DATE: 1 April 1997

OPERATIONAL REQUIREMENTS DOCUMENT (ORD)

AFSPC 005-95B-I/II

EXTREMELY HIGH FREQUENCY (EHF) CAPABILITY

FOR

THE ICBM LAUNCH CONTROL CENTERS

ACAT Level III

BRIAN A. ARNOLD

Brigadier General, USAF

Deputy Director of Requirements

OPR: HQ AFSPC/DRMS (Maj Negrón)

Phone: DSN 692-9608/COM 719-554-9608

EHF COMMUNICATIONS CAPABILITY FOR THE ICBM LCCs ORD

TABLE OF CONTENTS

Section Page

1. GENERAL DESCRIPTION OF OPERATIONAL CAPABILITY..... 1

1.1 Mission Area Description..... 1

1.1.1. ICBM EHF Primary Mission Areas..... 1

1.1.2. ICBM EHF Secondary Mission Areas..... 1

1.1.3. Survivable Communications Requirements..... 1

1.1.4 EHF Capability for the ICBM LCCs Operational Requirements Document..... 2

1.1.5. Key Performance Parameters..... 2

1.2. Mission Need 3

1.2.1. Survivable Communications 3

1.2.2. ICBM Mission Need Statement (MNS) 005-95 3

1.3. Proposed System 3

1.3.1. Requirements 4

1.3.2. Approach 4

1.3.3. Efficiency and Effectiveness 5

2. THREAT 5

2.1. Operational Threat Environment 5

2.2. System Specific Threats/Reactive Threat 5

3. SHORTCOMINGS OF EXISTING SYSTEMS 5

3.1. ICBM Super High Frequency Satellite Terminal 5

3.2. Air Force Satellite Communications Terminal 6

3.3. 616A Survivable Low Frequency Communications System 6

3.4. Strategic Automated Command and Control System 6

4. CAPABILITIES REQUIRED 6

4.1. System Performance 6

4.1.1. Interoperability 6

4.1.2. Probability of Correct Message Receipt 6

4.1.3. REACT Compatibility 6

4.1.4. Terminal Control 7

4.1.5. Human Machine Interface (HMI) 7

4.1.6. System Interfaces 7

4.1.7. Automated Communications Management System (ACMS) Compatibility 8

4.2. Logistics and Readiness ... 8

4.2.1. Mean Time Between Critical Failure (MTBCF) ... 8

4.2.2. Operational Availability ... 8

4.3. Other System Characteristics ... 8

4.3.1. Nuclear Survivability ... 8

4.3.2. Security ... 8

4.3.3. TEMPEST ... 9

5. PROGRAM SUPPORT ... 9

5.1. Maintenance Planning ... 9

5.1.1. Organizational ... 9

5.1.2. Depot ... 9

5.1.3. COMSEC Equipment Maintenance ... 9

5.1.4. System Support Initiative (SSI) ... 10

5.2. Support Equipment (SE) ... 10

5.2.1. Field Test Capability ... 10

5.2.2. Organizational Support Equipment ... 10

5.3. Human System Integration ... 10

5.3.1. Manpower and Personnel ... 10

5.3.2. Training and Training Support ... 10

5.3.3. MPT/MEP Trainer ... 11

5.3.4. Safety ... 11

5.4. Resources ... 11

5.4.1. Computer Resource Design ... 11

5.4.2. Computer Resource Support ... 11

5.4.3. Software Engineering ... 11

5.5. Other Logistics Considerations ... 11

5.5.1. Packaging, Handling, and Transportation ... 11

5.5.2. Technical Data ... 12

5.5.3. Operational Environment ... 12

5.5.4. Supply Support ... 12

5.6. Command, Control, Communications, and Intelligence (C3I) ... 13

5.6.1. COMSEC ... 13

5.7. Transportation and Basing ... 13

5.8. Standardization, Interoperability, and Commonality ... 13

5.9. Mapping, Charting, and Geodesy Support ... 13

5.10. Environmental Support ... 13

6. FORCE STRUCTURE ... 14

6.1. ICBM LCCs ... 14

6.2. 20th AF Missile Operations Center ... 14

6.3. Test Facility Assets ... 14

6.4. Trainers ... 14

6.5. Spares ... 14

7. SCHEDULE CONSIDERATIONS ... 14

7.1. Test Program ... 14

7.1.1. ICBM Test Sites/Operational LCCs ... 14

7.1.2. Capabilities Required Prior to IOT&E ... 14

7.2. Required Assets Available (RAA) ... 15

7.2.1. Maintainability Demonstration ... 15

7.3. Initial Operational Capability ... 15

7.3.1. Other Capabilities Required Prior to IOC ... 15

7.4. Full Operational Capability (FOC) ... 15

7.5. Program Major Milestone Dates Completed and Planned..... 15

FIGURES PAGE

Figure 1-1: ICBM EHF Concept of Operations..... 2

APPENDICES

Appendix A: Requirements Correlation Matrix - Part I..... A-1

Appendix B: Requirements Correlation Matrix - Part II..... B-1

Appendix C: Acronyms and Abbreviations..... C-1

OPERATIONAL REQUIREMENTS DOCUMENT (ORD)

AFSPC 005-95B-II

FOR

EXTREMELY HIGH FREQUENCY (EHF) COMMUNICATIONS CAPABILITY FOR THE ICBM LAUNCH CONTROL CENTERS

1. GENERAL DESCRIPTION OF OPERATIONAL CAPABILITY.

EHF 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. The Intercontinental Ballistic Missile (ICBM) Super High Frequency Satellite Terminal (ISST) was fielded as an interim system in 1990. ISST uses the Single Channel Transponder (SCT) package on the Defense Satellite Communication System (DSCS). This becomes unsupportable beyond 2004. 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 ICBM LCCs. Strategic systems must transition to the EHF spectrum to assure continued survivable command and control of nuclear forces.

1.1. Mission Area Description.

1.1.1. ICBM EHF 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 ICBM EHF system is to provide a high-confidence, survivable 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 EHF range as well as a survivable force report-back capability (See Figure 1-1).

1.1.2. ICBM EHF 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 will actually be received by the LCCs and our communications, both receive and transmit, will not be easily disrupted. Serious deficiencies will exist in this area when the SCT capability of the DSCS satellites becomes unsupportable and Air Force Satellite Communication (AFSATCOM) goes beyond its life expectancy of 2004. A replacement system is required for the interim ISST system and the report-back capability of AFSATCOM.

Figure 1-1 ICBM EHF Concept of Operations

1.1.4. EHF Capability for the ICBM Launch Control Centers Operational Requirements Document. This ORD addresses the requirements for a replacement of ISST that will maintain a survivable communications capability for the ICBM force for the remainder of its expected life span and the report-back capability of AFSATCOM.

1.1.5. Key Performance Parameters. The key performance parameters for the proposed system are Interoperability, Probability of Correct Message Receipt (PCMR), Rapid Execution And Combat Targeting (REACT) compatibility, ICBM EHF terminal control, and Nuclear Survivability.

1.1.5.1. Interoperability. Interoperability refers to the capability of the ICBM EHF system to operate within the JCS EHF-EAM networks. This includes the ability to receive all Chairman, Joint Chiefs of Staff (CJCS) EAM transmission formats transmitted by any existing or planned JCS EHF transmission platform across the JCS EHF-EAM networks. Additionally, the ICBM EHF system, whether operable or inoperable, must not exhibit any failure mode which would degrade mission critical functions or cause any safety or environmental hazard within the LCC.

1.1.5.2. Probability of Correct Message Receipt. PCMR is the key measurement of system performance and must be at least 90% with an objective of 99%.

1.1.5.3. REACT Compatibility. The new ICBM EHF system must be compatible with the REACT console system for receipt of all ICBM EHF system status, fault status, EAMs and associated alarms and transmission of force report-back messages.

1.1.5.4. Terminal Control. ICBM EHF terminal control refers to providing an interface which allows the operator to control the system while strapped into an LCC chair. Also, the ICBM EHF system must re-establish connectivity with the applicable satellite without operator assistance after intermittent loss of satellite signal occurs as described in the Milstar System Specification.

1.1.5.5. Nuclear Survivability. Nuclear survivability refers to the capability of the ICBM EHF system to accomplish its mission in the face of hostile nuclear enviornments resulting from an enemy attack.

1.2. Mission Need.

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

1.2.1.1. Background. The ICBM force requires an EHF system to provide continued survivable rapid receipt of NCA direction. Existing command and control communications will be unsupportable

beyond 2004 and have begun transition from the SCT payload to EHF. Improved EHF communications remains a key to providing survivable communications to strategic nuclear forces. Additionally, the SCT packages on board the DSCS satellites, which currently provide connectivity to the ISST system, will not be available for delivery of EAMs to the ICBM forces by 2004.

1.2.2. ICBM Mission Need Statement (MNS) 005-95. The need for an EHF system was addressed in the Air Force Space Command (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 Office of the Secretary of Defense (OSD) Strategic Command, Control, and Communications (C3) review of 3 September 1991 outlined a new Minimum Essential Emergency Communications Network (MEECN) command and control architecture. This review sought to improve the performance, survivability, and reliability of the US strategic communications systems. Key to this revised architecture is a modernization of the ICBM C3 capability. The proposed solution to the ICBM EHF deficiency is to move ICBM users from the Fleet Satellite (FLTSAT) constellation to an EHF capability as soon as possible. The EHF system will provide ICBM LCCs with reliable EHF receive and transmit capabilities that will ensure interoperability and connectivity with the NCA in support of the MEECN architecture.

1.3.1. Requirements. The ICBM EHF system must be capable of meeting the key performance parameters of Interoperability, PCMR, REACT compatibility, ICBM EHF system control and Nuclear Survivability as listed in paragraph 1.1.5, as well as several secondary requirements, as listed below.

1.3.1.1. Interoperability With Milstar Architecture. The ICBM EHF system shall be interoperable within the JCS EHF-EAM networks architecture and will receive all EAM transmission formats as prescribed by Emergency Action Procedures (EAP)-CJCS Volume VII. The ICBM EHF system will receive higher authority digital communications for US strategic forces across the JCS EHF network. The ICBM EHF system shall be capable of receiving and processing EAMs transmitted by all existing or planned EHF transmitters and transmitting force report-back messages using message formats and frequencies employed by the JCS EHF-EAM networks.

1.3.1.2. Compatibility. The ICBM EHF system must be compatible with all existing Missile Alert Facility (MAF) equipment. The ICBM EHF system must interface with the REACT console's Higher Authority Communications/Rapid Message Processing Element (HAC/RMPE) system for the transferal of fault status, system status, EAM reception data and associated alarms. Those components residing in the LCC must operate using the existing electrical and cooling systems, without degrading power or cooling to other LCC systems. The LCC components 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 EHF system must provide an interface which allows the operator to control the ICBM EHF system while strapped into an LCC chair.

1.3.1.3. System Performance. The ICBM EHF system shall provide timely, secure, survivable, jam-resistant reception of command, control and communications from NCA to fixed LCCs and force report-back capability from LCCs to the NCA in all specified environments. 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 Chairman, Joint Chiefs of Staff Instruction (CJCSI) 6811.01, Nuclear Command and Control System Technical Performance Criteria.

1.3.1.4. Emergency Operation. Any surviving ICBM EHF system must be capable of operating throughout the extended and emergency survivable period for the LCC as specified in the Minuteman Weapon System Specification, S-133-128C, Appendix I.

1.3.2. Approach. The approach of the proposed ICBM EHF program is to either integrate or modify existing Satellite Communications (SATCOM) systems or design, develop, test, and procure a new system. Additionally, integration will use existing paths into the LCCs wherever possible.

1.3.3. Efficiency and Effectiveness. The ICBM EHF system shall alleviate the deficiencies brought about by the unsupportability of the SCTs package onboard the DSCS satellites. This will establish a survivable two-way communications and control link between the NCA and the strategic nuclear forces which is a key of our deterrence strategy.

2. THREAT.

2.1. Operational Threat Environment. The threat environment for the ICBM EHF system is the same as that specified in the Minuteman III System Threat Assessment Report (STAR) dated Feb 1996. The threat to the ICBM 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.

2.2. 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, 31 Mar 94; C4I Systems and Networks Telecommunications Networks and Automated Information Systems (AIS) Threat Environment Description, DST-2660F-210-94, 15 Jan 94; and Threat to World Wide Military Command and Control System (WWMCCS) and MEECN Communications, DIA-475-45, January 1990. In addition, the Minuteman III STAR dated Feb 1996 describes 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.

3. SHORTCOMINGS OF EXISTING SYSTEMS. The ISST and AFSATCOM systems are not survivable. AFSATCOM is currently assessed as ineffective in a stressed environment, due to scintillation. However, both ISST and AFSATCOM will continue to be used throughout their mission duration. Neither SATCOM system is scheduled for replenishment. Milstar Ultra High Frequency (UHF), incorporated into the existing Minuteman III AFSATCOM terminal, Dual Modem Upgrade Phase II, meets our requirements for force element report-back but cannot meet the combat environment timing or availability for EAMs to the fixed ICBM force due to early scintillation outage of the UHF cross-banded networks. The Very Low Frequency/Low Frequency (VLF/LF) and Strategic Automated Command and Control System (SACCS) communication paths will remain critical components of strategic command and control. The requirement to upgrade the Survivable Low Frequency Communications System (SLFCS) receivers with Modified Miniature Receive Terminals (MMRTs) is associated with upgrading the timing and availability of the second survivable EAM path. The SACCS system supports EAM reception timing, availability, and separate path requirements by providing rapid hard copy communications in an unstressed environment.

3.1 ICBM Super High Frequency Satellite Terminal. The existing ISST was deployed as an interim system. Currently the ICBM force relies on the ISST system to provide timely, secure, jam-resistant receive capability. Although the Super High Frequency (SHF) spectrum in which ISST operates is more survivable than AFSATCOM's UHF spectrum, ISST was deployed as an interim system and was not designed to operate through the required Pre, Trans, and Post Single Integrated Operational Plan (SIOP) environment. The ISST relies on the SCT package onboard the DSCS satellite. This package will become unsupportable by 2003.

3.2. Air Force Satellite Communication Terminal. The Joint Staff has mandated all nuclear users shall migrate off the AFSATCOM constellation into the EHF spectrum. Because the AFSATCOM Terminal operates in the UHF frequency band, it cannot be considered a survivable system. Communications in this band are not capable of continued transmission/reception in a nuclear environment.

3.3. 616A Survivable Low Frequency Communications System. Because it operates in the VLF/LF bands and uses a buried antenna, SLFCS is a survivable system. However the extremely slow speed of message reception in this band means that it cannot be considered a timely system. In addition, its lack of a transmit capability means that it is not useable for force report-back messages.

3.4. Strategic Automated Command and Control System. SACCS is a non-hardened system intended for use in a day-to-day and pre-attack environment. While it is a relatively high speed and timely system, it is not survivable because of its reliance on soft land lines for data transmission.

4. CAPABILITIES REQUIRED. The capabilities defined below are required to provide the LCCs a reliable, secure and survivable two-way communications and control link with the NCA.

4.1. System Performance.

Sc -> Spark or flash -> rapid variation in light

4.1.1. Interoperability. The ICBM EHF system shall be interoperable with the JCS EHF network for receipt of all EAM formats and transmit of all report-back formats applicable to the ICBM force as prescribed by EAP-CJCS Volume VII. **(Threshold)** The ICBM EHF system, whether operable or inoperable, must not exhibit any failure mode which would degrade mission critical functions or cause any safety or environmental hazard within the LCC when exposed to any LCC nuclear or non-nuclear environment specified in the Minuteman Weapon System Specification, S-133-128C. **(Threshold)** **This is a key parameter**.

4.1.2. Probability of Correct Message Receipt. The PCMR for the ICBM EHF system shall be 90% **(Threshold)** The goal is to achieve 99%. **(Objective)** **This is a key parameter.**

4.1.3. REACT Compatibility. All automatically generated outputs from the ICBM EHF system, to include system status, fault status, EAMs and all associated alarms, shall be displayed to the operator at the REACT console HAC/RMPE Visual Display Unit (VDU). Furthermore, the ICBM EHF system shall be capable of accepting data from the HAC/RMPE system for transmission of force report-back status messages. **(Threshold)** In the event of failure of the HAC/RMPE primary processor, automatically generated output from the ICBM EHF system to include system status, fault status, EAMs, and all associated alarms will be displayed to the operator via the REACT console backup printer. **(Threshold)** The intent of this requirement is to ensure output generated by the new ICBM EHF system is handled in the same manner within REACT as output generated by existing ICBM communications systems (SACCS, SLFCS, AFSATCOM). **This is a key parameter**.

4.1.4. Terminal Control. The ICBM EHF system must have the capability to be controlled by the operator while strapped into an LCC chair. **(Threshold)** This system control device shall provide the capability for routine operations such as Built-in-Test (BIT) and any other crew operation required to control the ICBM EHF system. **(Threshold)** In addition, failure of the HAC/RMPE primary processor or peripheral devices must not degrade the operator's ability to control the EHF communication system. **(Threshold)** The ICBM EHF system must re-establish connectivity with the applicable satellite without operator assistance after intermittent loss of the satellite signal occurs as described in the Milstar System Specification. **(Threshold)** The intent of this requirement is for the operator to accomplish this system control from the REACT console. **(Objective)** In order to achieve this , the design solution must leave sufficient space at the REACT console for future communication system control units. **(Objective)** **This is a key parameter**.

4.1.5. Human Machine Interface (HMI). ICBM EHF system operations shall be directly tied to operations at the REACT console; therefore, the ICBM EHF 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, feedback as a result of crewmember data input errors should be displayed at the same position (REACT or EHF system) where the input occurs.

4.1.6. System Interfaces. Those portions of the ICBM EHF system and any associated subassemblies residing in the LCC must be capable of being integrated into the internal envelope of an existing or modified ICBM equipment rack, and must be securely mounted to existing LCC equipment to ensure conformance to nuclear hardness requirements. **(Threshold)** The system must also be capable of meeting the following interface requirements:

4.1.6.1. Environmental Control System (ECS). Those portions of the system that reside in the LCC must operate within the existing LCC ECS capabilities so as not to degrade cooling to other LCC equipment. **(Threshold)**

4.1.6.2. Power Source. The ICBM EHF system must be powered through the Pre, Trans, and post SIOP environments, including LCC extended and emergency survival periods, and shall not degrade MAF power available to other equipment. Those portions of the ICBM EHF system residing in the LCC or Launch Control Equipment Building (LCEB) must operate using available LCC power without degrading other systems. **(Threshold)**

4.1.6.3. Electromagnetic Interference/Electromagnetic Compatibility (EMI/EMC). The ICBM EHF system shall not interfere with nor suffer interference from other equipment located on or within the MAF/LCC which would degrade system operation and must comply with the ICBM EMI/EMC requirements of the Minuteman Weapon System Specification, S-133-128C, paragraph 3.2.2.3. **(Threshold)**

4.1.7 Automated Communications Management System (ACMS) Compatibility The ICBM

EHF system shall be capable of accepting system "image" data generated by the ACMS or uploaded by a fill device. **(Threshold)**

4.1.8. Electromagnetic Spectrum Supportability. The ICBM EHF system shall be certified in accordance with AFI 33-118. **(Threshold)**

4.2. Logistics and Readiness.

4.2.1. Mean Time Between Critical Failures (MTBCF). To the maximum extent possible, system reliability will be achieved through improved component reliability vice redundancy. The ICBM EHF system will have an MTBCF of **2738** hours while installed and operating 24 hours per day in the expected environment of the MAFs to include both day to day and wartime environments. **(Threshold)** The objective for MTBCF is **5476** hours. The ICBM EHF system shall not require dispatch of maintenance personnel nor the use of missile combat crews to perform periodic preventive maintenance to meet MTBCF requirements. **(Threshold)** Critical failures are those failures of the system which result in the inability to receive an EAM or transmit a report-back message.

4.2.2. Operational Availability. The ICBM EHF system shall have an operational availability (Ao) of 0.99. **(Threshold)**

4.3. Other System Characteristics.

4.3.1. Nuclear Survivability. The ICBM EHF system is required to operate without damage/degradation or loss of system parameters, timing, keys or ephemeris data throughout the nuclear induced High Altitude EMP (HEMP) environments specified in the Minuteman Weapon System Specification, S-133-128C, Appendix III, and the near neighbor nuclear environments specified in the Near Neighbor Specification Development for the Minuteman and Peacekeeper Launch Control Centers, 66900-K201-SR-00 (TRW). **(Threshold)** **This is a key parameter.**

4.3.2. Security. The ICBM EHF system shall not degrade the security of the ICBM weapon system. **(Threshold)** Program protection will be applied 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. It also includes Information Protection capabilities to protect the system from Information Warfare attack. Safeguarding the integrity of the system during acquisition, deployment and operation is necessary to maintain the high level of effectiveness of ICBM EHF 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. Critical Program Information (CPI) requires protection to prevent its compromise, unauthorized disclosure, inadvertent transfer or loss. The system must be assessed to identify those CPI items requiring protection. Identify protective countermeasures and determine how long it needs protection, the protection costs and foreign disclosure recommendations. Program protection planning will evaluate and tailor all security programs to develop the most cost-effective countermeasures based on risk and vulnerabilities to known/validated threats.

4.3.3. TEMPEST. The ICBM EHF system shall meet the TEMPEST requirements specified in the Minuteman Weapon System Specification, S-133-128C and associated appendices. **(Threshold)**

5. PROGRAM SUPPORT. The ICBM EHF system Joint Potential Designator has been assessed as **Joint Interest** with the US Navy. An Integrated Logistics Support (ILS) program shall be required for the EHF system and its integration and installation into the ICBM MAFs. This procurement should conduct a Cost As an Independent Variable (CAIV) process to determine the most cost-effective combination of organic and/or contractor maintenance for the lifecycle of the system. If the ILS program determines organic maintenance is the most cost- effective method of sustaining the system, then the maintenance program will support the maintenance concept presently used by ICBMs.

5.1. Maintenance Planning. An analysis must be conducted to determine optimal maintenance procedures to aid in identifying spare requirements and to identify logistics support resources. Two levels of maintenance, organizational and depot, have been defined for ICBM communications systems and must be used with the ICBM EHF 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 consists 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 shall consist of fault detection/isolation verification, Line Replaceable Unit (LRU) removal and replacement, followed by a functional checkout. An LRU is defined as the lowest level of hardware that can be removed and replaced at the organizational level using current two-level maintenance concepts.

5.1.1.1. BIT Effectiveness. BIT capability should be emphasized to minimize the skills required to isolate the fault to a single LRU. The BIT shall be effective enough to isolate to two or less LRUs 98% and to one LRU 95% of the time. **(Threshold)** Isolate to one LRU 99% of the time. **(Objective)**

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 in accordance with applicable AFKAM and AFKAG documentation.

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

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

5.2.1. Field Test Capability. Provide the capability to field test the entire ICBM EHF system installed in an operational LCC. This capability includes the ability to perform Hardness Maintenance/Hardness Surveillance (HM/HS) testing.

5.2.2. Organizational Support Equipment. 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. The ICBM EHF system and integration design shall 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 EHF system will be operated by the missile combat crew to include fault isolation and fault reporting.

5.3.1. Manpower and Personnel. Manpower requirements shall not exceed the current manning levels and skill level requirements at each location for operations, communications maintenance, security police, and support functions. **(Threshold)** In addition, manpower requirements need to be assessed for the ICBM EHF system operations and maintenance. Manpower requirements should not exceed the manpower currently allocated for the operations and maintenance of the ISST it is replacing.

5.3.2. Training and Training Support. Personnel will require contractor provided Type I training for operations, trainers, maintenance and testing of the ICBM EHF system. Information to support development of a recurring training plan will be provided for missile LCCs, through completion of Type I training. Courseware for system training must be provided by the contractor. The courseware must be designed so it can be released to operations training on electronic media. This will reduce manpower intensive tasks necessary to construct operations, trainer and maintenance training from the contractor course material. Any unique HM/HS requirements as a result of the new ICBM EHF 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 the system. Training in the ICBM environment will take place in the Missile Procedures Trainer (MPT) and with the use of the Minuteman Enhanced Procedures (MEP) Trainer. Formation of a Training Program Team is required to define all training requirements and to ensure the training requirements are incorporated into the respective Air Force System Training Plans in accordance with AFI 36-2201.

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

5.3.3.1. MPT Availability. The ICBM EHF system installed in the MPT must not cause the availability of the MPT to fall below 0.95 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 EHF system. 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. System design, specifically software and hardware, must be accomplished in a open systems architecture in compliance with the DoD Joint Technical Architecture (JTA).

5.4.2. Computer Resource Support. The system shall be supportable within the existing structure of 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 EHF system equipment.

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

5.5. Other Logistics Considerations.

5.5.1. Packaging, Handling, and Transportation.

5.5.1.1. Packaging. The packaging shall ensure that the ICBM EHF system equipment is capable of meeting the shock and vibration requirements of the Minuteman Weapon System Specification, S-133-128C, Appendix II, paragraphs 20.2.13 and 20.2.14.

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

5.5.1.3. Transportation. Packaged equipment should be capable of transportation by air and land freight between operational units and depot.

5.5.2. Technical Data.

5.5.2.1. Purpose. Technical data shall 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 operational units. 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-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 shall 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 Environment. The equipment must be protected from a variety of environments. The ICBM EHF system must be designed for the worst case environment of its host systems. Equipment such as the antenna subsystem which operates exposed to the environment must be capable of operating in adverse weather conditions. 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 vehicles 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. Normal supply support shall be 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 shall be supplied to support the system using established United States Air Force (USAF) Standard Base Supply System (SBSS) procedures. Initial spare objectives are:

5.5.4.2.1. 100% critical spares must be on-hand at each operational unit to ensure operational availability requirements are met.

5.5.4.2.2. 90% non-critical spares must be on-hand at each operational unit to ensure operational availability requirements are met.

5.6. Command, Control, Communications, and Intelligence (C3I). The OSD C3I review detailed requirements for MEECN equipment upgrades to support a future C3 architecture. The new EHF receiver must fulfill the EHF receive/transmit 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. The ICBM EHF system will not require changes to intelligence infrastructure support.

5.6.1. COMSEC.

5.6.1.1. COMSEC Device. The ICBM EHF terminal shall use the applicable COMSEC device(s) required to ensure system interoperability on the JCS EHF EAM networks. This device(s) may either be embedded or external. If external, all connecting interfaces shall be provided with the ICBM EHF system. The ICBM EHF terminal shall be fully compatible with the applicable COMSEC devices used in the JCS EAM and report-back networks assigned to the LCCs, to include the KG-84 and KGV-11. Modification of any external COMSEC device(s) shall not be required.

5.6.1.2. COMSEC/Transmission Security (TRANSEC) Fill Device. The ICBM EHF system shall be capable of accepting input from existing COMSEC/TRANSEC fill devices.

5.7. Transportation and Basing. The new ICBM EHF system shall impose no new transportation requirements.

5.8. Standardization, Interoperability, and Commonality. The new EHF system shall be interoperable with the NCA, airborne transmitting platforms and strategic nuclear forces current and

planned Command, Control, Communications, Computers and Intelligence (C4I) systems which utilize the JCS EHF networkand shall adhere to the Defense Information Infrastructure Common Operating Environment. The ICBM EHF system shall comply with the requirements of the DoD JTA. Additionally, the system shall be capable of accepting "image" data generated by the ACMS. In order to achieve interoperability with fielded and proposed systems, the requirements for this capability will conform to applicable information technology standards specified in the DoD JTA to enhance C4I.

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

5.10. Environmental Support. Forecast services will provide standard products and services containing meteorological conditions affecting EHF operations. The system and antenna equipment shall meet the connectivity requirements of the system in degraded weather conditions.

6. FORCE STRUCTURE.

6.1. ICBM LCCs. The ICBM EHF system will be deployed into 50 Minuteman operational LCCs and 5 Peacekeeper LCCs, contingent on the START II Treaty.

6.2. 20th AF Missile Operations Center. The ICBM EHF system will be deployed into the 20th Air Force Missile Operations Center at F.E. Warren AFB.

6.3. Test Facility Assets. There are six test facilities. Two are located at Hill AFB, two are located at Vandenberg AFB, one is located at the HAC/RMPE Software Support Facility at Offutt AFB and one is located at the Electronic Systems Center (ESC) MITRE REACT Testbed (EMRT) in Bedford, MA.

6.4. Trainers. Thirteeen MPTs, 20 MEP Trainers, and two software development stations will need modification for the ICBM EHF system. These facilities will not require installation of actual assets but must fully simulate the operation of the ICBM EHF system.

6.5. Spares. The quantity and location of spares to support the operational, test and trainer sites is to be determined in accordance with the ILS program detailed in paragraph 5 above and shall be based on the operational availability and reliability of ICBM EHF system.

7. SCHEDULE CONSIDERATIONS.

7.1. Test Program. The ICBM EHF system Test and Evaluation (T&E) 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 IOT&E.

7.1.1. ICBM Test Sites/Operational LCCs. DT&E and IOT&E shall be conducted on a REACT modified ICBM Test Site/Operational LCC and/or a Peacekeeper modified ICBM Test Site/Operational LCC. DT&E will begin as soon as possible. IOT&E will be conducted by AFOTEC to support a production/fielding decision.

7.1.2. Capabilities Required Prior to IOT&E.

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

7.1.2.2. System. ICBM EHF system, MPT and MEP Trainer capability must be delivered prior to IOT&E to support AFOTEC testing.

7.1.2.3. Technical Data. All technical data shall be validated and verified during development and delivered prior to IOT&E.

7.1.2.4. COMSEC Material. All applicable COMSEC material including required operational and test keys shall be requested and delivered through appropriate COMSEC channels to the test site(s) prior to IOT&E.

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

7.2. Required Assets Available (RAA). The RAA requirement shall be met by the delivery of **TBD** pre-production ICBM EHF system units to the program. ICBM EHF system units for ICBM LCCs are scheduled for delivery in **TBD**. 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 test Site/operational 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.

7.2.1. Maintainability Demonstration. A demonstration by the developer will be conducted to prove the concept(s) for maintaining and supporting the complete ICBM EHF system, including SE prior to RAA. This demonstration will include a demonstration of the fault detection/fault isolation capabilities of the system. The maintainability demonstration will also include faults/procedures to demonstrate HM/HS techniques.

7.3. Initial Operational Capability. IOC shall be declared for the new EHF system in ICBM LCCs when fully installed and operational in two ICBM LCCs and AFSPC determines that the system is capable of supporting the ICBM mission. The ICBM EHF system must be capable of receiving traffic from the JCS EHF network, and EAM traffic originated by all authorized EHF transmission systems. Also, Missile Combat Crew Members must be fully trained to operate the ICBM EHF system. Additionally, the ICBM EHF system must be capable of transmitting force status report-back messages into the applicable network. 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 **TBD**.

7.3.1. Other Capabilities Required Prior to IOC.

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

7.3.1.2. Software. The software shall have no known mission critical defects 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 or transmit a report-back message.

7.4. Full Operational Capability (FOC). The final program milestone is reached when: 1) all ICBM LCCs, 20 AF Missile Operations Center, test facilities, and trainers have an installed and operational ICBM EHF system; 2) required spares and maintenance support is in place; and 3) operators and maintainers are sufficiently trained. FOC for the ICBM EHF system will be an AFSPC decision. Anticipated FOC date is **TBD** for ICBM LCCs.

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

---

1. Interoperability (4.1.1) *	(1) With the JCS EHF-EAM Networks for receipt of all EAM transmission formats and transmit of all report-back formats per EAP-CJCS Volume VII, transmitted by any existing or planned JCS EHF platform (2) Must not exhibit any failure mode which would degrade mission critical functions or cause any safety or environmental hazard within the LCC when exposed to any LCC nuclear or non-nuclear environment specified in the Minuteman Weapon System Specification, S-133-128C	Same
2. Probability of Correct Message Receipt (4.1.2) *	90%	99%
3. REACT Compatibility (4.1.3) *	(1) Automatically generated output from the ICBM EHF system to include system status, fault status, EAMs and all associated alarms will be displayed to	Same

	the operator at the REACT console HAC/RMPE VDU (2) Accept data from the HAC/RMPE system for transmission of force report-back status messages (3) In event of failure of HAC/RMPE primary processor, automatically generated output from the ICBM EHF system to include system status, fault status, EAMs and all associated alarms will be displayed to the operator via the REACT console backup printer	
4 ICBM EHF System Control (4.1.4) *	(1) Capable of being controlled by an operator while strapped into an LCC Chair (2) Include capability of BIT, and any other crew operation required to control the ICBM EHF system (3) Failure of HAC/RMPE primary processor or peripheral devices must not prevent operator's ability to control the ICBM EHF system (4) Re-establish connectivity with the applicable satellite without operator assistance after intermittent loss of the satellite signal occurs as described in the Milstar System Specification	(1) Accom REACT cons (2) Desig space at t communicat
5. Human Machine Interface (4.1.5)	Consistent with HMI already employed for the REACT console and existing ICBM communications systems that interface with the REACT console	Same
6. System Interfaces (4.1.6)	Portions residing in the LCC 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	Same
7. Environmental Control System (4.1.6.1)	Portions residing in the LCC operate within existing LCC ECS capabilities and not degrade cooling to other LCC equipment	Same
8. Power Source (4.1.6.2)	Power must be available through the Pre, Trans , and post SIOP environments, including LCC extended and emergency survival periods, and shall not degrade MAF power available to any other equipment. Those portions of the system located in the LCC or LCEB must operate using available LCC power without degrading other systems.	Same
9. EMI/EMC (4.1.6.3)	Not interfere with nor suffer interference from other equipment on or within the MAF/LCC which would degrade system operation and must comply with the ICBM EMI/EMC requirements of the Minuteman Weapopn System Specification, S-133-128C, paragraph 3.2.2.3	Same
10. Automated Communications Management System (4.1.7)	The ICBM EHF System shall be capable of accepting system "image" data generated by the ACMS or uploaded by a fill device	Same
11. Electromagnetic Spectrum Supportability (4.1.8)	The ICBM EHF system shall be certified in accordance with AFI 33-118.	Same
12. MTBCF (4.2.1)	(1) 2738 Hours	5476 Hours

	(2) Not require periodic preventive maintenance to meet MTBCF	
13. Operational Availability (4.2.2)	0.99	Same
14. Nuclear Survivability (4.3.1) *	Operate without damage/degradation or loss of system parameters, timing, keys or ephemeris data throughout the nuclear induced High Altitude EMP (HEMP) environments specified in the Minuteman Weapon System Specification, S-133-128C, Appendix III and the near neighbor nuclear environments specified in the Near Neighbor Specification Development for the Minuteman and Peacekeeper Launch Control Centers, 66900-K201-SR-00 (TRW) .	Same
15. Security (4.3.2)	Will not degrade security of ICBM weapon system	Same
16. TEMPEST (4.3.3)	Meet the TEMPEST requirements specified in the Minuteman Weapon System Specification, S-133-128C and associated appendices	Same
17 Maintenance Planning (5.1)	Two levels	Same
18. Built-in-Test Effectiveness (5.1.1.1)	Isolate to 2 or less LRUs 98% of time and 1 LRU 95% of the time	Isolate to
19. Manpower and Personnel (5.3.1)	Not exceed current manning or skill levels	Same
20. MPT/MEP Classroom Trainer (5.3.3)	(1) ICBM EHF system installed in MPT must look identical to the operational LCC system and provide full fidelity simulation of the ICBM EHF capability (2) Minuteman Enhanced Procedures (MEP) Trainer must be modified (3) Trainer software must be modified to incorporate ICBM EHF system	Same
21. MPT Availability (5.3.3.1)	Not cause the MPT availability to fall below 0.95 to ensure MPT training not degraded due to excessive downtime	Same

REQUIREMENTS CORRELATION MATRIX

PART II

(Supporting Rationale for System Capabilities and Characteristics)

Parameter 1 -- Interoperability - The ICBM EHF system will be interoperable with the JCS EHF network, a part of 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 EHF transmission platforms. The system must also be capable of transmitting force report-back messages when required. This ensures the ICBM forces have a survivable two-way EHF communications link with the NCA so they can properly respond to NCA direction. The ICBM EHF system, whether operable or inoperable, must not exhibit any failure mode which would degrade mission critical functions or cause any safety or environmental hazard within the LCC when exposed to any LCC nuclear or non-nuclear environment specified in the Minuteman Weapon System Specification, S-133-128C. This ensures that although the EHF system components in the LCC may fail under some circumstances, a

failure will not result in degradation of mission critical functions nor cause injury or harm to the missile combat crew. **This is a key parameter.** (para 4.1.1)

Parameter 2 -- Probability of Correct Message Receipt - The Probability of Correct Message Receipt is 90% **(Threshold),** Goal is 99%. **(Objective)** This threshold will be met when an EAM transmitted from the satellite is received by the ICBM EHF system, processed and forwarded to the REACT HAC/RMPE and displayed to the operator on either the VDU or Printer. The rationale for this is based on the requirements outlined in CJCS 6811.01, Nuclear Command and Control System Technical Performance Criteria and United States Strategic Command (USSTRATCOM)/J61 letter, Operational Effectiveness Value to Support ICBM Modified Miniature Receive Terminal ORD, dated 10 Aug 95. **This is a key parameter.** (para 4.1.2)

Parameter 3 -- REACT Compatibility - All automatically generated output from the ICBM EHF system to include system status, fault status, EAMs and associated alarms must be displayed to the operator on the REACT console VDU. In the event of HAC/RMPE primary processor failure, automatically generated output from the ICBM EHF system to include system status, fault status, EAMs and associated alarms must be displayed to the operator via the REACT console backup printer. The intent of this requirement is to ensure output generated by the new ICBM EHF system is handled in the same manner within REACT as output generated by existing ICBM communication systems, thus ensuring a consistent interface is maintained between the REACT console and all ICBM communication systems. The ICBM community recently deployed a $651 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 EHF system interface with the REACT system. **This is a key parameter.** (para 4.1.3)

Parameter 4 -- Terminal Control - The ICBM EHF system must have the capability to be controlled by an operator while strapped into an LCC chair. **(Threshold)** This will ensure the operator's ability to safely control and operate the system in a nuclear environment. This system control will enhance human interface/human factors for routine operations such as BIT, and any other crew operation required to control the ICBM EHF system. **(Threshold)** In addition, failure of the HAC/RMPE primary processor or peripheral devices must not degrade the operators ability to control the system. **(Threshold)** The ICBM EHF system must re-establish connectivity with the applicable satellite without operator assistance after intermittent loss of the satellite signal occurs as described in the Milstar System Specification. **(Threshold)** The ICBM EHF 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. Additionally, it is necessary to minimize operator interaction with the EHF terminal. Accomplishment of system control from the REACT console and providing a design solution which allows sufficient space at the REACT console for future communication system control units is a goal. **(Objective)** **This is a key parameter.** (para 4.1.4)

Parameter 5 -- Human Machine Interface - The new ICBM EHF system operations are directly tied to operations at the REACT console; therefore, the ICBM EHF 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 system control unit may be separated from the REACT console. The intent is to develop a system that is consistent with how the other communication systems interface with the REACT console. For example, feedback as a result of crewmember data input errors should be displayed at the same position (REACT or EHF system) where the input occurred. (para 4.1.5)

Parameter 6 -- System Interfaces - To comply with Minuteman space and hardness requirements, the ICBM EHF system and any associated subassemblies intended to reside in the LCC 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 4.1.6)

Parameter 7 -- Environmental Control System - Those portions of the ICBM EHF system located in the LCC must interface with the existing LCC environmental control system capabilities so as to not degrade vital cooling to other LCC equipment. (para 4.1.6.1)

Parameter 8 -- Power Source - Power for the ICBM EHF system must be available through the Pre, Trans, and post SIOP environment, including LCC extended and emergency survival periods, and shall not degrade MAF power available to any other equipment. Those portions of the system located in the LCC or LCEB must operate using available LCC power without degrading other systems. The intent of this requirement is to ensure that the EHF system will operate should

commercial and/or diesel generator power be lost at the LCC. It is also intened to ensure that no new power sources are introduced into the LCC or LCEB. It does not preclude use of LCC power to support the above grade portion of the EHF system. (para 4.1.6.2)

Parameter 9 -- EMI/EMC - The ICBM EHF system shall not interfere with nor suffer interference from other equipment located on or within the MAF which would degrade system operation and must comply with the ICBM EMI/EMC requirements of the Minuteman Weapon System Specification, S-133-128C, paragraph 3.2.2.3. (para 4.1.6.3)

Parameter 10 -- Automated Communications Management System Compatibility The ICBM EHF system shall be capable of accepting system "image" data generated by the ACMS or uploaded by a fill device. This allows the ICBM EHF system to maintain its currency of the satellites and their health and position. (para 4.1.7)

Parameter 11 -- Electromagnetic Spectrum Supportability - The ICBM EHF system shall be certified in accordance with AFI 33-118. This parameter ensures that the electromagnetic spectrum required for operation of the EHF system will be available. (para 4.1.8)

Parameter 12 -- MTBCF - The ICBM EHF 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 requirement is based on analysis which considers the number of dispatches, distance to the sites, availability requirements, maintenance concept and spares pool. Critical failures are those failures which result in the inability to receive emergency action messages. 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. Additionally, the ICBM EHF system will not require dispatch of maintenance personnel nor the use of missile combat crews to accomplish periodic preventive maintenance in order to meet the MTBCF requirement. An MTBCF of **2738** hours would allow the ICBM units to meet their operational availability requirements. The objective is **5476** hours. (para 4.2.1)

Parameter 13 -- Operational Availability - The ICBM EHF system will have an operational availability of 0.99. This requirement shall 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. (para 4.2.2)

Parameter 14 -- Nuclear Survivability - The ICBM EHF system is required to operate without damage/degradation or loss of system parameters, timing, keys or ephemeris data throughout the nuclear induced HEMP environments specified in the Minuteman Weapon System Specification, S-133-128C, Appendix III and the near neighbor nuclear environments specified in the Near Neighbor Specification Development for the Minuteman and Peacekeeper Launch Control Centers, 66900-K201-SR-00 (TRW). **This is a key parameter.** (para 4.3.1)

Parameter 15 -- Security - The ICBM EHF system will not degrade the security of the ICBM weapon system. (para 4.3.2)

Parameter 16 -- TEMPEST - The ICBM EHF system shall meet the TEMPEST requirements given in S-133-128C and associated appendices. (para 4.3.3)

Parameter 17 -- Maintenance Planning - AF initiatives mandate implementation of two- level maintenance for all new systems. (para 5.1)

Parameter 18 -- Built-in-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 two or less LRUs 98% of the time and down to one LRU 95% of the time. Isolate to one LRU 99% of the time. The objective of isolating to a single LRU 99% of the time is a goal. This is predicated on the complexity and number of LRUs. Once the design is mature enough the objective will be revisited. (para 5.1.1.1)

Parameter 19 -- Manpower and Personnel - Existing manpower loading levels and existing skill levels cannot be increased. (para 5.3.1)

Parameter 20 -- MPT/MEP Trainer - It is essential the ICBM EHF system installed in the MPT look identical to the system installed in an operational LCC and it must provide a full fidelity simulation. Additionally, the MEP Trainer software must also be modified. Training is an integral part of ICBM operations and it is critical the MPT and MEP Trainer software be properly modified for this new capability. (para 5.3.3)

Parameter 21 -- MPT Availability - To ensure MPT training is not degraded due to excessive down-time, the ICBM EHF system installed in the MPT must not cause the MPT availability to fall below 0.95. (para 5.3.3.1)

ACRONYMS AND ABBREVIATIONS

ACMS Automated Communications Management System

AF Air Force

AFB Air Force Base

AFI Air Force Instruction

AFMC Air Force Materiel Command

AFOTEC Air Force Operational Test and Evaluation Center

AFSATCOM Air Force Satellite Communication

AFSPC Air Force Space Command

AIS Automated Information Systems

ALC Air Logistics Center

Ao Operational Availability

BIT Built-in-Test

C3 Command, Control, and Communications

C3I Command, Control, Communications and Intelligence

C4 Command, Control, Communications, and Computers

C4I Command, Control, Communications, Computers and Intelligence

CJCS Chairman, Joint Chiefs of Staff

CJCSI Chairman, Joint Chiefs of Staff Instruction

COMSEC Communications Security

CPI Critical Program Information

DIA Defense Intelligence Agency

DLA Defense Logistics Agency

DoD Department of Defense

DSCS Defense Satellite Communication System

DT&E Development Test and Evaluation

EAM Emergency Action Message

EAP Emergency Action Procedures

ECS Environmental Control System

EHF Extremely High Frequency

EMI Electromagnetic Interference

EMC Electromagnetic Compatibility

EMRT ESC/MITRE REACT Testbed

EMP Electromagnetic Pulse

ESC Electronic Systems Center

FLTSAT Fleet Satellite

FOC Full Operational Capability

FOT&E Follow-on Operational Test and Evaluation

HAC/RMPE Higher Authority Communications/Rapid Message Processing Element

HEMP High Altitude EMP

HM/HS Hardness Maintenance/Hardness Surveillance

HMI Human Machine Interface

HQ Headquarters

ICBM Intercontinental Ballistic Missile

ILS Integrated Logistics Support

INFOSEC Information Security

IOC Initial Operational Capability

IOT&E Initial Operational Test and Evaluation

ISST ICBM Super High Frequency Satellite Terminal

JCAALS Joint Computer Aided Acquisition Logistics System

JCS Joint Chiefs of Staff

JTA Joint Technical Architecture

LCC Launch Control Center

LCEB Launch Control Equipment Building

LRU Line Replaceable Unit

MAF Missile Alert Facility

MEECN Minimum Essential Emergency Communications Network

MEP Minuteman Enhanced Procedures

MLDT Mean Logistics Delay Time

MMRT Modified Miniature Receive Terminal

MNS Mission Need Statement

MPT Missile Procedures Trainer

MRT Mean Repair Time

MTBCF Mean Time Between Critical Failure

NCA National Command Authority

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

REACT Rapid Execution and Combat Targeting

SACCS Strategic Automated Command and Control System

SATCOM Satellite Communications

SBSS Standard Base Supply System

SCT Single Channel Transponder

SE Support Equipment

SHF Super High Frequency

SIOP Single Integrated Operational Plan

SLFCS Survivable Low Frequency Communications System

SSI System Support Initiative

STAR System Threat Assessment Report

TBD To Be Determined

T&E Test and Evaluation

T.O. Technical Order

TRANSEC Transmission Security

UHF Ultra High Frequency

US United States

USAF United States Air Force

USCINCSTRAT Commander in Chief, United States Strategic Command

USSTRATCOM United States Strategic Command

VDU Visual Display Unit

VLF/LF Very Low Frequency/Low Frequency

WWMCCS World Wide Military Command and Control System