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CREW FORCE MANAGEMENT

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This publication supplements AFSPCI 10-1202, *Crew Force Management*, 1 August 2001 and defines specific missile operations responsibilities. It applies to all headquarters Twentieth Air Force (20 AF) and subordinate units assigned, attached or supported by the headquarters 20 AF. Users should send comments and suggested improvements on an AF Form 847, **Recommendation for Change of Publication**, through appropriate command channels, to 20 AF/DOMV, 6610 Headquarters Drive, Suite 2, F. E. Warren AFB, WY 82005. Organizations at any level may supplement this instruction; however, all supplements must be coordinated through 20 AF/DOMV and HQ/AFSPC/DOT prior to publication. Maintain and dispose of records created as a result of prescribed processes in accordance with AFMAN 37-139, *Records Disposition Schedule*. Comply with AFI 33-332, *Air Force Privacy Act Program*, for documents containing Privacy Act Information. For Official Use Only information comply with DoDR 5400.7, *DOD Freedom of Information Act Program*, Air Force Supplement, Chap 4.

SUMMARY OF REVISIONS

Incorporates previous guidance and clarification. Updates BMR requirements, CMR requirements, dual qualified CMR crews, crew scheduling, utilization, alert duty, relief of command, MCC work requirements, transfer of weapons custody, STU III usage, and AF Form 1067, **Modification Proposal**, completion guidelines. Due to the substantial changes incorporated into this revision, this supplement requires a review in its entirety.

1.3.5. (Added) The 20 AF operations evaluators will become Basic Mission Ready (BMR) qualified.

1.4.4. (Added) The unit operations group Chief of Standardization and Evaluation and unit Current Operations Flight commander will become Combat Mission Ready (CMR) qualified.

4.1. (Added) Units will establish an ORB process to determine the cause of any abnormal system response. An abnormal system response may include the following: hardware or software anomalies,

DATE: 24 June 1996

FINAL

OPERATIONAL REQUIREMENTS DOCUMENT (ORD)

AFSPC 005-95A-I/II

VERY LOW FREQUENCY/LOW FREQUENCY COMMUNICATIONS CAPABILITY FOR

THE ICBM LAUNCH CONTROL CENTERS

ACAT Level III

//SIGNED//

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VLF/LF COMMUNICATIONS CAPABILITY FOR THE ICBM LCCs ORD

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OPERATIONAL REQUIREMENTS DOCUMENT

(ORD) AFSPC 005-95-I/II

FOR

VERY LOW FREQUENCY/LOW FREQUENCY (VLF/LF) COMMUNICATIONS CAPABILITY FOR THE ICBM LAUNCH CONTROL CENTERS

1. GENERAL DESCRIPTION OF OPERATIONAL CAPABILITY.

VLF/LF Objective

National Security Strategy requires the United States (US) to maintain sufficient nuclear forces to deter any future foreign leadership with access to strategic nuclear forces from acting against our vital national interest and to convince such leadership that seeking a nuclear advantage would be futile. Survivable communications are an integral part of our deterrence strategy because potential adversaries must be convinced that launch orders could actually be transmitted to, and received by, the Launch Control Centers (LCC) when required. However, serious deficiencies exist in the current Survivable Low Frequency Communications System (SLFCS) that may jeopardize future survivable communications connectivity. We need a replacement for this system that will ensure reliable, secure, and survivable communications are maintained between the National Command Authority (NCA) and the Intercontinental Ballistic Missile (ICBM) LCCs.

1.1. Mission Area Description.

1.1.1. ICBM VLF/LF Primary Mission Areas. The primary mission areas supported by this ORD are Strategic Warfare 100; Strategic Offensive 110; Land-Based Strike 111; and Strategic Communications 333. The mission of the VLF/LF system is to provide a high-confidence, electromagnetic pulse-protected link for reception of Emergency Action Messages (EAM) from the NCA, the Joint Chiefs of Staff (JCS), and the Commander in Chief, United States Strategic Command (USCINCSTRAT) to the ICBM LCCs in the VLF/LF range (See Figure 1-1).

1.1.2. ICBM VLF/LF Secondary Mission Areas. Secondary and collateral mission areas are: Strategic Command and Control 331, and Strategic Command, Control and Communications Programs 330.

1.1.3. Survivable Communications Requirements. Survivable communications are key elements of our deterrence strategy, because potential adversaries must be convinced that launch orders would actually be received by the LCCs and our communications could not be easily disrupted. Serious deficiencies exist in this area since the aging SLFCS is expected to experience increasing numbers of failures, and declining stocks of spare parts, as validated by the Headquarters Electronic Systems Center (HQ/ESC) Survivable Low Frequency Communication System Supportability Study. A replacement VLF/LF system is required for the aging SLFCS.

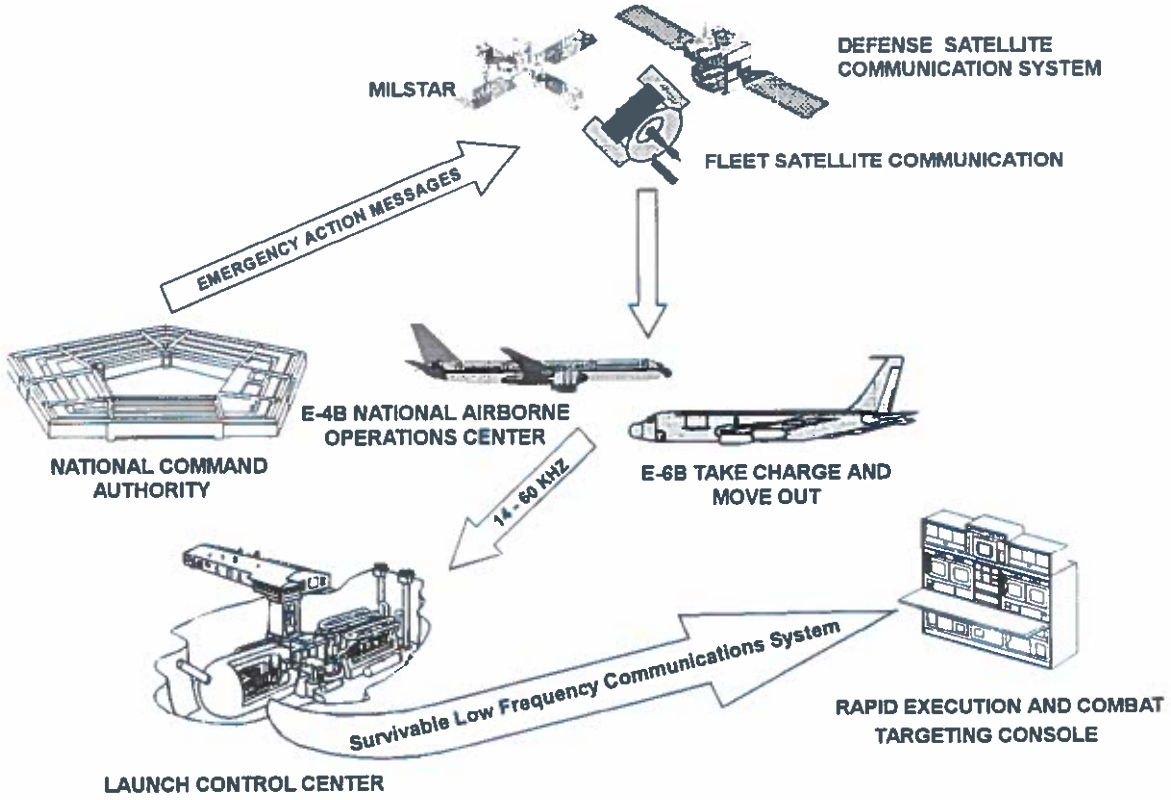

Figure 1-1 ICBM VLF/LF Concept of Operations

1.1.4. ICBM VLF/LF Operational Requirements Document. This ORD addresses the requirements for a replacement of SLFCS that will maintain a survivable communications capability for the ICBM forces for the remainder of its expected life span.

1.1.5. Key Performance Parameters. The key performance parameters for the proposed system are Interoperability, VLF/LF Modes, Rapid Execution And Combat Targeting (REACT) Compatibility, ICBM VLF/LF system terminal control and Probability of Correct Message Receipt (PCMR). Interoperability refers to the capability of the ICBM VLF/LF system to operate within the Minimum Essential Emergency Communications Network (MEECN). This includes the ability to receive all Chairman, Joint Chiefs of Staff (CJCS) EAM transmission formats transmitted by any existing or planned JCS VLF/LF transmission platform across the JCS VLF/LF spectrum of 14-60 Kilohertz (KHz). VLF/LF Modes refers to the ability of the ICBM VLF/LF system to receive EAMs over the following MEECN modes of operation: 15, 9, 9 MEECN Message Processing Mode (MMPM) and the new JCS mandated High Data Rate (HIDAR) mode, which is a key conduit for future reception of EAM traffic using the JCS VLF/LF network. The new ICBM VLF/LF system must be compatible with the REACT console for receipt of all ICBM VLF/LF system status, fault status, EAMs and associated alarms. Additionally, the ICBM VLF/LF system must provide an interface which allows the operator to control the receiver while strapped into an LCC chair. PCMR is the key measurement of system performance and must be at least 90% with an objective of 99%.

1.2. Mission Need.

1.2.1. Survivable Communications. Our strategic deterrence strategy along with Department Of Defense (DoD) and Air Force policies dictate that survivable communications are a key element of our national security strategy.

1.2.1.1. Background. The new ICBM VLF/LF system is needed to support the JCS HIDAR communications capabilities which have been designated for future implementations In Accordance With (IAW) CJCS Memorandum, dated 30 August 91. Improved VLF/LF communications remain a key to providing survivable communications to strategic nuclear forces. Additionally, the current 616A VLF/LF receivers are outdated and cannot be modified to incorporate the HIDAR mode. The DoD Appropriation Bill, 1995, directed the Modified Miniature Receive Terminal (MMRT) be developed and installed in the Air Force E-4B and Navy E-6B aircraft. Additionally, the Office of the Secretary of Defense (OSD) has approved MMRT for use in the ICBM LCCs.

1.2.1.2. Other Platforms Projected To Use New VLF/LF System. Use of the new VLF/LF system by the strategic airborne community as described in the CAF-USN Operational Requirements Document 330-92-II-B for Modified Miniature Receiver Terminal VLF/LF Receiver for E-4B National Airborne Operations Center (NAOC) and E-6B Mercury, dated 14 Dec 95, responds to a similar deficiency resulting in a need for communication system compatibility in the ICBM LCCs.

1.2.2. ICBM Mission Need Statement (MNS) 005-95. Air Force Space Command (AFSPC) originally planned to replace the SLFCS receiver with the Dual Frequency MEECN Receiver (DFMR). However, the DFMR program was terminated for convenience of the government. As a result, AFSPC sought another solution for the deficiencies identified with the SLFCS system. This need for a VLF/LF replacement was addressed in the AFSPC C4 Mission Need Statement 005-95, ICBM Strategic Command, Control, Communications, and Computers (C4) Modernization, dated 30 Jan 96.

1.3. Proposed System. The OSD Strategic Command, Control, and Communications (C3) review of 3 September 1991 outlined a new MEECN command and control architecture. This review sought to improve the performance, survivability, and reliability of the U.S. strategic communications systems. Key to this revised architecture is a modernization of the VLF/LF capability to include the implementation of the HIDAR mode. The proposed solution to the ICBM VLF/LF deficiency is to remove Miniature Receive Terminals (MRT) from decommitted Single Integrated Operational Plan (SIOP) B-1B and B-52H aircraft and then modify them to provide the ICBM forces with the capabilities outlined in this ORD (See Figure 1-2). The modified receiver will provide the ICBM LCCs with a reliable VLF/LF receive capability that will ensure interoperability and connectivity with the NCA in support of the new C3 Strategic Connectivity System (SCS) architecture. Implementation of the new ICBM VLF/LF system will not change the ICBM VLF/LF Concept of Operations described in Figure 1-1, only the VLF/LF receiver used to receive EAMs.

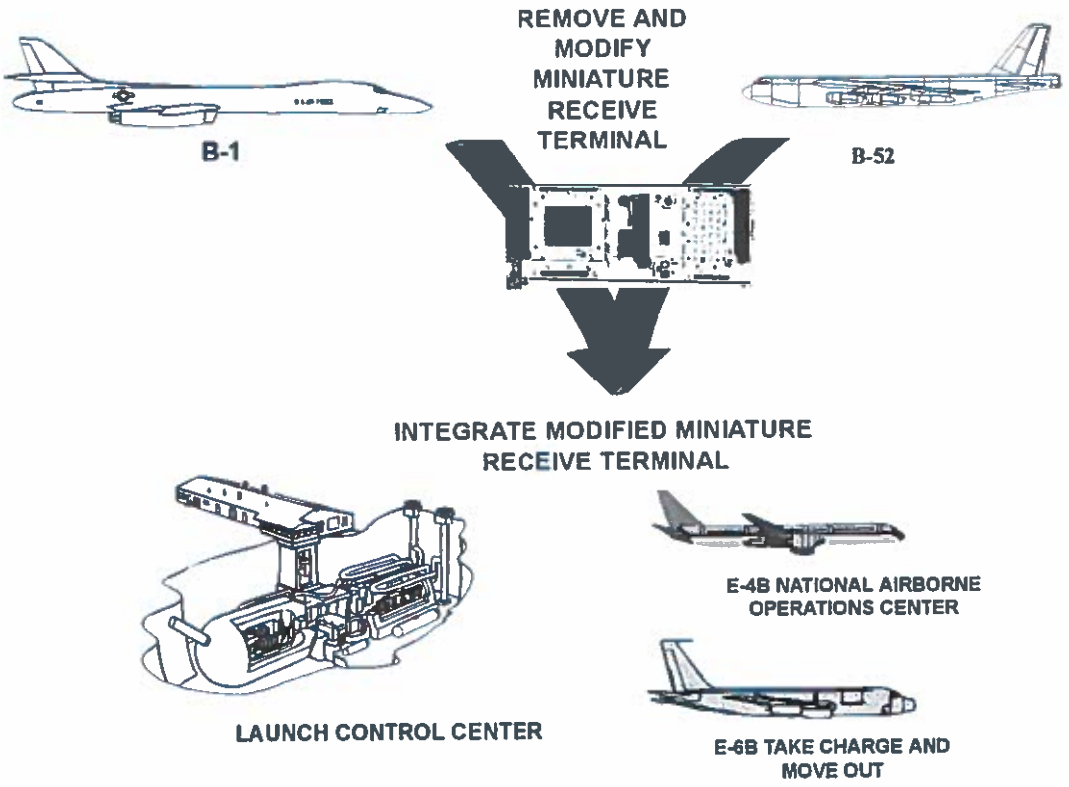

Figure 1-2 ICBM VLF/LF Proposed Solution

1.3.1. Requirements. The ICBM VLF/LF system must be capable of meeting the key performance parameters of Interoperability, VLF/LF Modes, REACT Compatibility, ICBM VLF/LF system terminal control, and PCMR listed in paragraph 1.1.5, as well as several secondary requirements, as listed below.

1.3.1.1. Interoperability With MEECN Architecture. The ICBM VLF/LF system will be interoperable within the MEECN architecture and will receive all EAM transmission formats as prescribed by EAP-CJCS Volume VII. The ICBM VLF/LF system will receive higher authority digital communications for US strategic forces across the 14-60 KHz VLF/LF band and must receive EAMs transmitted over all MEECN modes, including the CJCS directed HIDAR mode. To ensure receipt of EAMs over encrypted MEECN Modes, an accurate timing source must be provided that can be manually updated by the operator. The ICBM VLF/LF system will be capable of receiving and processing EAMs transmitted by all existing or planned VLF/LF transmitters using message formats and frequencies employed by the JCS VLF/LF network. The ICBM VLF/LF system will employ message piecing capabilities in compliance with the procedures in EAP-CJCS, Vol I. A message piece/fragment received over MEECN Mode 15 or 9 that cannot be pieced by the ICBM VLF/LF system will be sent to the REACT console for further processing.

1.3.1.2. Compatibility. The ICBM VLF/LF system must be compatible with all existing LCC equipment. The ICBM VLF/LF system must interface with the REACT console Higher Authority Communications/Rapid Message Processing Element (HAC/RMPE) system for the transferal of ICBM VLF/LF fault status, system status, EAM reception data and associated alarms. The system must operate using the existing SLFCS antenna and existing LCC electrical and cooling systems, without degrading power or cooling to other LCC systems. The system must be

securely mounted in an existing or modified equipment rack, with both signal and power interfaces and in compliance with nuclear hardness requirements. Additionally, the ICBM VLF/LF system must provide an interface which allows the operator to control the ICBM VLF/LF receiver while strapped into an LCC chair. Finally, the ICBM VLF/LF system must be capable of storing a minimum of 5 days worth of frequencies and associated crypto variables for 5 operator selected transmission sources.

1.3.1.3. System Performance. The key measure of system performance is PCMR, with 90% as the threshold and 99% as the performance objective. The rationale for the PCMR threshold/objective is based on the requirements outlined in CJCSI 6811.01, Nuclear Command and Control System Technical Performance Criteria. The ICBM VLF/LF system will include the capability of frequency scanning/mode searching a minimum of five operator selected transmission sources as well as the capability to receive in HIDAR mode. The new ICBM VLF/LF system will simultaneously search for and recognize MEECN Mode 15 and any one of the special modes. The ICBM VLF/LF system will also provide timely, secure, survivable, jam-resistant reception of command, control and communications from NCA to fixed launch control centers despite disturbances caused by nuclear detonations.

1.3.2. Approach. The approach of the proposed ICBM VLF/LF system program is to modify existing MRT receivers and to integrate the modified receivers into the ICBM LCCs and the E-4B and E-6B aircraft to satisfy system requirements. The majority of the receivers are available as a result of the removal of B-52H and B-1B aircraft from SIOP commitments, with the remaining receivers being procured by opening the production line.

1.3.3. Efficiency and Effectiveness. The new ICBM VLF/LF system will alleviate the severe deficiencies identified in the current SLFCS. It is expected that the modified system will be capable of meeting all requirements at a substantial cost savings compared with designing a new system. This will ensure a continued survivable communications link is maintained between the NCA and the strategic nuclear forces which is a key of our deterrence strategy.

2. THREAT.

2.1. Operational Threat Environment.

2.1.1. The threat environment for the ICBM VLF/LF system is the same as that specified for the weapon system in which the ICBM VLF/LF system will be deployed. The threat to the ICBM VLF/LF system could come from a number of areas including ballistic or aerodynamic missile attack, information warfare (automated information systems threats and electronic warfare), nuclear perturbations/electromagnetic pulse, sabotage, and terrorism.

2.1.2. Command and Control systems are high priority targets for compromise, corruption and/or physical destruction. Whereas the current environment mitigates the probability of physical destruction by ballistic or aerodynamic missiles, information warfare has become a high interest area for a number of countries and represents a significant potential threat to the ICBM VLF/LF system. Sabotage, either by internal or external forces, and terrorism also are considered potential

threats.

2.2. System Specific Threats/Reactive Threat. A more thorough discussion of the threat including the system specific threats at Initial Operational Capability (IOC) and IOC+10 years, reactive threats and targets can be found in the Strategic Systems Threat Environment Description, DST-2660F-729-94, 1 Feb 1994; Electronic Warfare Threat to US Satellite Communications Links - Foreign, DST-2610S-111-94m 3/31/94; C4I Systems and Networks Telecommunications Networks and Automated Information Systems (AIS) Threat Environment Description, DST-2660F-210-94, 1/15/94; and Threat to WWMCCS and MEECN Communications, DIA-475-45, January 1990. In addition, the Minuteman III System Threat Assessment Report (STAR) dated Feb 1996 provides the threat against the Minuteman weapon system. The OSD Strategic C3 Review of 3 September 1991 validates present day needs for our strategic C3 systems to satisfy the requirement to respond to all types of attack. Finally, AFSPC/IN has created a detailed system specific threat to the ICBM VLF/LF system. This document is classified and will be made available on an as needed basis.

3. SHORTCOMINGS OF EXISTING SYSTEMS.

3.1. Miniature Receive Terminal. The existing MRT is not capable of receiving the HIDAR mode. The current MRT configuration is not designed for integration into the LCCs and will not interface with the existing SLFCS antenna system without modification or adaptation through the use of another device such as an antenna coupler. With modification for HIDAR and interface integration, the MRT is capable of meeting the requirements for VLF/LF connectivity to the LCCs.

3.2. SLFCS Receiver. The existing VLF/LF SLFCS 616A receive subsystem is not capable of adding HIDAR, frequency scanning, or automatic mode recognition. It is an older generation, single channel, hardwired receiver designed in the late 1960's and upgraded in the 1970's. It now has many obsolete components, subsequent production/maintenance limitations and a very low Mean Time Between Failure (MTBF). Limitations and costs of sustaining the SLFCS are described in the Electronic Systems Center/TG "Survivable Low Frequency Communications System Supportability Study" dated 15 Dec 95.

4. CAPABILITIES REQUIRED. The capabilities defined below are required to provide the ICBM LCCs an assured and survivable communications link from the NCA.

4.1. System Performance.

4.1.1. Interoperability. The ICBM VLF/LF system will be interoperable with the JCS VLF/LF network for receipt of all EAM transmission formats, as prescribed by EAP-CJCS Volume VII, transmitted by any existing or planned JCS VLF/LF transmission platform. (Threshold) This is a key parameter.

4.1.2. VLF/LF Modes. The ICBM VLF/LF system will be capable of receiving messages over the following modes of operation: MEECN modes 15, 9, 9 MMPM and HIDAR. (Threshold) This is a key parameter.

4.1.3. Frequency Scan/Mode Search. The ICBM VLF/LF system will include the

capability of frequency scanning and mode searching a minimum of five operator selected transmission sources. (Threshold) The ICBM VLF/LF system will simultaneously search for and recognize MEECN Mode 15 and any one of the Special Modes. (Threshold) The MEECN Mode 15 message will take priority over a special mode message received at the same time. (Threshold)

4.1.4. Probability of Correct Message Receipt. The PCMR for the ICBM VLF/LF system will be 90% (Threshold) with an objective of 99%. PCMR is a key parameter in determining the operational effectiveness of the new ICBM VLF/LF system.

4.1.5. Message Piecing. The ICBM VLF/LF system will employ message piecing in compliance with the procedures in EAP-CJCS, Vol I. (Threshold) The purpose behind message piecing is to combine multiple EAM pieces/fragments into one usable EAM, which is then output to the REACT HAC/RMPE for processing. A message piece/fragment received over MEECN Mode 9 or 15, that cannot be pieced into a usable EAM by the ICBM VLF/LF system, will be sent to the REACT HAC/RMPE for further processing. (Threshold)

4.1.6. Timing Source. The ICBM VLF/LF system will include a timing source accurate enough to ensure continued receipt of EAMs over all required modes of operation as specified in paragraph 4.1.2. (Threshold) A method must be provided for the manual updating of the ICBM VLF/LF system timing source to account for "timing drift" and possible loss of time due to loss of power to the ICBM VLF/LF system, maintenance actions or upset and recovery of the system due to nuclear effects. (Threshold)

4.1.7. REACT Compatibility. All automatically generated output from the ICBM VLF/LF system to include system status, fault status, EAMs and all associated alarms, will be displayed to the operator at the REACT console Video Display Unit (VDU). (Threshold) In the event of failure of the HAC/RMPE primary processor, automatically generated output from the ICBM VLF/LF system to include system status, fault status, EAMs, and all associated alarms, will be displayed to the operator at the REACT console backup printer. (Threshold) The intent of this requirement is to ensure output generated by the new ICBM VLF/LF system is handled in the same manner with REACT as output generated by the already existing ICBM communications systems (SACDIN, SLFCS, AFSATCOM). REACT Compatibility is a key parameter.

4.1.8. ICBM VLF/LF System Terminal Control. The ICBM VLF/LF system receiver must have the capability to be controlled by the operator while he/she is strapped into an LCC chair. (Threshold) This terminal control device will provide the capability for routine operations such as Built-in-Test (BIT), loading/updating time, mission/communication plans, frequency changes, crypto variables and any other crew operation required to control the ICBM VLF/LF system. (Threshold) The ICBM VLF/LF system will have the capability of storing a minimum of 5 days worth of frequencies and associated crypto variables for 5 operator selected transmission sources. (Threshold) In addition, failure of the HAC/RMPE primary processor must not prevent the operator's ability to control the ICBM VLF/LF system. (Threshold) The objective is for the operator to accomplish this terminal control from the REACT console. In order to achieve this objective however, the design solution must leave sufficient space at the REACT console for future

communication system terminal control units. ICBM VLF/LF system terminal control is a key parameter.

4.1.9. Anti-Jam Capability. The ICBM VLF/LF system will provide an anti-jam capability to counter the projected jamming threats identified in "Threat to WWMCCS and MEECN Communications", DIA-475-45, Jan 1990, ensuring PCMR requirements are unaffected in a jammed environment. (Threshold)

4.1.10. Human Machine Interface (HMI). The new ICBM VLF/LF system operations are directly tied to operations at the REACT console; therefore, the ICBM VLF/LF HMI must be consistent with the HMI already employed for the REACT console and the existing ICBM communication systems that interface with the REACT console. (Threshold) For example, ICBM VLF/LF system feedback as a result of crewmember data input errors should be displayed at the ICBM VLF/LF terminal control unit instead of forcing the operator to move to the REACT console to determine his data input error.

4.1.11. System Interfaces. The ICBM VLF/LF system and any associated subassemblies must be capable of being integrated into the internal envelope of an existing or modified ICBM equipment rack, be securely mounted to existing LCC equipment to ensure conformance to nuclear hardness requirements (Threshold) and meet the following interface requirements:

4.1.11.1. Environmental Control System (ECS). Operate within the existing LCC ECS capabilities so as not to degrade cooling to other LCC equipment. (Threshold)

4.1.11.2. Power Source. Use available LCC power and not degrade power requirements to other LCC equipment. (Threshold) The ICBM VLF/LF system must maintain frequencies, crypto and time during LCC power transfers. (Threshold)

4.1.11.3. Antenna Interface. The ICBM VLF/LF system must use the existing SLFCS antenna system for EAM reception. (Threshold)

4.1.11.4. Electromagnetic Interference/Electromagnetic Compatibility (EMI/EMC). The ICBM VLF/LF system will not interfere with nor suffer interference from other equipment located within the LCC which would degrade system operation. (Threshold)

4.2. Logistics and Readiness.

4.2.1. MTBCF. The ICBM VLF/LF System will have an MTBCF of 2738 hours while installed and operating 24 hours per day in the ground benign environment of the LCCs. (Threshold). The objective for MTBCF is 5475 hours. The ICBM VLF/LF system will not require dispatch of maintenance personnel to perform periodic preventive maintenance to meet MTBCF requirements. (Threshold) Critical failures are those failures of the ICBM VLF/LF system which result in the inability to receive any emergency action message.

4.2.2. Operational Availability. The ICBM VLF/LF system will have an operational availability of 0.99. (Threshold)

4.3. Critical System Characteristics.

4.3.1. Mission Capability. The ICBM VLF/LF system must be fully mission capable without damage/degradation, throughout the nuclear environment expected to be experienced by the ICBM weapon system and during all phases of conflict while continuing to meet PCMR requirements. Specific requirements for these environments are detailed below.

4.3.1.1. Nuclear Shock and Vibration. The ICBM VLF/LF system must operate through the nuclear shock and vibration environments anticipated for the ICBM weapon system without damage/degradation. (Threshold)

4.3.1.2. Electromagnetic Pulse (EMP). The ICBM VLF/LF system must operate through the EMP environments anticipated for the ICBM weapon system without damage/degradation. (Threshold)

4.3.1.3. Nuclear Radiation. The ICBM VLF/LF system must operate within the nuclear radiation environments expected for the ICBM weapon system without damage/degradation. (Threshold) Upset resulting from nuclear effects and recovery with operator assistance will be permitted. (Threshold) Operator assistance during this period may include loading/updating of crypto keying variables, time and setting operational parameters. Recovery from nuclear radiation effects must not exceed 5 minutes. (Threshold) The objective is for the ICBM VLF/LF system to operate through the nuclear radiation environment without upset and recovery or damage/degradation.

4.3.2. Security. The ICBM VLF/LF system will not degrade the security of the ICBM weapon system. (Threshold) Apply program protection throughout the system's life cycle to ensure technical superiority, system integrity and availability. This includes Information Security (INFOSEC), Communications Security (COMSEC), Operations Security (OPSEC) and physical security. Safeguarding the integrity of the system acquisition, deployment and operation is necessary to maintain the high level of effectiveness of ICBM VLF/LF system operations. System security measures are required to assure mission capabilities during peacetime, war, and intermediate levels of conflict. Physical security protects both information and resources by preventing unauthorized access to facilities, equipment, data and critical operations.

4.3.3. TEMPEST. TEMPEST performance will be consistent with the existing environment found in the ICBM LCC and will provide the same protection from hostile interception of emanations as the current system. (Threshold)

5. INTEGRATED LOGISTICS SUPPORT (ILS). An ILS program will be required for the updated VLF/LF receiver and its integration and installation into the ICBM LCCs. This ILS program will support the maintenance concepts presently used by ICBMs.

5.1. Maintenance Planning. An analysis must be conducted to determine optimal maintenance planning procedures, to aid in identifying spare requirements and to identify logistics support resources. Two levels of maintenance have been defined for the ICBM VLF/LF system. (Threshold) Advanced maintenance practices that

significantly reduce operations and maintenance (O&M) life cycle costs are encouraged. The following maintenance practices will be conducted at each of these levels:

5.1.1. Organizational. The level of maintenance consisting of those on-equipment tasks normally performed using in-place resources at operating unit locations. On-equipment tasks are those tasks which can be accomplished on communication electronics equipment in its installed location or rack with skill and equipment possessed by the units. Organizational maintenance will consist of fault detection/isolation verification, LRU removal and replacement, followed by a functional checkout. A Line Replaceable Unit (LRU) is defined as the lowest level module of hardware that can be removed and replaced at the organizational level using current two-level maintenance concepts. For the ICBM VLF/LF system this does not include card replacement, but instead focuses on subsystem assembly or box level components.

5.1.1.1. BIT Effectiveness. BIT capability should be emphasized to minimize the skills required to isolate the fault to a single LRU. Using the BIT effectiveness, isolate to two or fewer LRUs 98% and to one LRU 95% of the time. (Threshold) The objective is to isolate to one LRU 100% of the time.

5.1.2. Depot. The level of maintenance consisting of on and off equipment tasks performed using the highly specialized skills, sophisticated shop equipment, or special facilities of a supporting command at a technology repair center, other types of military or commercial centralized repair facility, or in some cases, at an operating location. Depot level maintenance may also include maintenance normally considered to be organizational or intermediate as negotiated between the operating and supporting commands.

5.1.3. COMSEC Equipment Maintenance. COMSEC equipment maintenance will be performed IAW applicable AFKAM and AFKAG.

5.1.4. System Support Initiative (SSI). The SSI must be in place until maintenance is provided an organic capability at ICBM VLF/LF system IOC.

5.2. Support Equipment. The system will be designed to make maximum use of existing support equipment (SE). Developmental items will be held to an absolute minimum. Provide depot and organizational level test/support equipment for new hardware and software.

5.2.1. Provide the capability to field test the entire ICBM VLF/LF system, including all MEECN Modes, installed in an operational LCC.

5.2.2. Organizational level SE must be lightweight, portable, and ruggedized. It must be capable of enduring the same climate conditions as the prime mission equipment.

5.3. Human System Integration (HSI). The ICBM VLF/LF system and integration design will be identified through human engineering design criteria for military systems, personnel, equipment and facilities. Human engineering must be considered throughout the design effort and must include design criteria to minimize problems associated with equipment size, location and handling. Removal

and replacement of end items or LRUs must not require the removal of non-failed LRUs or require any other facilitating maintenance. In the LCC environment, the ICBM VLF/LF system will be operated by the missile combat crew to include fault isolation and fault reporting. Training in the ICBM environment will take place in the Missile Procedures Trainer (MPT) and the Emergency War Order (EWO) classroom trainer (ECT)/Minuteman Enhanced Procedures (MEP) Trainer.

5.3.1. Manpower and Personnel. Manpower requirements will not exceed the current manning levels and skill level requirements at each location for operations, communications maintenance, security police, or support functions. (Threshold)

5.3.2. Training and Training Support. Personnel will require Type I training for operations, trainers, maintenance and testing of the ICBM VLF/LF system. Information to support development of a recurring training plan will be provided for missile LCCs. Courseware for ICBM VLF/LF system training must be provided by the contractor. The courseware must be designed so it can be released to operations training in an "electronic media" format. This will reduce manpower intensive tasks necessary to reconstruct operations, trainer and maintenance training from the contractor course material. Any unique Hardness Maintenance/Hardness Surveillance (HM/HS) requirements as a result of the new ICBM VLF/LF system will require Hardness awareness training and hardness critical item operational training for field and depot logistic personnel. In addition, hardness awareness training is required for management personnel involved with ICBM VLF/LF system.

5.3.3. MPT/EWO Classroom/MEP Trainer. The ICBM VLF/LF system installed in the MPT must look identical to the operational ICBM VLF/LF system installed in an LCC and provide a full fidelity simulation of the ICBM VLF/LF capability in the existing MPT. (Threshold) Additionally, the software that controls operation of the ECT/MEP Trainer must be modified to incorporate the ICBM VLF/LF system. (Threshold)

5.3.3.1. MPT Availability. The ICBM VLF/LF system installed in the MPT must meet the existing MPT requirements for availability to ensure MPT training is not degraded due to excessive downtime. (Threshold)

5.3.4. Safety. Protecting the system as a critical national resource and ensuring the safety of people and property are some of the most important concerns in developing, fielding and operating the ICBM VLF/LF system replacement. There are no unique safety requirements.

5.4. Computer Resources.

5.4.1. Computer Resource Design. System design must provide a user interface which is easy to learn and use. Software design must allow ease of modification and maintenance. It must allow maximum flexibility to adapt to external changes without major modification to the operating programs. It will allow flexibility for the user to adapt the system to changing requirements. The software development methodology must support the construction, use and reuse of software components throughout the system. It must allow for expandability to accommodate future

upgrades or system changes.

5.4.2. Computer Resource Support. The system will be supportable within the existing structure of Air Force (AF) and ICBM maintenance. Planning must allow for a software maintenance option by AF personnel, with adequate facilities to maintain and test all software and interfaces to ICBM VLF/LF system equipment.

5.4.3. Software Engineering. New and modified software will be managed to ensure maturity and proper configuration management is realized. Software will be fully tested, corrected and under strict configuration management when delivered.

5.5. Other Logistics Considerations.

5.5.1. Packaging, Handling, and Transportation.

5.5.1.1. Packaging. The packaging should meet the special packaging instructions and the transportation packaging orders IAW the best available commercial standards.

5.5.1.2. Handling. There are no unique handling requirements for this program.

5.5.1.3. Transportation. Packaged equipment should be transportable by air freight between operational unit and depot.

5.5.2. Technical Data.

5.5.2.1. Purpose. Technical data will provide the technical base for system operation, configuration control, interface identification, parts breakdown, maintenance, testing, performance, assessment, and training.

5.5.2.2. Format/Validation and Verification. Technical data must be created in the same format as the Technical Orders (T.O.) already in use at the wings. Operations, maintenance, communications and trainer T.O.s will be printed in paper format, unless the new AF technical data automation program is in place for that specific T.O. Commercial data may be acceptable for off-the-shelf procured systems; however, all maintenance technical data must be written for use by five-skill level maintenance/operator personnel after minimum formal training. Technical data must identify and support the levels of maintenance for a given task. Fault isolation using BIT and approved SE must be an integral part of the system's T.O.s or manuals. Supporting and organizational level repairs must be covered in applicable system technical manuals. Applicable HM/HS items and procedures will be clearly identified in the T.O.s.

5.5.2.3. Digitized Technical Data. Operations, trainer and maintenance T.O. changes will be provided to Air Force Materiel Command (AFMC) in the appropriate digitized format to accommodate the planned Joint Computer Aided Acquisition Logistics System (JCAALS) AF technical data automation program. The content of digitized T.O.s must be consistent with the paper copy T.O.s.

5.5.3. Operational Equipment. The equipment must be protected from a variety of environments. The ICBM VLF/LF system must be designed for the worst case environment of its host systems. During shipping, handling, transportation,

operations and storage, the equipment will encounter extremes in temperatures ranging from -65 to +150 degrees Fahrenheit and may be stored in trucks exposed to the environment for extended periods of time. Additionally, equipment may be subject to moisture and corrosive effects of atmospheric conditions.

5.5.4. Supply Support.

5.5.4.1. Supply Support Functions. Provide normal supply support through the main operating base. Existing AFMC and Defense Logistics Agency (DLA) supply support systems will be used to the maximum extent possible.

5.5.4.2. Spare Requirements. Spares will be supplied to support the system using established United States Air Force (USAF) Standard Bases Supply System (SBSS) procedures. Initial spare objectives are:

5.5.4.2.1. 100% critical spares on-hand at each wing to ensure Operational Availability requirements are met.

5.5.4.2.2. 90% noncritical spares on-hand at each wing to ensure Operational Availability requirements are met.

6. INFRASTRUCTURE SUPPORT AND INTEROPERABILITY. The ICBM VLF/LF system must be interoperable with the JCS VLF/LF network and be able to receive all required messages from all existing or planned JCS VLF/LF transmitters.

6.1. Joint Potential Designator. Joint

6.2. COMSEC. The COMSEC device shall provide one key fill-port interface for use with a Data Transfer Device (DTD), a KOI-18 COMSEC tape reader, and a KYK-13 COMSEC load device. The COMSEC device interface device with the DTD shall be as defined in National Security Agency (NSA) DS-102 for use with DTD interface specification (0n 477312, AN CYZ - 10). The COMSEC device fill-port shall also interface with the KOI-18 and KYK-13 IAW NSA DS-102 and CSESD-11. The COMSEC device shall be compatible with a KG-30 series Cryptographic, or NSA designated replacement, operating in clock start mode.

6.3. Command, Control, Communication, and Intelligence. The OSD C3 review detailed requirements for MEECN equipment upgrades to support a future C3 architecture. The updated VLF/LF receiver must fulfill the VLF/LF receive capability requirement in support of the proposed architecture. The primary mandate of the revised architecture is the integration of the complete complement of required modes of operation, i.e., MEECN Mode 15, 9, 9 MMPM, and HIDAR.

6.4. Transportation and Basing. The upgraded VLF/LF receiver will impose no more transportation requirements than the hardware it replaces in the LCCs.

6.5. Standardization, Interoperability, and Commonality. The upgraded VLF/LF receiver will be interoperable with the NCA, airborne transmitting platforms and strategic nuclear forces current and planned C4I systems which utilize the SCS/MEECN modes, as well as, the Global Command and Control System (GCCS). In order to achieve interoperability with fielded and proposed system(s) the requirements for this capability will conform with applicable information

technology standards specified in the DoD Technical Architecture Framework for Information (TAFIM), Volume 7, Adopted Information Technology Standards (AITS) to enhance C4I.

6.6. Mapping, Charting, and Geodesy Support. Not required.

6.7. Environmental Support. The ICBM VLF/LF system will not require any unique weather support.

7. FORCE STRUCTURE.

7.1. ICBM LCCs. 55 (50 Minuteman) and (5 Peacekeeper--Contingent on START Treaty)

7.2. 20 AF Missile Operations Center. 1 at F.E. Warren AFB.

7.3. Test Facility Assets. 6. Two are located at Hill Air Force Base (AFB), two are located at Vandenberg AFB, 1 is located at the HAC/RMPE Software Support Facility at Offutt AFB and 1 is located at the Headquarters (HQ) ESC MITRE REACT Test bed in Bedford, MA.

7.4. Trainers. 13 MPTs, 8 ECTs/19 MEP Trainers and two software development stations will need to be modified for the ICBM VLF/LF system. These facilities will not require installation of actual ICBM VLF/LF system assets but must fully simulate the operation of the ICBM VLF/LF system.

7.5. Spares. LCCs -- **TBD** and Trainers -- **TBD**. Adequate sparing will be required for operational LCCs and trainers to ensure both operational and training requirements are met.

8. SCHEDULE CONSIDERATIONS.

8.1. Test Program. The ICBM VLF/LF system Test and Evaluation program will include Development Test and Evaluation (DT&E), Initial Operational Test and Evaluation (IOT&E), and Follow-on Operational Test and Evaluation (FOT&E). Air Force Operational Test and Evaluation Center (AFOTEC) will plan and conduct the ICBM VLF/LF system IOT&E in ICBM launch control centers.

8.1.1. ICBM LCCs. DT&E and IOT&E will be conducted on a REACT modified ICBM LCC. DT&E for ICBM LCCs will begin as soon as possible. IOT&E will be conducted by AFOTEC to support a production/fielding decision.

8.1.2. Capabilities Required Prior to IOT&E.

8.1.2.1. Training. Completion of Type I training with a cadre of operations, maintenance, trainer and software support personnel adequately trained.

8.1.2.2. System. ICBM VLF/LF system, MPT and ECT/MEP Trainer capability must be delivered prior to IOT&E to support AFOTEC testing.

8.1.2.3. Technical Data. All Technical Data will be validated and verified during development and delivered prior to IOT&E.

8.1.2.4. COMSEC Material. COMSEC key crypto materials shall be in place to support DT&E/IOT&E and IOC requirements.

8.1.2.5. Support Equipment. All SE will be provisioned and delivered through the SBSS prior to the start of IOT&E.

8.2. Required Assets Available (RAA). RAA will be accomplished by the delivery of **TBD** pre-production modified ICBM VLF/LF system units to the program. ICBM VLF/LF system units for ICBM LCCs are scheduled for delivery in 2001. Unit deployment will be as soon as possible after system availability and integration testing. The deployment in ICBM LCCs is dependent on successful DT&E and IOT&E on a REACT modified LCC. Specific unit deployment schedules will be determined by the ICBM System Program Director, Ogden Air Logistics Center (ALC), in coordination with HQ AFSPC, 20 AF and applicable units.

8.2.1. Maintainability Demonstration. A demonstration by the developer will be conducted to prove the concept(s) for maintaining and supporting the complete ICBM VLF/LF system, including support equipment prior to RAA. The maintainability demonstration will also include faults/procedures to demonstrate HM/HS techniques.

8.3. Initial Operational Capability (IOC). IOC may be declared for the new VLF/LF system in ICBM LCCs when fully installed and operational in one ICBM LCC and AFSPC determines that the new VLF/LF system is capable of supporting the ICBM mission. The ICBM VLF/LF system must be capable of receiving traffic from the JCS VLF/LF network, and EAM traffic originated by any authorized transmission source. As a minimum, the capabilities required for IOT&E, RAA and a complete set of logistics resources, required for organizational/depot maintenance of the system will be in place at IOC. Anticipated IOC date is 2001.

8.3.1. Other Capabilities Required Prior to IOC.

8.3.1.1. Initial Spares. Initial spare objectives must be met prior to IOC.

8.3.1.2. Software. The software will have no known mission critical problems or anomalies and adhere to implementing agency, DoD, and service development standards at IOC. Mission critical problems are those failures which would result in the inability to receive an EAM.

8.4. Full Operational Capability (FOC). The final program milestone is reached when all ICBM LCCs, test facilities, and trainers have an installed and operational ICBM VLF/LF system with sufficient operator and maintenance training, required sparing and maintenance support in place. FOC for the ICBM VLF/LF system will be an AFSPC decision. Anticipated FOC date is 2003 for ICBM LCCs.

8.5. Program Major Milestone Dates Completed and Planned. To be provided by AFMC.

1. InteroperabilityMessage Compose and (4.1.1) *		With the JCS VLF/LF Network for receipt of all EAM transmission formats per EAP-CJCS Vol VII, transmitted by any existing or planned JCS VLF/LF transmission platform	Sa
2. VLF/LF Modes (4.1.2) *		MEECN modes 15, 9, 9 MMPM, HIDAR	Sa
3. Frequency Scan/Mode Search (4.1.3)		(1) Frequency scan/mode search minimum of 5 operator selected transmission sources (2) Simultaneously search for and recognize MEECN Mode 15 and any special mode (3) MEECN Mode 15 message will take priority over a special mode message received at the same time	Sa
4. Probability of Correct Message Receipt (4.1.4) *		90%	99
5. Message Piecing (4.1.5)		(1) Employ message piecing in compliance with requirements of EAP-CJCS Vol I (2) Message piece/fragment received over MEECN Mode 9 or 15 that cannot be pieced by ICBM VLF/LF system, will be sent to the REACT HAC/RMPE for further processing	Sa
6. Timing Source Update (4.1.6)		(1) Timing source accurate enough to ensure continued receipt of EAMs over all required MEECN Modes (2) Capability to manually update ICBM VLF/LF system timing source	Sa

7. REACT Compatibility (4.1.7) *		(1) Automatically generated output from the ICBM VLF/LF system to include system status, fault status, EAMs and associated alarms will be displayed to the operator at the REACT console VDU (2) In event of failure of HAC/RMPE primary processor, automatically generated output from the ICBM VLF/LF system to include system status, fault status, EAMs and associated alarms will be displayed to the operator at the REACT console backup printer	Sa
8. ICBM VLF/LF System Terminal Control (4.1.8) *		(1) Capable of being controlled by an operator while strapped into an LCC Chair (2) Include capability of BIT, loading/updating time, mission/communication plans, frequency changes, crypto variables and any other operation required to control the ICBM VLF/LF system (3) Capability of storing minimum of 5 days of frequencies and associated crypto variables for 5 operator selected transmission sources (4) Failure of HAC/RMPE primary processor must not prevent operator's ability to control the ICBM VLF/LF system	(1 (2 co un
9. Anti-Jam Capability (4.1.9)		Anti-jam capability to counter jamming threat identified in DIA-475-45, ensuring PCMR requirements are unaffected in a jamming environment	Sa
10. Human Machine Interface (4.1.10)		Consistent with HMI already employed for the REACT console and existing ICBM communications systems that interface with the REACT console	Sa
11. System Interfaces (4.1.11)		Integrated into internal envelope of an existing or modified ICBM rack and be securely mounted to existing LCC equipment to ensure conformance to nuclear hardness requirements	Sa
12. Environmental Control System (4.1.11.1)		Operate within existing LCC ECS capabilities and not degrade cooling to other LCC equipment	Sa
13. Power Source (4.1.11.2)		(1) Use available LCC power and will not degrade power to other LCC equipment (2) Must maintain frequencies, crypto and time during power transfers	Sa
14. Antenna Interface (4.1.11.3)		Use existing SLFCS Antenna for EAM reception	Sa
15. EMI/EMC (4.1.11.4)		Not interfere with nor suffer interference from other equipment within the LCC which would degrade system operation	Sa
16. MTBCF (4.2.1)		(1) 2738 Hours (2) Not require periodic preventive maintenance to meet MTBCF	54
17. Operational Availability (4.2.2)		0.99	Sa
18. Nuclear Shock and Vibration (4.3.1.1)		Operate through nuclear shock and vibration environments anticipated for the ICBM weapon system without damage/degradation	Sa

19. Electromagnetic Pulse (EMP) (4.3.1.2)		Operate through EMP environments anticipated for the ICBM weapon system without damage/degradation	Sa
20. Nuclear Radiation (4.3.1.3)		(1) Operate with nuclear radiation environments expected by the ICBM weapon system without damage/degradation (2) Upset and recovery permitted with operator assistance (3) Recovery from nuclear radiation effects must not exceed 5 minutes	Op for da
21. Security (4.3.2)		Will not degrade security of ICBM weapon system	Sa
22. TEMPEST (4.3.3)		Consistent with existing environment found in ICBM LCC and will provide same protection from hostile interception of emanations as the current system	Sa
23. Maintenance Planning (5.1)		Two levels	Sa
24. Built-in-Test Effectiveness (5.1.1.1)		Isolate to 2 or fewer LRUs 98% of time and 1 LRU 95% of the time	Isc
25. Manpower (5.3.1)		Not exceed current manning or skill levels	Sa
26. MPT/EWO Classroom/MEP Trainer (5.3.3)		(1) ICBM VLF/LF system installed in MPT must look identical to the operational ICBM VLF/LF system and provide full fidelity simulation (2) EWO classroom/MEP trainer must be modified	Sa
27. MPT Availability (5.3.3.1)		Meet existing MPT availability requirements to ensure MPT training not degraded due to excessive downtime	Sa

REQUIREMENTS CORRELATION MATRIX

PART II

(Supporting Rationale for System Capabilities and Characteristics)

AS OF DATE: 26 April 1996

Parameter 1 -- Interoperability - The ICBM VLF/LF system will be interoperable with the JCS VLF/LF network, also known as the MEECN, and must be capable of receiving all EAM transmission formats prescribed in EAP-CJCS Volume VII, transmitted by any existing or planned JCS VLF/LF transmission platforms. The JCS VLF/LF network transmits across the 14-60 KHz frequency spectrum. This is a key parameter to ensure the ICBM forces have a survivable VLF/LF communications link with the NCA for receipt of EAMs so they can properly respond to NCA direction. (para 4.1.1)

Parameter 2 -- VLF/LF Modes - The ICBM VLF/LF system must receive and process messages over MEECN Modes 15, 9, 9 MMPM and HIDAR. The requirements for MEECN interoperability identified in JCS Memorandum 124-91, High Data Rate Strategic Connectivity Modes and JCS Memorandum 156-91, Minimum Essential Emergency Communication Network Modes mandate that all

VLF/LF MEECN systems incorporate the capability of receiving MEECN Modes 15, 9, 9 MMPM, and HIDAR. This is a key parameter. (para 4.1.2)

Parameter 3 -- Frequency Scan/Mode Search - The updated receiver requires the capability of frequency scanning and mode searching a minimum of 5 operator selected transmission sources. This is required because ICBM forces have the capability of receiving emergency action message from 5 airborne platforms. The VLF/LF system must be capable of simultaneously searching and recognizing MEECN Mode 15 and either MEECN Mode 9, 9 MMPM or HIDAR to meet the MEECN interoperability, message delivery time, and probability of correct message receipt requirements. A MEECN Mode 15 message will take priority over a special mode message received at the same time, since the primary mode of receipt for ICBM forces is MEECN Mode 15. (para 4.1.3)

Parameter 4 -- Probability of Correct Message Receipt - The threshold requirement is 90% with an objective of 99%. This threshold will be met when an EAM transmitted from the originator is received by the ICBM VLF/LF system, processed through the REACT HAC/RMPE and displayed on the REACT console VDU or Printer. This is a key parameter in determining the operational effectiveness of the MMRT system. The rationale for this parameter is based on the requirements outlined in CJCS 6811.01, Nuclear Command and Control System Technical Performance Criteria and USSTRATCOM/J61 letter, Operational Effectiveness Value to Support ICBM Modified Miniature Receive Terminal ORD, dated 10 Aug 95. (para 4.1.4)

Parameter 5 -- Message Piecing - To meet the message delivery time and probability of missed message requirements of the MEECN, the modified VLF/LF receiver will be capable of piecing multiple copies of messages. This piecing capability is already resident in the existing MRT system that will be modified for the ICBM VLF/LF system. The ICBM VLF/LF system must comply with the message piecing requirements of EAP-CJCS Vol I. If the ICBM VLF/LF system is unable to piece a message received over MEECN Mode 9 or 15, the piece/fragment should be sent to the REACT HAC/RMPE for further processing. We recognize that message piece/fragments received over 9 MMPM and HIDAR will not be sent to the output device and it would be cost prohibitive to change this. However, it is critical that no changes are made to the MRT during modification that would prevent a message piece/fragment received over MEECN Mode 15/9 from being sent to the operator for processing. This would allow the ICBM forces to take maximum advantage of the piecing capabilities already resident in the REACT system for pieces/fragments received over multiple communication systems. (para 4.1.5)

Parameter 6 -- Timing Source Update - To ensure continued receipt of emergency action messages over VLF/LF special modes, the ICBM VLF/LF system must include an accurate timing source. A method must be provided for the manual updating of the ICBM VLF/LF system timing source to account for "timing drift" and possible loss of time due to loss of power to the ICBM VLF/LF system, maintenance actions or upset and recovery of the system due to nuclear effects. (para 4.1.6)

Parameter 7 -- REACT Compatibility - All automatically generated output from the ICBM VLF/LF system to include ICBM VLF/LF system status, fault status,

EAMs and associated alarms must be displayed to the operator at the REACT console VDU. In the event of HAC/RMPE primary processor failure, automatically generated output from the ICBM VLF/LF system to include ICBM VLF/LF system status, fault status, EAMs and associated alarms must be displayed to the operator at the REACT console backup printer. The intent of this requirement is to ensure output generated by the new ICBM VLF/LF system is handled in the same manner with REACT as output generated by the already existing ICBM communication systems, thus ensuring a consistent interface is maintained between the REACT console and all ICBM communication systems. This is a key parameter because the ICBM community recently deployed a $700 million REACT console whose primary purpose was to improve the human interface/human factors associated with operating the ICBM system and to improve crew reaction time by consolidating functionality of LCC components into one operating console. Therefore, it is critical the new ICBM VLF/LF system interface with the REACT system. (para 4.1.7)

Parameter 8 -- ICBM VLF/LF System Terminal Control - The ICBM VLF/LF system receiver must have the capability to be controlled from a location that allows the operator to control the ICBM VLF/LF receiver while strapped into an LCC chair. This will ensure the operator's ability to safely control and operate the ICBM VLF/LF system in a nuclear environment. This terminal control will enhance human interface/human factors for routine operations such as BIT, loading/updating time, mission/communication plans, frequency changes, crypto variables and any other crew operation required to control the ICBM VLF/LF system. The ICBM VLF/LF system must have the capability of storing a minimum of 5 days worth of frequencies and associated crypto variables for 5 operator selected transmission sources. This will ensure the amount of time the operator must spend controlling and operating the ICBM VLF/LF system is minimized. In addition, failure of the HAC/RMPE primary processor must not prevent the operators ability to control the ICBM VLF/LF system. The ICBM VLF/LF system design must ensure a single point failure to the HAC/RMPE primary system does not result in the loss of the LCCs survivable communications link to the NCA. The objective is to accomplish terminal control from the REACT console, provided the design solution allows sufficient space at the REACT console for future communication system terminal control units. ICBM VLF/LF system terminal control is a key parameter. (para 4.1.8)

Parameter 9 -- Anti-Jam Capability - The updated MMRT receiver is required to incorporate an Anti-Jam capability, to counter the jamming threat to VLF/LF MEECN systems, as projected in Threat to WWMCCS and MEECN Communications, DIA-475-45, Jan 90. This anti-jamming capability must ensure PCMR requirements are still met in a jamming environment. (para 4.1.9)

Parameter 10 -- Human Machine Interface - The new ICBM VLF/LF system operations are directly tied to operations at the REACT console; therefore, the ICBM VLF/LF HMI must be consistent with the HMI already employed for the REACT console and the existing ICBM communication systems that interface with the REACT console. This is particularly important since the terminal control unit may be separated from the REACT console. The intent is to employ a system that is consistent with how the other communication systems interface with the REACT console. For example, ICBM VLF/LF system feedback as a result of crewmember data input errors should be displayed at the ICBM VLF/LF terminal control unit instead of forcing the operator to move to the REACT console to determine his data

input error. (para 4.1.10)

Parameter 11 -- System Interfaces - To comply with Minuteman space and hardness requirements, the ICBM VLF/LF system and any associated subassemblies must be capable of being integrated into the internal envelope of an existing or modified ICBM equipment rack or be securely mounted to existing LCC equipment. (para 4.1.11)

Parameter 12 -- Environmental Control System - The ICBM VLF/LF system must interface with the existing LCC environmental control system for cooling so as not to degrade vital cooling to other LCC equipment. (para 4.1.11.1)

Parameter 13 -- Power Source - The ICBM VLF/LF system must use available LCC power and will not degrade the existing power system of the LCC. The ICBM VLF/LF system must maintain frequencies, crypto and time during LCC power transfers. (para 4.1.11.2)

Parameter 14 -- Antenna Interface - In order to meet the message delivery time, probability of missed message requirements, and the probability of correct message receipt requirements; the ICBM VLF/LF system must use the existing SLFCS antenna system. (para 4.1.11.3)

Parameter 15 -- EMI/EMC - The ICBM VLF/LF system will not adversely effect surrounding equipment, causing electromagnetic interference which degrades system operation. MIL-STD-461 must be complied with to satisfy this requirement. (para 4.1.11.4)

Parameter 16 -- MTBCF - The ICBM VLF/LF system will have no more than one critical failure in 2738 hours while installed and operating (24 hours per day) in the ground benign environment of the LCC. This is based on analysis which considers the number of dispatches, distance to the sites, availability requirements, change in maintenance concept and spare pool. Critical failures are those failures to the ICBM VLF/LF system which result in the inability to receive any emergency action message. ICBM LCCs are up to 150 miles from the support base. A low MTBCF would necessitate more frequent trips to the field and could result in excessive down-time of critical communications equipment. Compounding this problem is the limited number of spare assets available. Additionally, the ICBM VLF/LF system will not require dispatch of maintenance personnel to accomplish periodic preventive maintenance in order to meet the MTBCF requirement. An MTBCF of 2738 hours would allow the ICBM fleet to meet their operational availability requirements with a limited spare pool. The objective is 5475 hours. This is a joint program and MTBCF is similar to the E-4B/E-6B requirement of Mean Time Between Operational Mission Failure (MTBOMF). (para 4.2.1)

Parameter 17 -- Operational Availability - The ICBM VLF/LF system will have an operational system availability of 0.99. This requirement must support the overall missile weapon system availability and is based on the requirements outlined in CJCS 6811.01, Nuclear Command and Control System Technical Performance Criteria. The formula for Operational Availability is: **MTBCF/MTBCF+Mean Repair Time (MRT)+Mean Logistics Delay Time (MLDT).** The MLDT for ICBM communications is 24 hours and should be used in Operational Availability calculations. The aircraft portion of this program uses a

similar formula of: Uptime/Uptime+Downtime. (para 4.2.2)

Parameter 18 -- Nuclear Shock and Vibration - The ICBM VLF/LF system must operate through nuclear shock and vibration environments anticipated for the ICBM weapon system without damage/degradation. These environments are specified in ICBM Weapon System Specification S-133-128B, Appendix III, Section 30.3.2.1.1.3. (para 4.3.1.1)

Parameter 19 -- Electromagnetic Pulse (EMP) - The ICBM VLF/LF system will be capable of operating through the EMP portion of a nuclear event without damage/degradation or loss of EAM reception as defined in ICBM Weapon System Specification, S-133-128B. (para 4.3.1.2)

Parameter 20 -- Nuclear Radiation - The ICBM VLF/LF system will operate with nuclear radiation environments expected by the ICBM weapon system without damage/degradation. Upset resulting from nuclear effects shall be permitted with operator assistance. In order to ensure connectivity with the NCA, the ICBM VLF/LF system must recover from nuclear effects within the time parameters for upset and recovery of the REACT console--5 minutes. The objective is for the system to operate through the nuclear radiation environment without upset and recovery or damage/degradation. The nuclear environment constraints to ensure survivability are identified in the ICBM Weapon System Specification, S-133-128B. (para 4.3.1.3)

Parameter 21 -- Security - The ICBM VLF/LF system will not degrade the security of the ICBM weapon system. (para 4.3.2)

Parameter 22 -- TEMPEST - ICBM VLF/LF system TEMPEST performance must conform to the requirements of the ICBM Weapon System Specification, S-133-128B, Appendix I, Section 10.3.2.2.2.1.5. (para 4.3.3)

Parameter 23 -- Maintenance Planning - Air Force initiatives mandate implementation of two level maintenance for all new systems. (para 5.1)

Parameter 24 -- Built -n-Test Effectiveness - Inability to replicate transient faults and increasingly scarce O&M funds necessitate LRU fault isolation to the maximum realistic extent possible. BIT is the preferred method to isolate faults down to a single LRU. The BIT effectiveness requirement is to isolate to 2 or fewer LRUs 98% of the time and down to 1 LRU 95% of the time. The objective is to isolate to 1 LRU 100% of the time. (para 5.1.1.1)

Parameter 25 -- Manpower - Existing manpower loading levels and existing skill levels can not be increased. (para 5.3.1)

Parameter 26 -- MPT/EWO Classroom/MEP Trainer - It is essential the ICBM VLF/LF system installed in the MPT look identical to the ICBM VLF/LF system installed in an operational LCC and it must provide a full fidelity simulation. Additionally, the EWO Classroom/MEP trainer software must also be modified. Training is an integral part of ICBM operations and it is critical the MPT be properly modified for this new capability. (para 5.3.3)

Parameter 27 -- MPT Availability - To ensure MPT training is not degraded due

to excessive down-time, the ICBM VLF/LF system installed in the MPT must meet the existing MPT requirements for availability. (para 5.3.3.1)

ACRONYMS AND ABBREVIATIONS

AF Air Force

AFB Air Force Base

AFMC Air Force Materiel Command

AFOTEC Air Force Operational Test and Evaluation Center

AFSPC Air Force Space Command

AIS Automated Information Systems

AITS Adopted Information Technology Standards

BIT Built-in-Test

C3 Command, Control, and Communications

C4I Command, Control, Communications, Computers and Intelligence

CJCS Chairman, Joint Chiefs of Staff

COMSEC Communications Security

Crypto Cryptographic

DIA Defense Intelligence Agency

DFMR Dual Frequency MEECN Receiver

DLA Defense Logistics Agency

DoD Department of Defense

DTD Data Transfer Device

DT&E Development Test and Evaluation

EAM Emergency Action Message

EAP Emergency Action Procedures

ECS Environmental Control System

ESC Electronic Systems Center

ECT EWO Classroom Trainer

EMI Electromagnetic Interference

EMC Electromagnetic Compatibility

EMP Electromagnetic Pulse

EWO Emergency War Order

FOC Full Operational Capability

FOT&E Follow-on Operational Test and Evaluation

GCCS Global Command and Control Center

HAC/RMPE Higher Authority Communications/Rapid Message Processing Element

HIDAR High Data Rate

HM/HS Hardness Maintenance/Hardness Surveillance

HMI Human Machine Interface

HSI Human System Integration

HQ Headquarters

IAW In Accordance With

ICBM Intercontinental Ballistic Missile

ILS Integrated Logistics Support

INFOSEC Information Security

IOC Initial Operational Capability

IOT&E Initial Operational Test and Evaluation

JCAALS Joint Computer Aided Acquisition Logistics System

JCS Joint Chiefs of Staff

KHz Kilohertz

LCC Launch Control Center

LRU Line Replaceable Unit

MDT Mean Down Time

MEECN Minimum Essential Emergency Communications Network

MEP Minuteman Ehanced Procedures

MIL Military

MLDT Mean Logistics Delay Time

MMPM MEECN Message Processing Mode

MMRT Modified Miniature Receive Terminal

MPT Missile Procedures Trainer

MRT Miniature Receive Terminal

MRT Mean Repair Time

MNS Mission Need Statement

MTBCF Mean Time Between Critical Failure

MTBF Mean Time Between Failure

MTBOMF Mean Time Between Operational Mission Failure

MTTR Mean Time to Repair

NAOC National Airborne Operations Center

NCA National Command Authority

NSA National Security Agency

O&M Operations and Maintenance

OPSEC Operations Security

ORD Operational Requirements Document

OSD Office of the Secretary of Defense

PCMR Probability of Correct Message Receipt

RAA Required Assets Available

RCM Requirements Correlation Matrix

REACT Rapid Execution and Combat Targeting

SBSS Standard Base Supply System

SCS Strategic Connectivity System

SE Support Equipment

SIOP Single Integrated Operational Plan

SLFCS Survivable Low Frequency Communication System

SRU Shop Replaceable Unit

SSI System Support Initiative

STAR System Threat Assessment Report

STD Standard

TAFIM Technical Architecture Framework for Information

TBD To Be Determined

T.O. Technical Order

US United States

USAF United States Air Force

USCINCSTRAT Commander in Chief, United States Strategic Command

VLF/LF Very Low Frequency/Low Frequency

Vol Volume

WWMCCS World Wide Military Command and Control System