ALASKA LAND MOBILE RADIO

Alaska Land Mobile Radio Communications System

Cooperative and Mutual Aid Agreement Appendix B

System Description

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Version 17

December 2, 2025

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Document Revision History

Date	Reason for Changes	Version
7/7/2010	Annual review/update. Approved by the User Council - final.	2
9/6/2011	Annual review. Approved by the User Council - final.	3
12/24/2012	Annual review. Approved by the User Council - final.	4
12/3/2013	Annual review/update. Approved by the Operations Management Office - final.	5
12/19/2014	Annual review/update. Approved by the Operations Management Office - final.	6
12/17/2015	Annual review/update. Approved by the Operations Management Office - final.	7
12/15/2016	Annual review/update. Approved by the Operations Management Office - final.	8
12/14/2017	Annual review/update. Approved by the Operations Management Office - final.	9
12/27/2018	Annual review/update. Approved by the Operations Management Office - final.	10
12/16/2019	Annual review/update. Approved by the Operations Management Office - final.	11
12/22/2020	Annual review/update. Approved by the Operations Management Office - final.	12
12/23/2021	Annual review/update. Approved by the Operations Management Office - final.	13
12/7/22	Annual review/update. Approved by the Operations Management Office - final.	14
12/7/2023	Annual review/update. Approved by the Operations Management Office.	15
12/10/2024	Annual review/update. Approved by the Operations Management Office and System Management Office.	16
12/02/2025	Annual review/update. Approved by the Operations Management Office and System Management Office.	17

Acronyms and Definitions

ACP: Administrator Control Panel

Alaska Federal Executive Association (AFEA): federal government entities, agencies, and organizations, other than the Department of Defense, that operate on the shared ALMR system infrastructure.

Alaska Land Mobile Radio (ALMR) Communications System: the ALMR Communications System, as established in the Cooperative and Mutual Aid Agreement.

Alaska Municipal League: a voluntary non-profit organization in Alaska that represents 165 cities, boroughs, and unified municipalities.

Alaska Public Safety Communication Services (APSCS): a State of Alaska (SOA) office in the Department of Public Safety (DPS) that operates and maintains the SOA Telecommunications System (SATS) supporting ALMR and providing public safety communication services and support to state agencies.

Anchorage Wide Area Network (AWARN): the 700/800 MHz Anchorage node of ALMR. AWARN makes up Zone 4 of the system.

BDA: Bi-Directional Amplifier

Department of Defense (DoD) – Alaska: Alaskan Command, US Air Force and US Army component services, operating under United States Pacific Command and United States Northern Command.

Department of Public Safety (DPS): a State of Alaska (SOA) department where the SOA Telecommunications System (SATS) and ALMR programs reside.

DS0: Digital Signal 0 – the lowest digital signal or data service level having a transmission rate of 64,000 bits per second (64 kb/s), intended to carry one voice channel (a phone call).

Executive Council: governing body made up of three voting members and two associate members representing the original four constituency groups: the State of Alaska, the Department of Defense, Federal Non-DoD agencies (represented by the Alaska Federal Executive Association), and local municipal/government (represented by the Alaska Municipal League and the Municipality of Anchorage).

Fleetmap: determines how the radio communications for each user group of an organization is controlled. Through controlling communications between different user groups and between individuals within a group, the radio communications system resources are used efficiently. Fleetmapping also provides a structured approach to the management of a large number of radio users and provides the opportunity to plan in advance for expansion or changes within an organization.

Key Management Facility (KMF): allows for secure re-keying of radios over the air.

Local Governments: those Alaska political subdivisions defined as municipalities in AS 29.71.800(14).

MCC 7500 Dispatch Console with VPM: console with Voice Processor Module (VPM) is a mission-critical Internet Protocol (IP) command and control solution designed to provide optimal quality audio and reliable communication and interfaces directly to the IP network to support communication and administration activities for trunked and conventional radios.

MCC 7500E Dispatch Console: connects directly to the radio system IP transport network without gateways or interface boxes. Vocoding and encryption are performed within each software-based operator position. Consoles function as an integrated component of the total radio system without additional centralized electronics.

Member: a public safety agency including, but not limited to, a general government agency (local, state, tribal, or federal), its authorized employees and personnel (paid or volunteer), and its service provider, participating in and using the system under a membership agreement.

Municipality of Anchorage (MOA): the MOA covers 1,951 square miles with a population of over 300,000. The MOA stretches from Portage, at the southern border, to Knik River at the northern border, and encompasses the communities of Girdwood, Indian, Anchorage, Eagle River, Chugiak/Birchwood, and the native village of Eklutna.

NMT: Network Management Terminals

OMC: Operations Management Center

Operations Manager represents the User Council interests and makes decisions on issues related to the day-to-day operation of the system and any urgent or emergency operational or repair decisions; establishes policies, procedures, contracts, organizations, and agreements that provide the service levels as defined in the ALMR Service Level Agreement in coordination with the User Council.

P25 Radio: a Project 25 compliant control station, consolette, mobile, or portable radio assigned to the system that has a unique identification number.

PSTN: Public Switched Telephone Network

Radio: either a Project 25 compliant control station, consolette, mobile, or portable radio, which has a unique identification number and is assigned to it in ALMR.

RGU: Radio Gateway Unit

RF: Radio Frequency

Service Level Agreement (SLA): outlines the operations and maintenance services as required by the User Council membership for the sustainment and operation of the ALMR infrastructure. The performance metrics contained in the SLA describe the maintenance standards for the ALMR system infrastructure. ALMR cost share services are also outlined in the SLA.

SIP: Session Initiation Protocol

State of Alaska (SOA): the primary maintainer of the State's infrastructure system, and shared owner of the system. The State of Alaska sponsors local/municipal agencies onto the system.

System Management Office (SMO): the team of specialists responsible for management of maintenance and operations of the system.

User: an agency, person, group, organization, or other entity which has an existing written membership agreement to operate on ALMR with one of the parties to the Cooperative and Mutual Aid Agreement. The terms user and member are synonymous and interchangeable. All terms and conditions of the Cooperative and Mutual Aid agreement defined apply to local/municipal government agencies that are sponsored/represented by the State of Alaska.

User Council: governing body responsible for recommending all operational and maintenance decisions affecting the system. Under the direction and supervision of the Executive Council, the User Council has the responsibility for management, oversight, and operations of the system. The User Council oversees the development of system operations, plans, procedures, and policies.

WAN: Wide Area Network

Zone: a grouping of channels within the radio; also refers to the three geographic areas of division pertaining to the Master Controllers (Zone 1, Zone 2, and Zone 4).

1.0 Introduction

The Alaska Land Mobile Radio (ALMR) Communications System is a digital, trunked, wide-area network (WAN), shared system between the State of Alaska (SOA), the Department of Defense (DoD), the Alaska Federal Executive Association (AFEA), the Alaska Municipal League (AML), and the Municipality of Anchorage (MOA). The communications transport network supporting sites and site infrastructure are components of the system.

The fundamental objective of the system is to provide reliable and secure interoperable communications for first responders, not only for day-to-day operations, but also during critical emergency situations, exercises, and multi-agency, multi-jurisdictional response efforts.

This document identifies components making up the ALMR system and their functions.

2.0 System Description

The system is a Motorola™ ASTRO 25™ Digital Trunking WAN SmartZone solution that consists of the system infrastructure and multiple subsystems, as follows.

2.1 System Equipment

The system is a multiple-zone design that is divided into three zones. All sites south of the Denali Highway are in Zone 1, while those sites north of the Denali Highway are in Zone 2. The Municipality of Anchorage (MOA) encompasses Zone 4 with its own 700/800MHz subsystem. Zone 3 is reserved for possible expansion in Southeast Alaska.

2.1.1 Master Sites

Each zone has a master site and a number of radio frequency (RF) sites. The master site for Zone 1 is located in Anchorage. The master site for Zone 2 is located in Fairbanks. The master site for the Zone 4 Anchorage Wide Area Radio Network (AWARN) is located in an Anchorage municipal facility.

The Zone 1 master site serves as a core network center for the entire SmartZone system. The Zone 2 master site serves as a core network center for all north zone sites. The Zone 4 master site serves as a core network center for AWARN sites. Data packets from the various ALMR system sites are routed through and processed from the Anchorage Master Site network center.

Equipment associated with each master site includes a primary and redundant zone controller; the main ethernet switch; core, gateway and exit routers; zone database; and system level and network security servers.

2.1.2 Radio Frequency Site Equipment

The radio frequency (RF) site equipment includes a quantity of Motorola™ GTR8000 IntelliSite Repeaters, redundant site controllers, and a single router/gateway to interface the data packets to the SmartZone® Master Sites. The RF equipment includes the associated multi-coupler, combiner, antenna system, Motorola™ System Control and Data (MOSCAD) fault alarm system, and 48 VDC power supplies. This category also includes the associated RF antenna systems consisting of transmit and receive antennas, coaxial cables, lightning arrestors, grounding kits, and mounting brackets/other fasteners.

2.2 Subsystem Equipment

Subsystem equipment connects directly to the system equipment or enhances the system functionality. These subsystems can include dispatch consoles (MCC7500E and MCC7500), Key Management Facilities (KMFs), Network Management Terminals (NMTs), telephone interconnect systems, logging recorders, data servers, and bi-directional amplifiers (BDAs).

2.2.1 Console System

Agencies with dispatch consoles are operating the current MCC7500E or MCC7500 models.

2.2.2 Key Management Facility

The Motorola™ ASTRO 25® system allows two-way radio transmissions to be encrypted and secure. The Key Management Facility (KMF) is a solution for centralized key management, over-the-air-rekeying (OTAR) for radios, and over-the-ethernet-rekeying (OTEK) for dispatch consoles. The KMF equipment includes a KMF application server, KMF database server, KMF CryptR, and KMF client.

2.2.3 Network Management Terminals

Network Management Terminals (NMTs) are specialized computers that connect to the system. The NMT is used by agency system managers and technologists to manage their radio system fleetmaps, subscriber units, configurations, and many other administrative functions. The System Management Office (SMO) oversees the operation of all NMTs. NMTs can be used by individual agencies to manage their individual radio systems. In the event interoperability between participating agencies is required, the SMO can enable interoperability between multiple agency NMTs.

2.2.4 Telephone Interconnect

The telephone interconnect subsystem provides a means to connect the system with the Public Switched Telephone Network (PSTN) allowing properly programmed system subscriber radios to initiate and receive half-duplex telephone calls. Telephone interconnectivity is not considered a critical service. The telephone interconnect system is located in Zone 2 at the master site.

2.2.5 Logging Recorders

Voice logging recorders are directly associated with the console system at a particular dispatch location.

2.2.6 Data Server

Includes all equipment associated with the integrated voice and data servers which can provide data over the internet protocol (IP) network.

2.2.7 Bi-Directional Amplifier

Bi-directional amplifiers (BDAs) extend coverage into, or within, a particular facility or tunnel by repeating transmissions to and from an available donor RF site. BDAs for infrastructure sites are addressed under the RF site equipment category.

2.3 MotoBridge® Gateway System

The Motorola™ MotoBridge® gateway network that was installed by the DoD and SOA has connectivity to system talk groups, but it is separate from the ALMR network. It is on a State of Alaska local area network (LAN) with connectivity through the Alaska Public Safety Communication Services (APSCS).

The MotoBridge® system was originally intended to provide interoperability between various communications networks. However, it is currently at end of life and is only being used by a couple of agencies until replacement. Central management is currently provided by the management server located in Anchorage. Other components may consist of dispatch positions with Workstation Gateway Units (WSGU) and computer consoles for linking conventional and trunked two-way radio systems together, and Radio Gateway Units (RGU) that physically tie the dissimilar radio resources to the network.

2.3.1 Operations Management Center Server

The Operations Management Center (OMC) Server is the main management server in the system and a central repository where all system users and resources (i.e., administrators, dispatchers, and radios) are registered, and where system-wide information (i.e., active patches and conferences, security parameters, etc.) is stored. The OMC Server runs on the Red Hat Linux® operating system. A user-level interface to the OMC Server is provided by the Administrator Control Panel (ACP) Client Personal Computer (PC). The OMC Server is located in Zone 1 at the master site.

2.3.2 Administrator Control Panel

The administrator control panel (ACP) Client PC allows an administrator, located anywhere in the system, to perform management activities for ALMR.

2.3.3 Session Initiation Protocol Proxy Server

The session initiation protocol (SIP) proxy server is a signaling server for establishing talk paths (calls) across the system. The SIP proxy server complies with international standards for multimedia call routing and telephone services on the Internet. The SIP proxy server interacts with the gateway units in the system, which implements the SIP agent portion of the standard. The SIP proxy server runs on the Red Hat Linux® operating system.

2.3.4 Radio Gateway Units and WorkStation Units

The gateway units are based on one hardware platform, which can be configured to serve as either a radio gateway unit (RGU) or a workstation gateway unit (WSGU). The RGU connects radio equipment to the system. The WSGU interfaces with the dispatch console PC to provide the MotoBridge® dispatch position used by the public safety interoperability dispatcher.

2.3.5 Dispatch Console Personal Computer

The dispatch console PC enables a dispatcher to activate the WSGU, which allows control over many connected remote radios, intercom connections, audio conferences, and phone calls.

2.4 WAVE

WAVE is a subscription-based, communications interoperability platform for push-to-talk that instantly connects across disparate networks, different devices, and locations to communicate between smartphones, radios, computers, or landlines.

2.5 Site Equipment

A major component of the system is the remote equipment sites. Without appropriate site and supporting equipment, the system will not function properly. The supporting site equipment includes shelters, towers, site/backup power, site physical area and equipment, and site grounding (i.e., infrastructure).

2.5.1 Shelters

This category includes all stand-alone shelters, both prefabricated and stick-built used for housing systems and associated communication equipment. For areas within existing buildings, this also includes required improvements to the rooms where the system and associated communications equipment is housed. Components in the shelters include racks, internal wiring, external ice bridges, foundations and leveling, interior/exterior lighting, air conditioners, louvers, fans, and door locks.

2.5.2 Towers

This category includes all components of the tower including the frame and ladders, painting, guy wires (as applicable), beacons, foundations, and anchors.

2.5.3 Site/Back-Up Power

This category includes the distribution panel for external power, inverters, battery plants, battery chargers, transfer switches, and generators. Also included are generator fuel tanks, generator enclosures, and exhaust piping. This category also includes uninterrupted power source (UPS) systems associated with the zone controllers.

2.5.4 Site Physical Area

This category includes all activities for the right-of-way and the area surrounding the structure for which the system is responsible. This would include grading, plowing, and graveling access roads, brushing, mowing, and fencing around the area where the shelter and tower are located (as appropriate).

2.5.5 Equipment and Site Grounding

All site equipment shall be bonded together to form a single common earth ground electrode system as outlined in the Motorola® “R56 - Standards and Guidelines for Communication Systems.” All internal and external grounding must be in working order and maintained through the life of system usage.

2.6 Transportable/Deployable Systems

The system includes two transportable/deployable systems. One system is designed to operate in the South Zone (Zone 1), and the other in the North Zone (Zone 2). The transportable systems are the property of US Northern Command (NORTHCOM) and are available to the services to meet their mission needs.

The transportables are designed to function as stand-alone systems or to connect with, and be an integral part of, the ALMR system. The transportable systems are designed to provide three critical functions in support of sustained emergency communications. First the transportable is designed to “plug” into the existing system to provide emergency replacement or fill in for site infrastructure that is damaged or down for repair. Second, the design allows for the transportable system to be added to the wide-area system, as needed, to expand the loading capacity at a location where emergency response has overwhelmed the existing capacity. Thirdly, the transportable is designed to provide a stand-alone capability with reach back to the fixed infrastructure and other critical communications capabilities where there is not a fixed ALMR infrastructure present to support emergency operations.

Each transportable/deployable consists of multiple modules that can be transported via tractor-trailer, C-130/similar-sized cargo plane, or Chinook/similar-sized helicopter. Transportable Area South (TAS) encompasses the five shelters/skids and the Mesh® Network. Transportable Area North (TAN) does not have a 4.5 Meter C-Band Satellite Earth Station Antenna Skid, a Logistics Skid, or a Mesh® Network. Only the modules required for the mission will be transported for set up.

The transportable system has a total bandwidth capacity of 15 T1s. This capacity is provided through various components of the system. The following is a breakdown of the bandwidth capacity provided by each component: the satellite earth-station (2 T1s); high-bit-rate digital subscriber line (1 T1); tactical fiber gigabyte Ethernet (2 T1s); spread spectrum microwave (4 T1s); and digital-to-analog converter (DAC)/Premisys mux (6 T1s).

2.6.1 Communication Shelter

The Communications Shelter module is approximately 9 feet wide, 16 feet long, by 9 feet high. It contains a five-channel RF site, satellite control interface, an unlicensed 5.8 GHz microwave radio, and a 48 VDC battery plant for eight hours run time. It is air and ground transport ready.

2.6.2 Dispatch Shelter

The Dispatch Shelter is approximately 9 feet wide by 16 feet long by 9 feet high. It contains one Motorola™ console position and conventional UHF and VHF radios, marine band, and air-to-ground radios. It is air and ground transport ready.

2.6.3 Tower/Power Skid

The tower/power skid is approximately 9 feet wide by 20 feet long and contains a 35KW self-contained diesel generator and integral fuel tank designed for three continuous days of operation at half load. It also contains a 50-foot, powered crank-up tower. It has permanently mounted antennas for the RF site and two conventional frequencies. It is air and ground transport ready.

2.6.4 C-Band Satellite Earth Station Antenna Skid

A C-Band transportable earth station is provided with an Andrew 4.5-meter tri-fold antenna mounted on a trailer/skid approximately 9 feet wide by 20 feet long. It is air and ground transport ready.

2.6.5 Logistics Skid

The Logistics Skid is utilized to store ancillary equipment that supports the transportable system during deployment. It also serves as a facility for maintenance operations while in the deployed state. The Logistics Skid measures 9 feet wide, 20 feet long, by 9 feet high. It is air and ground transport ready.

2.6.6 Unclassified Deployable Mesh® Network

The Unclassified Deployable Mesh® (UDM) network includes components which provide a robust wireless communications solution operating in the unlicensed 2.4GHz and the newly licensed 4.9GHz public safety spectrum at the employed site via microwave, and fiber or satellite connection, which supports up to four networks in a single access point with a two-mile radius coverage capacity. It also provides Wi-Fi access, license-free mobile broadband, a dedicated licensed network connectivity and security, and real-time video.

Mesh® network technology was originally developed for the military battlefield to provide instant, ad-hoc communication networks where fixed infrastructure was not available or deployable. As a result, users receive a robust mobile broadband communications network that is self-forming and self-healing. The Mesh® technology is also capable of delivering seamless broadband data connections and real-time video transfers to vehicles moving at highway speeds.

2.6.7 Transporter

The Transporter is a tracked or wheeled, all-terrain trailer used to transport the modules short distances, move the modules from hot storage, stage modules for deployment, and place the modules back into their original configuration upon redeployment (North and South Zone).

2.6.8 Tug

Each transportable has an associated tug.

2.6.9 Rapid Deployable System

The Rapid Deployable System (RDS) shelter provides a fast, durable, and versatile structure perfect for first responders, command posts, operations centers, or other remote operations. There is only one and it is located with the TAS.

2.7 Communications Transport Network

All voice and data signals that are carried on the system are transported to the Master Site Zone 1 controller through APSCS. APSCS is comprised of multiple methods of network connectivity to include microwave, commercially leased T1s, and local fiber networks. In some locations, the connectivity links are encrypted utilizing bulk encryption equipment.

The system channel banks provide a connectivity gateway from the central controllers to the remote RF sites. The channel banks provide individual channel service units (CSUs) to each remote site location and link them to the prime site controller.

3.0 Administration/Management

To administer and manage ALMR, several full-time permanent employees are required to provide operations management, system management, system monitoring and maintenance, asset management, and administrative support for the governance structure.

3.1 General Administration

To ensure the operational integrity of the system and to provide centralized administration and system management, which supports all users, an Operations Management Office (OMO) and a System Management Office (SMO) are cost shared between the cooperative partners. The OMO oversees day-to-day operations of ALMR; develops and recommends policies, procedures, plans, and guidelines; identifies technology and standards; and coordinates intergovernmental resources to facilitate communications interoperability with emphasis on improving public safety and emergency response communications with the User Council for approval. The OMO is the central point of contact for all users concerning the operation of the shared system.

The SMO, which works in coordination with the OMO, includes the System Manager, System Technologists, Asset Management, Help Desk, Information Systems Security Manager, and other contracted maintenance functions. The SMO develops technical processes and procedures related to the shared infrastructure and provides technical assistance and advice to ALMR users and prospective users. The SMO provides routine system maintenance, periodic maintenance inspections, and repair actions for the system.

3.2 Support

The OMO attends monthly meetings, or as requested, with the User Council (UC), Executive Council (EC), and other designated representatives of system user groups to understand new communication needs, to communicate system information, address questions and complaints, or provide clarification about the system, and other topics, as requested.

3.3 Technology Planning

The OMO keeps abreast of new technology developments, advancements, announcements, standards, and operational best practices in LMR-related technology. The OMO reports and meets periodically with the appropriate UC personnel to discuss and evaluate new technology for applicability to the system. The OMO is present during system/equipment testing or product reviews at the designated user facility and facilitates the test plan (if requested), check off procedures, and signs off documents, where appropriate.

An important initial consideration in enhancing the management of an existing wireless network is the condition, design, and operations of the current wireless equipment. The OMO will work closely with users to evaluate the current state of operations and equipment capabilities and recommend changes to the UC, as necessary, for improved management and operations of the system.

The OMO, working with the UC, will assess the goals and objectives of the system from time to time to identify the role radio communications play in achieving the desired system operational objectives. Some of the activities that will be involved in the strategic technology planning process include, but are not limited to:

- Reviewing currently available wireless technologies in the industry and evaluating their applicability to system functional, technical, and agency requirements.
- Evaluating changing technical and applicable user mission requirements to recommend how the system can be used more effectively.
- Developing a plan, in cooperation with the User Council, for the necessary modification of hardware/software of the existing wireless system equipment.

3.4. Management Processes

Management and operational processes and procedures required for the smooth operation of the system are developed and administered by the OMO at the direction and approval of UC, on behalf of the user community.

4.0 Conclusion

The User Council shall be responsible for the formal approval of the System Description and any substantial revisions hereafter.