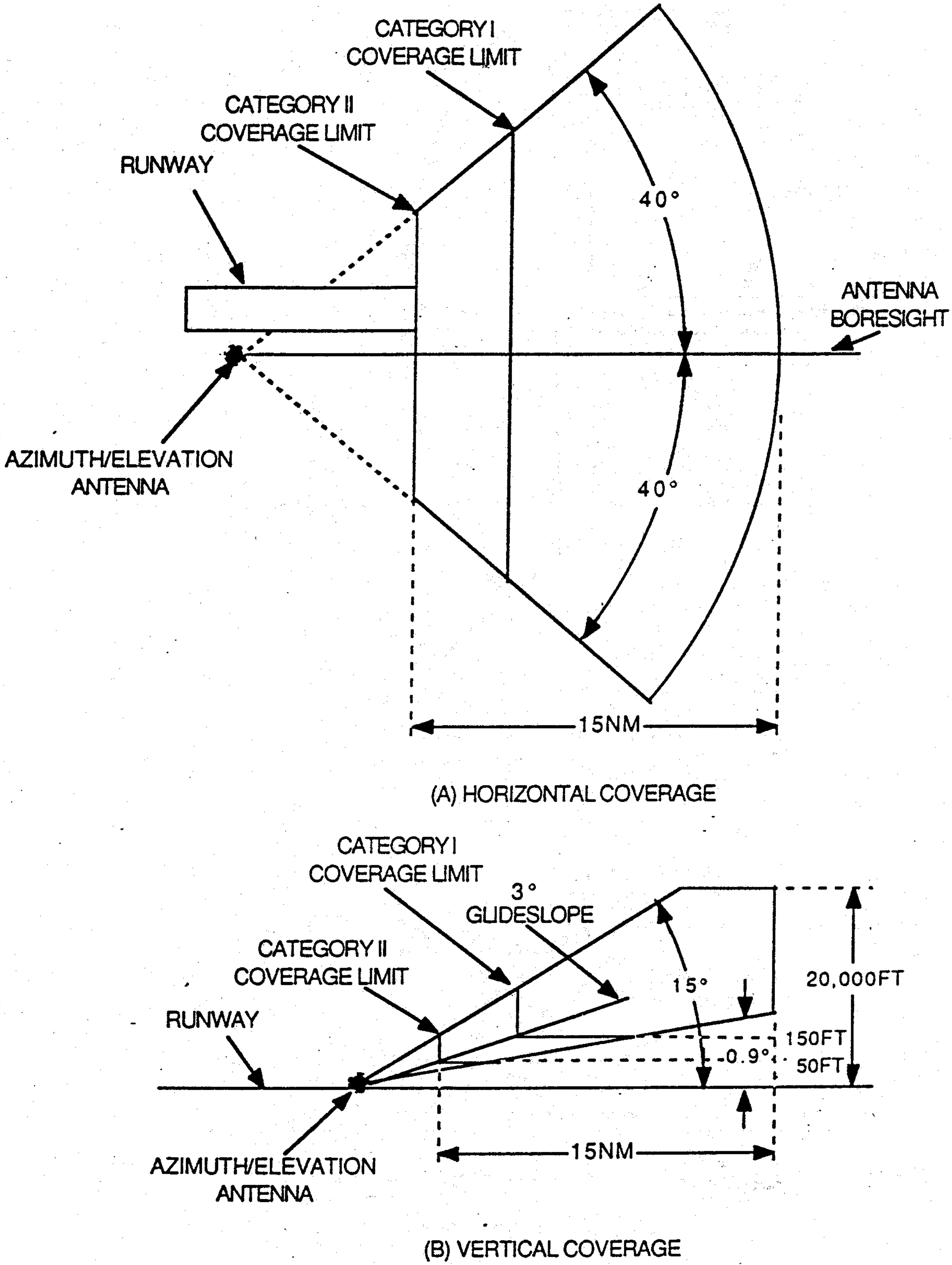


Figure 2. Elevation Equipment and Collocated Equipment Azimuth Coverage