

Long Range Discrimination Radar (LRDR)

Statement of Work



16 October 2015

Revision 2: 20 September 2016

Revision 3: 1 February 2017

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LRDR SOW

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STATEMENT OF WORK (SOW)
Long Range Discrimination Radar (LRDR)

1.0 Introduction

The LRDR will provide persistent discrimination capability to the Ballistic Missile Defense System (BMDS) to support the defense of the Homeland. This was a critical finding from the joint MDA and US Strategic Command (USSTRATCOM) Ballistic Missile Defense (BMD) Vision Study conducted in 2013. The LRDR's primary mission is to provide mid-course autonomous acquisition and persistent precision tracking and discrimination capability in the BMDS Pacific architecture to optimize the defensive capability of the Ground-Based Midcourse Defense (GMD) interceptor inventory and counter evolving threats in the Pacific Region. Additionally, the LRDR provides hit assessment support to improve the war fighting capability needed to manage the GMD interceptor inventory. LRDR inherent capability will support additional mission areas, including but not limited to, Space Situational Awareness (SSA).

2.0 Applicable Documents

Compliance and reference documents are contained in Contract Attachments J-04 and J-05, respectively. Compliance documents are mandatory whereas reference documents are provided for guidance.

3.0 Requirements

The contractor shall perform the work as specified in this SOW and in accordance with the terms and conditions of the contract. This applies to all hardware, software and firmware utilized in the design, development, production, test, delivery, operation and sustainment of LRDR regardless of origin and funding sources. The origin and funding sources include, but are not limited to, the following:

- Current and former acquisition programs
- Technical Demonstrations
- Independent Research and Development (IR&D)
- Section H Corporate Contribution Costs clause as codified in dollars within the table

3.0.1 LRDR (CLIN 0001)

The contractor shall design, develop, produce, test, and deliver a LRDR to be located at Clear Air Force Station (AFS), Alaska in accordance with the LRDR Element Specification (ES) and the terms and conditions of the contract. (b)(4)

(b)(4)

(b)(4)

The LRDR architecture design shall accommodate the Future Growth of LRDR radar sensitivity and Objective raid capacity levels as defined in the LRDR ES. The

resulting LRDR design shall provide a Threshold radar sensitivity and Threshold raid capacity levels as set forth in the LRDR ES and accommodate the Future Growth sensitivity level without requiring structural modifications to the facilities.

3.0.2 Initial Spares for CLIN 0001 (CLIN 0010)

The contractor shall provide initial spares for the LRDR in order to meet LRDR Reliability, Availability, Maintainability, and Testability (RAM-T) requirements defined in the LRDR ES and in accordance with the terms and conditions of the contract.

3.0.3 Additional Capability for Primary Face (CLIN 1000*) (*-Priced Option)

This option shall increase the sensitivity of the primary face from the CLIN 0001 Threshold capability to the Objective sensitivity requirement as defined in the LRDR ES.

The contractor shall leverage the LRDR design procured under CLIN 0001 to produce, test, and integrate additional hardware and software into the LRDR design. The installation, integration, and checkout of the hardware and software associated with this upgrade shall not degrade LRDR RAM-T below limits defined in the LRDR ES. Contractor-generated maintenance, calibration, and logistics procedures shall accommodate the added components.

All LRDR documentation generated by the contractor prior to award of this option CLIN shall be updated to reflect the components included under this CLIN. Specifically, engineering drawings and specifications shall reflect the design changes and shall be controlled in accordance with Attachment J-21, MDA Assurance Provisions (MAP) Section 3.10.

3.0.3.1 Initial Spares for CLIN 1000 (CLIN 1010*) (*-Priced Option)

The contractor shall provide spares to meet A_0 requirements defined in the LRDR ES.

3.0.4 Additional Capability for Secondary Face (CLIN 1200*) (*-Priced Option)

This option shall increase the sensitivity of the secondary face from the CLIN 0001 Threshold capability to the Objective sensitivity requirement as defined in the LRDR ES.

The contractor shall leverage the LRDR design procured under CLIN 0001 to produce, test, and integrate additional hardware and software into the LRDR design. The installation, integration, and checkout of the hardware and software associated with this upgrade shall not degrade LRDR RAM-T below limits defined in the LRDR ES. Contractor-generated maintenance, calibration, and logistics procedures shall accommodate the added components.

All LRDR documentation generated by the contractor prior to award of this option CLIN shall be updated to reflect the components included under this CLIN. Specifically, engineering drawings and specifications shall reflect the design changes and shall be controlled in accordance with Attachment J-21, MDA Assurance Provisions (MAP) Section 3.10.

3.0.4.1 Initial Spares for CLIN 1200 (CLIN 1210*) (*-Priced Option)

The contractor shall provide spares to meet A_O requirements defined in the LRDR ES.

3.1 Program Management (CLINs 0001, 0020, 0030, 1000*, 1200*, 2000*, 3000*, 5000*, 6000*) (* - Priced Option)

The contractor shall manage and execute all activities under this contract, including those of subcontractors, suppliers, and any and all sub-tier vendors. The contractor's duties shall include: serving as the focal point to the Government LRDR Program Office; conducting and integrating all aspects of the contract such as schedule, cost, risk & opportunity management, and technical status to ensure successful design reviews and execution of the program. The contractor shall perform the necessary administration required to support the contract and provide coordination for the development of presentations, the arrangement and coordination of Program Management Reviews (PMR), and other reviews and meetings.

3.1.1 Progress, Status & Management Report

The contractor shall generate and make available to the Government, a monthly contractor's Progress, Status and Management Report. [Contract Data Requirements List (CDRL) (CDRL A001)]

3.1.2 Program Management Reviews (PMR)

The contractor shall conduct an initial Program Management Review (PMR) within 60 calendar days of contract award and at least quarterly thereafter. External stakeholders (e.g., other Government contractors) may be invited as approved by the Government. Each PMR shall address at a minimum: technical, earned value, schedule, risk and opportunities, action items, technical performance measures, and quality assurance findings – as well as special topics determined by the Government. To the extent feasible, the contractor shall schedule PMRs concurrent with other meetings or Technical Interchange Meetings (TIMs) in order to reduce costs. PMRs shall be conducted via Classified Video Teleconference (CVTC) or held either at the contractor's facility or at another location designated by the Government if CVTC capability is unavailable. The contractor shall coordinate a draft agenda with the Government at least 10 working days in advance of each PMR with a final agenda released no later than 5 working days in advance of each PMR. The PMR read ahead material (Accessible Data Product (ADP) 001) shall be available at least two working days prior to the PMR. The contractor shall provide

meeting minutes (ADP 002) of all program and technical reviews for Government review and revision, if necessary, within 5 working days of completion of these reviews.

3.1.3 Integrated Product and Process Development (IPPD)

The contractor shall establish and implement an IPPD process in all technical and functional disciplines in accordance with corporate policies and procedures. The contractor shall optimize the IPPD process to achieve effective communication and program execution. The IPPD process shall allow for coordination/interaction with the Government and other designated contractors on: schedule reconciliations, technical interchanges, comprehensive program management meetings, integrated product team meetings, and related tasks necessary to deliver the requisite performance within cost and schedule constraints.

3.1.3.1 LRDR Integrated Product/Process Teams (IPTs)

The contractor shall establish and implement IPTs with appropriate subject matter experts. The contractor shall prepare and submit presentation material (ADP 001) as required. The IPTs identified below shall together meet no more than fifty-two (52) times per year:

- Program Management and Integration IPT
- Engineering IPT
- Facilities IPT

3.1.3.2 Participation in Government WGs and Boards

The contractor shall prepare and submit presentation material (ADP 001) and provide subject matter expertise to Government Boards, Councils, and WGs as needed no more than 150 times per year. Examples of Boards, Councils, and WGs requiring contractor participation are:

- MDA Program Change Board (PCB)
- Integration Synchronization Group (ISG)
- Systems Engineering and Integration Council (SEIC)
- MDA Supply Chain Risk Management/Trusted Systems and Networks Integration Council (MSTIC)
- BMDS Requirements Working Group (BRWG)
- BMDS Operational Capacity Baseline Working Group (OWG)
- Corrective Action Board (CAB)
- Failure Reporting Analysis and Corrective Action (FRACAS) Board
- BMDS Discrepancy Report (BDR) Board
- Risk and Opportunity Management Board
- Parts, Materials, and Processes Control Board (PMPCB)
- SN Engineering Review Board

- SN Configuration Control Board
- LRDR Project Office Configuration Control Board (CCB)
- SN System Safety Working Group
- Quality/Mission Assurance Working Group (QMAWG)
- Security and Program Protection Working Group
- Site Integration Working Group (SIWG)
- Warfighter Working Group (WWG)

3.1.3.3 Technical Interchange Meetings (TIMs)

A TIM provides LRDR stakeholders (both internal and external to the MDA) a forum for in-depth discussions to resolve issues arising during contract performance. TIMs shall be planned meetings with Government approved agendas involving the LRDR IPTs identified above but without formal entrance and exit criteria. Therefore, TIMs shall not be used as design reviews. The contractor shall provide subject matter expertise for TIMs, maximize use of CVTC/VTC capability, and manage action items to Government-approved closure.

3.1.4 Business Operations

3.1.4.1 Contractor Integrated Performance Management

The contractor shall prepare and utilize, in the performance of this contract, an integrated performance management system. Central to this integrated system shall be a validated Earned Value Management System (EVMS), compliant with the EVMS guidelines contained in the latest version of ANSI/EIA-748. To establish the integrated performance management system, the EVMS shall be linked to, supported by, and integrated with the contractor's management processes and systems to include the IMS, Contract Work Breakdown Structure (CWBS), change management, material management, procurement, cost estimating, and accounting. The contractor shall develop, maintain and deliver:

- The Contract Funds Status Report (CFSR) (CDRL A002)
- Integrated Program Management Report (IPMR) (CDRL A003)

The correlation and integration of these systems and processes shall provide for early indication of cost and schedule problems, and their relation to technical achievement.

3.1.4.2 Contract Work Breakdown Structure (CWBS)

The contractor shall develop and maintain the CWBS and CWBS dictionary (CDRL A004) consistent with the CSDR Manual (DoD 5000.04-M-1), and MIL-STD-881C, using the WBS structure contained in the Cost and Software Data Reporting (CSDR) plan. The contractor shall extend the CWBS down to provide adequate internal management, surveillance, and

performance measurement, regardless of the reporting level stipulated in the contract for Government visibility. The contractor shall analyze the system requirements specified in the SOW, FRD, and LRDR ES and translate them into a structure representing the products and services that comprise the entire work effort commensurate with the acquisition phase and contract requirements. The contractor shall update the CWBS during the execution of the contract. Changes to the CWBS or associated definitions, at all reporting levels, require approval of the Government.

3.1.4.3 Integrated Master Plan (IMP)

The contractor shall update and adhere to an IMP (CDRL A003) consisting of a hierarchical relationship of Events, Accomplishments, and Criteria. The IMP shall be consistent with and traceable to the CWBS, EVMS, and the SOW.

3.1.4.4 Integrated Master Schedule (IMS)

The contractor shall develop, deliver, adhere to, and maintain a resource loaded IMS (CDRL A003) using a Government compatible version of Microsoft Project® that networks detailed program activities. The contractor shall prepare the IMS consistent with MDA Directive 5012.01. The IMS shall contain the planned IMP events and milestones, accomplishments, exit criteria, and activities. The IMS shall comprise necessary links and dependencies to the following Government Furnished Information (GFI): MILCON site Construction IMS, C2BMC IMS, the OSF IMS, Logistics IMS, and the BMDS Integrated Master Test Plan (IMTP).

The IMS shall be traceable to the CWBS, EVMS, and the SOW. The contractor shall deliver a Schedule Risk Assessment (SRA) (CDRL A003) at the initial IBR and then quarterly for duration of contract. The IMS shall be used to evaluate progress toward meeting program objectives and to integrate the program schedule activities. The contractor shall quantify risk in hours, days, or weeks of delay and provide optimistic, pessimistic, and most likely duration for the Primary and Secondary Critical Path task/activity.

The contractor shall maintain and update the IMS to identify and resolve conflicting activities for the duration of the LRDR Project.

3.1.4.5 Integrated Baseline Reviews (IBR)

The contractor shall engage jointly with the Government's program manager in IBRs to evaluate the risks inherent in the contract's planned Performance Measurement Baseline (PMB) (CDRL A003). The contractor shall complete the first IBR within six months, including subcontractor IBRs, after contract award in accordance with MDA Manual 5004.01-M. The contractor shall provide the following documentation 14 days prior to IBR:

CONTRACTOR DOCUMENTATION REQUIREMENTS

1. Statement of Work (SOW), Contract Work Breakdown Structure (CWBS) (and CWBS Dictionary).
2. Program (Project) Organizational Structure.
3. Responsibility Assignment Matrix (dollarized for the Budget at Completion (BAC) and Budgeted Cost of Work Remaining (BCWR)).
4. Work Authorization Documents.
5. Integrated Master Schedule (master, intermediate, and detail schedules (MS Project format). Include Monte Carlo output (histogram and sensitivity analysis).
6. Integrated Master Plan.
7. Control account plans or equivalent at the Work Package Level (include Control Account Manager (CAM) names and dollars/hours).
8. Records documenting contractual changes and internal actions.
9. Current earned value performance report (CPR).
10. Earned value management system procedural documents.
11. List of major subcontractors and major vendors, including description of product, applicable CWBS element, value of subcontracts/purchase orders, period of performance, and responsible control account manager.
12. Technical risk register and specific risk sheets with mitigation plans, as well as opportunities.
13. Baseline Change Control Log, Management Reserve Log, Undistributed Budget Log.
14. Headcount Graphic per CAM and LOE versus Discrete by WBS.

The contractor shall host up to four (4) subsequent IBRs as required by the Government. Each IBR shall verify that the contractor is using a reliable PMB (to include the entire contract scope of work), is consistent with contract schedule requirements, and has adequate resources assigned.

The contractor shall manage to closure all identified IBR action items. The contractor shall conduct IBRs on subcontracts that meet or exceed the EVMS application threshold. The contractor shall lead the subcontractor IBRs, with participation by the Government.

3.1.5 Contract Cost Data Reporting

The contractor shall systematically collect and report actual contract costs to provide DoD cost analysts with needed data to estimate future costs. Contractor Reports (CDRL A005, A006, A007, and A008) shall be prepared in accordance with the instructions contained in the most recently approved versions of DI-FNCL-81565, DI-FNCL-81566, and DI-MGMT-81739. The contractor shall develop Contractor Reports to include:

- a. A documented standard CSDR process that satisfies the guidelines contained in the DoD 5000.04-M-1;
- b. Management procedures that provide for generation of timely and reliable information for the Contract Cost Data Reports (CCDRs) and Software Resource Data Reports (SRDRs) required by the CCDR and SRDR data items of this contract;
- c. The Government-approved CSDR plan for this contract, DD Form 2794, and the related Resource Distribution Table as the Basis for reporting in accordance with the required CSDR DIDs;
- d. The contractor shall require and flow down the requirement for CSDR reporting from subcontractors with a subcontract that exceeds \$50 million or subcontracts valued between \$20 million and \$50 million that are designated by the Government as being high risk, high value, or high technical interest. If, for subcontracts that exceed \$50 million, the contractor changes subcontractors or makes new subcontract awards, the contractor shall notify the Government.
- e. The contractor shall report ALL contractor labor hours (including subcontractor labor hours) required for performance of services provided under this contract for the Missile Defense Agency via a secure data collection site. The contractor is required to completely fill in all required data fields using the following web address: <http://www.ecmra.mil>. Beginning January 1, 2013, reporting inputs will be for the labor executed during the period of performance during each Government fiscal year (FY), which runs October 1 through September 30. While inputs may be reported at any time during the FY, all data shall be reported no later than October 31 of each calendar year, beginning with 2013. Contractors may direct questions to the help desk at <http://www.ecmra.mil>.

The contractor shall provide all administrative effort associated with issuing and monitoring sub-tier contract efforts and products including cost and schedule requirements and reporting. The contractor shall ensure flow down of applicable Government technical and administrative

requirements to all sub-contractors. The contractor shall maintain and provide current status of sub-contracts including scope of work, cost, schedule, and status of products and data items.

3.1.6 Data Management

The contractor shall implement a data management program with controls to address quality of data preparation, compliance with data specification, timely submittal, configuration, maintenance, and tracking of all data deliverables and related correspondence. The contractor shall clearly mark the version of each data deliverable and assign a unique submission identifier with each submittal.

Data (technical data and computer software) shall be protected in accordance with the appropriate Program Protection Plans and Information Assurance guidelines.

3.1.6.1 Integrated Digital Environment (IDE)

The contractor shall develop, implement, and maintain an access-controlled unclassified IDE and an access-controlled classified IDE, both accessible by the Government from Government facilities and in compliance with the applicable requirements contained in:

- MDA Assurance Provisions (MDA-QS-001-MAP Rev B)
- DoDI 8582.01 for protection of unclassified BMD information on non-DoD information systems;
- DoD 5220.22-M for protection of classified BMD information; and
- Information security best practices and guidelines documents such as, at a minimum, NIST 800-53



(b)(4)

3.1.6.2 Data Accession List (DAL)

The contractor shall generate and maintain a DAL (CDRL A009). The DAL shall list data generated by the contractor during contract performance (and the associated data rights for each item) to include items stored on the IDE, Logistics Management Information Database (LMID), CDRLs, Accessible Data Products (ADPs), white papers, trade studies, briefings, special study reports, investigations reports, reference data, test data and reports, manuals, software documentation, software models, source code, executable code, algorithms, technical analyses, and other internal data/reports generated during contract performance regardless of where the data resides.

The contractor shall deliver any documentation listed on the DAL by providing the Government team read access to all items listed in the DAL and the ability to download documentation to Government workstations at Government facilities via an IDE.

3.1.7 Security

The contractor shall ensure coverage, by a Facility Security Officer (FSO) and an Information Assurance Officer/Information System Security Officer (IAO/ISSO), at the contractor and deployment site until signature of DD-250. The Government will assume FSO and IAO/ISSO responsibilities after DD-250. The contractor shall prepare and implement a Site Security Management Plan (SSMP) (CDRL A010). The contractor shall secure approval from the site commander on contractor and subcontractor facility access. The contractor shall provide the Government access to all existing security-related data and documentation.

3.1.7.1 Information Security

The contractor shall ensure implementation of the National Industrial Security Program Operating Manual (NISPOM) across their facilities.

The contractor shall comply with NISPOM requirements for inspections (section 1-206b). Serious deficiencies at subcontractor locations shall be reported to the contractor. When a security risk has been identified, the contractor shall conduct a security program review or Staff Assistance Visits (SAV) with the concurrence of the COR. The contractor shall develop Information Security Program Review (ISPR) reports (ADP 003) and conduct briefings with MDA Information Security (EIR) to identify and review goals, processes, and findings.

The contractor shall assist with implementation of the Security Incident and Preliminary Inquiry (PI) process in accordance with NISPOM (DoD 5220.22-M). The contractor shall analyze security incidents to verify incident descriptions and address cause, impact, mitigation, and recommended courses of action. The contractor shall coordinate, discuss, and resolve discrepancies. Cybersecurity incidents or compromises affecting LRDR information systems shall be reported to the Government (CDRL A013). The contractor shall submit reports to MDA Security within 24 hour of a security incident, with subsequent reports until incident resolution.

3.1.7.2 Program Protection

The contractor shall plan and implement an Acquisition System Protection program encompassing acquisition security, program protection, supply chain risk management and systems security engineering for this contract based upon the requisite Program Protection Plan (PPP) and threat documents provided by MDA.

The contractor shall generate, update, maintain and implement a Program Protection Implementation Plan (PPIP) (CDRL A011). The PPIP shall include compliance implementation planning in accordance with the Government provided PPP, DoDI 5200.39, DoDI 5200.44, DoD 5200.1-M, SI 538-02, DoDM 5200.01, DoDI 8500.01, DoD 5200.8-R, CJCSI 6510.01F, CJCSI 3210.01B, CNSSP 11, MDA 5200.08-INS, and MDA 5200.01. The PPIP shall include the following elements:

- Technology/System Description
- Contractor Program Protection Responsibilities
- Protection Implementation Approach
- Location list of Critical Program Information (CPI), Critical Components, and Critical Functions to be protected
- Summary of threats, vulnerabilities, and countermeasures for the CPI and Critical Components
- Anti-Tamper
- Information Assurance (IA) responsibilities, acquisition strategy, and summary of how appropriate implementation of IA protection for a non-DoD information systems hosting CPI will be ensured
- Software Assurance, to include contractor responsibilities and the design/test methodology used to assure protection of critical functionality and CPI (including protection of COTS and unknown pedigree software)

The contractor shall provide inputs to and support Government security analyses, including system security analyses, the System Vulnerability Analysis (SVA), Operations Security (OPSEC) Plan, System Security Engineering (SSE) requirements analysis, and

Cybersecurity/Computer Network Defense (CND) technical assessments. The contractor shall participate in Government Protection Assessment Reviews (PAR), security audits, and Security and Program Protection Working Groups.

The contractor shall develop Program Protection training plans and conduct contractor training of how to assess criticality of technologies and mitigate CPI risks from known or postulated threats in accordance with Government issued PPPs. The contractor shall conduct a CPI assessment.

The contractor shall conduct annual self-assessments to evaluate program adherence to PPIP and related processes and shall provide self-assessment reports (ADP 004). The contractor shall develop and implement security policy and procedures. The contractor shall provide self-assessment reports to the MDA program office and MDA Industrial Security Office no later than 30 days after the completion of the assessment. The contractor shall provide the Government updates on implementing the BMDS SSE requirements defined in the LRDR ES (ADP 089).

The contractor shall maintain weapon system security features using established System Security Engineering processes in accordance with DoD 5200.1-M Acquisition Systems Protection Program, DoDI 5000.2, Defense Acquisition Guidebook, MIL-HDBK-1013/1A Design Guidelines for Physical Security of Facilities, DoDM 5200.01 Information Security Program, DoD 5200.08R Physical Security Program, Committee on National Security Systems Advisory Memorandum (CNSSAM) TEMPEST 1-13 RED/BLACK Installation Guidance, Committee on National Security Systems (CNSS) Advisory Memorandum Tempest 01-02, National Security Telecommunications and Information Systems Security Instruction (NSTISSI) 7003, Common Criteria and National Security Telecommunications and Information Systems Security Policy (NSTISSP) Number 11.

The contractor shall develop SSE requirements, System Connection Authorization Requirements documents, and Security Accreditation Agreements documents.

The contractor shall comply with security requirements in accordance with DoDI 8500.01 (Cybersecurity), DoDI 8510.01 (Risk Management Framework for DoD Information Technology), and the NSA Guide for Addressing Malicious Code Risk, and be accredited by the Authorizing Official (AO) prior to operation.

The contractor shall submit a Technology Control Plan (TCP) for approval by Defense Security Services (DSS) and then provide a copy to MDA EIR within 90 days, of contract award, if a TCP is required.

3.1.7.3 System Protection

LRDR shall be protected at Security System Level (SSL) –A. The contractor shall comply with the DOD 5200.08R, Physical Security Program as implemented by USSTRATCOM Instruction (SI) 538-02, BMDS Security Program. The contractor shall work with the Program Office to coordinate activities to protect assets at a SSL-A level prior to the Joint Occupancy Date (JOD).

3.1.7.4 Supply Chain Risk Management (SCRM)

The contractor shall assist the Government in conducting a Criticality Analysis in accordance with DoDI 5200.44 immediately following the Software/M&S PDR to identify LRDR mission critical functions and Information and Communications Technology (ICT) critical components of the BMDS system elements as requested. The contractor shall submit to and participate in unannounced Government audits into their supply chain activities no more than three (3) times per year – unless unacceptable supply chain practices are identified by the Government.

The contractor shall demonstrate:

- 1.) Visibility into its supply chain for critical components and materials
- 2.) Understanding of the risks to that supply chain
- 3.) Implementation or plans to implement risk mitigations to counter those risks documented in the PPIP.

For all subcontracts involving the procurement of Critical Components identified in the Government PPP, the contractor shall flow down requirements for supply chain risk management detailed in the section below. The contractor shall ensure vulnerabilities and discrepancies identified by subcontractors and lower tier vendors are reported to the MDA Supply Chain Risk Management/Trusted Systems and Networks Integration Council (MSTIC).

The contractor shall only procure logic bearing components identified on the Critical Components List from vendors accredited by the Defense Microelectronic Activity (DMEA) (<http://www.dmea.osd.mil/trustedic.html>) or request an exception in writing prior to procurement to the LRDR COTR and MDA/DEI with a justification as to why the component could not be procured from an accredited DMEA supplier.

The contractor shall continuously monitor the Program Critical Components List for impact of MDA SCRM Advisories, Government-Industry Data Exchange Program (GIDEP) Alerts, and similar information from other programs. Critical components affected by these alerts shall not be used without additional analysis and approval by the MSTIC. Critical component and supply chain vulnerability issues discovered by the contractor in the course of development shall be reported to the MSTIC for review. Throughout the duration of this contract, the Radar contractor shall report the discovery of Critical Component and Supply Chain Vulnerability Issues (CDRL A012) to the MSTIC for review. The Critical Component and Supply Chain Vulnerability Issues Report shall include the following elements:

- A complete list of LRDR Mission Critical Functions and Components
- Criticality level assignments (I-IV) for all items on the list
- Rationale for inclusion or exclusion from the list
- Detailed multi-tier supplier information for each Critical Component
- Identification of critical elements for inclusion in a DIA Threat Analysis Report

The contractor shall ensure MDA end use anonymity in all procurement of microelectronic components deemed critical by the Program Protection Plan (PPP). Ensure purchase orders do not include DoD or MDA contract numbers, end use, or subassembly destinations.

The contractor shall prepare an SCRM Impact Statement (ADP 005) for each MDA SCRM Advisory for which a response is required containing the following:

- MDA SCRM Advisory Number
- Points of Contact for Information
- Confirmation of the presence of the affected component
- System and subassemblies impacted
- Description of the function performed by the component
- Physical locations of the component
- Status of the component

Impact statements shall be submitted to the MDA SCRM Advisory Coordinator listed on the advisory. The contractor shall follow the response instructions listed on the advisory.

The provisions of this SOW shall be included in the solicitations and subcontracts for all suppliers, suitably modified to identify the security risks suppliers must address to ensure the protection of CPI and critical components within the supply chain.

3.1.8 Cybersecurity (CS) - Formerly known as Information Assurance (IA)

LRDR shall be developed, manufactured, delivered and maintained in accordance with DoDI 8500.01 (Cybersecurity), DoDI 8510.01 (Risk Management Framework for DoD Information Technology), DoDI 8581.01 (Information Assurance (IA) Policy for Space Systems used by the DoD), DoDD 8530.1 (Computer Network Defense), NIST SP 800-53 Revision 4 (Recommended Security Controls for Federal Information Systems and Organizations), and MDA 8500.02-P (Information Assurance Program Plan) requirements. The contractor shall integrate all applicable cybersecurity requirements into the systems engineering requirements process to ensure early identification of and integration of cybersecurity into the system, including verification methods. The contractor shall configure system components in accordance with applicable DISA Security Technical Implementation Guides (STIG) and NSA Security Configuration Guides (SCG). The contractor shall provide assessment evidence of compliance in accordance with DoD and MDA RMF guidance. The contractor shall stay aware of current/changing cybersecurity requirements to ensure the final system meets current

requirements and thus capable of receiving an Authorization to Operate (ATO). Assessment and authorization recommendations will be based on the resolution or mitigation of all identified findings to an acceptable level of risk per the Authorization Official (AO).

3.1.8.1 Cybersecurity Applicability

The cybersecurity accreditation requirements described in this SOW shall apply to prime mission equipment information systems and any supporting or ancillary information systems developed during the period of performance.

3.1.8.2 Documentation & Artifacts

The contractor shall develop, update and maintain the following cybersecurity documentation/artifacts in accordance with the Cybersecurity policies and regulations above:

- Initial Statement of Compliance (CDRL A014)
- Annual Statement of Compliance (CDRL A015)
- Contractor Configuration Management (CM) Plan (CDRL A016)
- RMF Security Plan (CDRL A017)
- Disaster Recovery / Continuity of Operations Plan (CDRL A018)
- Incident Response Plan (CDRL A019)
- Systems Architecture Document (ADP 011)
- Topology/Data Flow (CDRL A020)
- Information Assurance Vulnerability Management (IAVM) and Patch Management Process (CDRL A021)
- Ports, Protocols, and Services (PPS) List (CDRL A022)
- Physical Inventory Plan/Schedule and Reports for GFP (CDRL A057)
- Software Inventory List (CDRL A023)
- Cybersecurity Product and Tools Software Documentation (ADP 006)

3.1.8.3 IAVM/CTO Activities

The contractor shall assess Government IA Vulnerability Notices (IAVNs) and Command Tasking Orders (CTOs) to determine system applicability, and develop plans and implement product vendor patches and other mitigations in support of IAVM as approved by MDA. The contractor shall report IAVM and CTO status to the Government ISSM on a monthly basis.

3.1.8.4 Vulnerability Assessment and Asset Testing

Once the contractor has developed a LRDR string, the contractor shall conduct monthly cybersecurity vulnerability assessment scans for the initial and all subsequent strings utilizing the

Assured Compliance Assessment Solution (ACAS) DoD toolset current at the time the scan is performed. Download the ACAS DoD toolset from DISA.mil patch repository at: <https://patches.csd.disa.mil/CollectionInfo.aspx?id=442> (DoD CAC required). At the time the scan is performed the contractor shall request the MDA Sensors Information System Security Manager (ISSM) provide software and required licenses.

Resulting data shall be made available via secure methods for Government review and analysis. The contractor shall provide technical, Systems Administrator (SA), and Network Administrator (NA) expertise for execution of Government-conducted Security Control Assessment (SCA), Penetration Testing, and Interface Boundary (IFB) Tests. The contractor shall participate in pre-SCA coordination meetings, post-test analysis, Assessment and Authorization Technical Interchange and Risk Assessment Meetings, and Plan of Action & Milestone (POA&M) maintenance activities.

3.1.8.5 Vulnerability Resolution

The contractor shall implement, with MDA concurrence, vulnerability mitigations and software patches to correct Information Assurance (IA)/Cybersecurity (CS) vulnerabilities discovered during periodic IA/CS audits, formal SCA activities and applicable DoD-issued Information Assurance Vulnerability Alerts (IAVAs) by providing quarterly updates (4/year) to be installed on test and deployed radar assets and supporting systems accredited by MDA.

3.1.8.6 Host Based Security System (HBSS)

The contractor shall research, develop, test and implement the HBSS per USCYBERCOM OPORD 12-1016 on all MDA accredited systems/networks developed in support of LRDR.

3.1.8.7 IA/CS Training

All contractor personnel performing IA/CS duties and responsibilities as either a primary or as an additional/embedded duty, to include system or network privileged users, shall meet the training, certification, and reporting requirements in accordance with DODD 8570.01 and DODM 8570.01-M Change 3 Information Assurance, Training, Certification and Workforce Management Instructions.

3.1.8.8 Computer Network Defense

The contractor shall design and implement an MDA approved cybersecurity infrastructure to protect the confidentiality, integrity and availability of LRDR and supporting systems and shall ensure the successful interconnection with a DoD-approved Computer Network Defense Service Provider (CNDSP) to meet mandatory Tier 2 CND monitoring and reporting requirements.

3.1.9 Small Business Requirements

The Contractor shall execute the Small Business Participation and Commitment Plan (Attachment J-18). The Contractor shall submit semiannually CDRL A024 to the Missile Defense Agency Office of Small Business Programs (MDA/SB).

3.1.10 Contractor Travel

The contractor and subcontractors shall utilize video-teleconferencing (VTC) and other communications technologies to minimize travel costs and enhance efficiency.

If VTC cannot be accomplished, the contractor shall only travel as necessary to meet the requirements of this contract.

Except as otherwise noted herein, the contractor shall be reimbursed for reasonable actual travel costs in accordance with FAR 31.205-46. The costs to be reimbursed will be those costs accepted by the cognizant Defense Contract Auditing Agency (DCAA).

Reimbursable travel costs include only that travel performed from the contractor's facility to the worksite, in and around the worksite, and from the worksite back to the contractor's facility.

The contractor shall not be reimbursed for the following daily local travel costs:

- Commuting to and from work
- Travel performed for personal convenience/errands

3.1.11 Total Ownership Cost (TOC) Model

The contractor shall generate and deliver a TOC Model (CDRL A025) to be used for system design trades. After initial delivery the contractor shall update and maintain the TOC model. The model shall include development, production, operations and sustainment, and disposal costs. The TOC model shall include all equipment and software supplied with the radar. The contractor shall include Hazardous Material Management impact inputs to the TOC model. The Government will provide top-level assumptions for the TOC Model in the CSDR plan. The contractor shall work with the Government team in order to establish an agreed-to set of assumptions included in the model. The model shall follow the approved CWBS (CDRL A004).

In addition, applicable data shall be reflected in the TOC models to project production unit cost by CWBS for each unit. The cost shall be broken down to the Line Replaceable Units (LRUs) even if that is below the level of the CWBS.

3.2 Studies and Analysis (CLIN 0030)

The contractor shall deliver technical report(s) to the Government in response to written technical instructions from the Government as stated in Attachment J-22. Technical studies will focus on improvements to radar mission performance/reliability in areas of interest including, but not limited to, fixed and scan angle bias error reduction, improved target detection, object

classification improvement, atmospheric effects mitigation, impact of emerging threat, ramifications of sensor netting and data fusion, net-centric operations, and field of view expansion.

3.3 Systems Engineering (CLINs 0001, 0010, 1000*, 1010*, 1200*, 1210*, 2000*, 3000*, 5000*, 6000*) (*- Priced Option)

The contractor shall perform rigorous and disciplined LRDR systems engineering and technical management for designing, developing, integrating, fielding, and verifying the LRDR system. The contractor shall plan, organize, direct, coordinate and control the technical and business management activities of the contractor's Systems Engineering (SE) team.

3.3.1 Systems Engineering Management

3.3.1.1 Systems Engineering Planning & Execution

The contractor shall generate, maintain, and execute the Systems Engineering Management Plan (SEMP). The SEMP (CDRL A026) shall document the LRDR development program through Transition & Transfer (T2). The contractor shall update the SEMP with systems engineering achievements and future activities. The contractor shall establish in the SEMP how the fully integrated engineering effort, to include all subcontractors, is managed and conducted. Applicable systems engineering processes outlined in the SEMP shall be applied to the subcontractors and identified in subcontractor documentation. The SEMP shall provide details of the requirements management process, from the Government's top level requirements to the contractor's design documents. In addition, the contractor shall include a Technical Performance Measurement (TPM) process in the SEMP that indicates what test methodology and analysis is used to manage and update the TPMs. A minimum set of required TPMs are listed in the LRDR TPM List (Attachment J-C02-03).

3.3.1.2 Risk & Opportunity Management

The contractor shall generate, maintain, and execute the Risk & Opportunity Management Plan (ROMP) (CDRL A027) that describes the risk & opportunity management program for the contract. The ROMP shall be consistent with the SN Risk Management Plan, MDA Instruction 3058.01-INS, and the Risk Management Guide for DoD Acquisition. The contractor shall store all risks and opportunities on the IDE. As part of the ROMP, the contractor shall:

- Identify, analyze, manage, and track TPMs, cost, schedule, and technical risks. Technical risks shall include technology maturation, integration, and design considerations.
- Identify, analyze, manage and track opportunities that could benefit cost, schedule or performance.
- Identify, analyze, manage, and track risks and opportunities that could impact the outcome of test events.

- Integrate quantitative risk and opportunity assessments into cost and schedule baselines.
- Report new and updated risks and opportunities to the Government during Risk and Opportunity Management Board meetings.
- Submit risk and opportunity assessments in the Government format as part of entrance and exit criteria for SETRs and programmatic reviews.

3.3.2 System Engineering Technical Reviews (SETRs)

The contractor shall host and participate in formal SETRs that are chaired by the Government. The contractor shall capture and incorporate all formal SETRs into the IMS. These reviews will be event driven and predicated upon satisfying the SETR Entrance Criteria. The following SETRs shall be conducted for each delivered capability:

- System Requirements Review (SRR)
- System Preliminary Design Review (PDR)
- System Critical Design Review (CDR)
- System Final Design Review (FDR)
- Test Readiness Reviews (TRRs) (quantity determined in contractor's IMS)
- Pre-Shipment Reviews (PSRs) (quantity determined in contractor's IMS)
- Mission Readiness Reviews (MRRs) (quantity determined in IMTP)

The contractor shall submit the schedule, location, security requirements, and agenda for all formal SETRs, subject to Government approval. The contractor shall develop and submit a SETR Package for each formal SETR (CDRL A028). The SETR Packages shall be consistent with the SN Systems Engineering Technical Review Plan. The contractor shall submit inputs into entrance and exit criteria for each formal SETR. The Government will approve all formal SETR entrance and exit criteria. The contractor shall place Presentation Material (ref ADP 001) on the contractor IDE 10 working days prior to each formal SETR. Contractor Action Items from each formal SETR shall be updated at least weekly until closure. The Government will have approval authority over Action Item closure.

The contractor shall develop, maintain, and submit Developmental Design Drawings/Models (ADP 007) for the System PDR and System CDR. The contractor shall conduct two design disclosure TIMs with the Government prior to the System PDR and System CDR. These meetings shall address the engineering material and documentation sufficient to convey a detailed understanding of the design. The contractor shall document the design disclosures and adjudicated concerns in the Engineering Design Notebook (EDN) (ADP 008) and incorporate the changes into the Development Design Drawings/Models and respective specification documents.

The contractor shall complete subsystem PDRs prior to the formal System PDR and subsystem CDRs prior to the formal System CDR. The contractor shall project subsystem PDRs and subsystem CDRs on the IMS. The contractor shall notify the Government two weeks prior to each subsystem PDR and subsystem CDR. The Government may participate in each subsystem PDR and subsystem CDR. The contractor shall capture meeting minutes (ADP 002) and design changes from each subsystem PDR and subsystem CDR in the EDN.

3.3.3 System Requirements

The LRDR shall meet the specification value of all technical requirements in the LRDR ES and FRD. If the contractor discovers that a LRDR technical requirement cannot be met, then the contractor shall provide a variance request with mitigation strategy (CDRL A029).

3.3.3.1 Systems Requirements Allocation

The contractor shall generate, maintain, and submit the following LRDR specification documents: Prime Item Development Specification (PIDS) (CDRL A030); Delta Facility Requirements Document (ΔFRD) (CDRL A031); Hardware Requirements Specification (HRS) (CDRL A032); Software Requirements Specification (SRS) (CDRL A033); Interface Requirements Specification (IRS) (CDRL A034); Hardware Design Description (HDD) (CDRL A035); Software Design Description (SDD) (CDRL A036); and Interface Design Description (IDD) (CDRL A037). The contractor shall use at a minimum the LRDR ES, LRDR FRD, BMD SS, and all applicable Interface Control Documents as Government source requirements to develop these documents.

3.3.3.2 Requirements Management and Traceability

The contractor shall use the Dynamic Object Oriented Requirements System (DOORS®) multi-site version, compatible with Government information systems, for requirements management and bidirectional traceability, to include management of all subcontractor-developed requirement documents. The Government shall have real-time read only access to the DOORS® multi-site version. The contractor shall conduct requirements management and bidirectional traceability in accordance with the MDA BMDS Requirements Traceability Handbook and SN Requirements Management Plan. At a minimum, the contractor shall indicate TPM, cyber security, mission critical, and safety critical as attribute fields of the respective requirement in the DOORS® database. The contractor shall generate, maintain, and deliver a Specification Tree (ADP 009) to illustrate document decomposition flowing from the Government source requirements down to item detail specifications. The contractor shall utilize a Requirements Traceability and Verification Matrix (RTVM) (CDRL A038) to ensure orphan and widow (i.e. childless parent) requirements are identified and adjudicated prior to test events. The contractor shall submit the DOORS® requirements database quarterly (ADP 010). The contractor shall develop, maintain,

and submit a Trace Certification Memo (TCM) (CDRL A039) in accordance with the MDA BMDS Requirements Traceability Handbook.

3.3.3.3 System Architecture

The contractor shall generate, maintain and submit an LRDR Systems Architecture Document (ADP 011). The Systems Architecture Document shall contain the architecture products that describe the functional allocation consistent with the PIDS, ΔFRD, HRS, SRS, and IRS. These architecture products shall provide the context, operation, functions, interfaces, and activities of the LRDR and integration with C2BMC. The contractor shall include system views compatible with Department of Defense Architecture Framework (DoDAF) SV-1, SV-2, SV-4, SV-5a, SV-6, SV-7, SV-9, SV-10a, and SV-10b. The contractor shall develop these architecture products using a Government-approved architecture language, such as Unified Modeling Language (UML), System Modeling Language (SysML), or DoDAF. The contractor shall generate and submit Conceptual Design Drawings/Models (ADP 012) with the Systems Architecture Document.

The architecture products shall also include operationally-oriented diagrams that describe the functionality of LRDR. *The* operational activity and sequence diagrams shall be under configuration control and updated to reflect the current operational system. The operational activity and sequence diagrams shall contain information on the following:

- Complete description of all operational activities;
- Mapping of operational activities to subsystem;
- Identification of driving system throughput and timing;
- Identification of parallelism or sequential operation;
- Concurrent radar operations, including overload processing; and
- Supporting context of software Configuration Items (CIs)

3.3.3.4 Hardware Requirements Specification (HRS)

The contractor shall include a requirement specification for each hardware CI in the HRS (ref CDRL A032). The contractor shall plan and conduct the necessary tests, demonstrations, inspections, and analyses for the verification of the HRS. For all affected hardware CIs, the contractor shall update the following documents to reflect all hardware changes incorporated:

- PIDS (ref CDRL A030)
- HRS (ref CDRL A032)
- HDD (ref CDRL A035)
- ΔFRD (ref CDRL A031)
- IRS (ref CDRL A034)
- IDD (ref CDRL A037)

3.3.3.5 Hardware Design Description (HDD)

The contractor shall document and maintain the hardware designs in the HDD (ref CDRL A035). The HDD shall contain the detailed design requirements and key drivers for meeting the requirements. The HDD shall identify all mission critical and safety critical hardware.

3.3.3.6 Software Requirements Specification (SRS)

The contractor shall include a requirement specification for each software CI in the SRS (ref CDRL A033) and HRS (ref CDRL A032).

The contractor shall conduct software qualification testing to verify the SRS and all changes to the SRS. For all affected software CIs, the contractor shall update all applicable documents to reflect all software changes incorporated.

3.3.3.7 Software Design Description (SDD)

The contractor shall document and maintain the software designs in the LRDR SDD (ref CDRL A036). The SDD shall contain the detailed design requirements, design assumptions, and key design drivers, to include system thread definitions and the underlying rationale.

The contractor shall maintain firmware required by hardware subsystems, including Field Programmable Gate Arrays (FPGAs), as software CIs within the respective Hardware items. The contractor shall treat firmware as part of the overall software configuration for the LRDR. The contractor shall apply the same processes and procedures to the firmware as is applied to software.

3.3.3.8 Interface Requirements Specification (IRS)

The contractor shall document the internal and external functional, physical, and electrical interface specifications of the LRDR in the IRS (ref CDRL A034).

3.3.3.9 Interface Design Description (IDD)

The contractor shall document the internal and external functional, physical, and electrical interface designs of the LRDR in the IDD (ref CDRL A037).

3.3.4 Technical Data (TD)

3.3.4.1 Technical Data Package (TDP)

The contractor shall generate and deliver a Production Level (3) TDP for the LRDR system (CDRL A041 with TDP Option Selection Worksheet). This delivery shall include both hardware schematics, technical data, software documentation (see DFARS 252.227-7013(a)(4), -7013(a)(15)), computer software source code, object/operating/executable code, algorithms, models, and processes (see DFARS 252.227-7014(a)(4)) as defined by MIL-STD-31000A. The TDP shall be current, complete, defect free, and accurate. The technical data provided shall allow the Government to manufacture, procure, rework, repair, and maintain LRDR configuration items using DoD depots, secondary sources, and Full & Open competition. Contractor and subcontractor Bills of Materials shall list commercially available part numbers under the original equipment manufacturers part number when available. The contractor shall update all technical data, include new technical data, and continue configuration management of the TDP throughout the period of performance as required in CDRL A041.

3.3.4.2 Source Control Request

The contractor shall generate and submit Source Control Drawing Approval Requests (ref CDRL A041) and Parts Approval Requests (CDRL A042) in accordance with the PMAP to support the secondary source approval process. The contractor shall update the TDP accordingly with each Government-approved secondary source.

3.3.4.3 Engineering Design Notebook (EDN)

The contractor shall maintain an Engineering Design Notebook (EDN) (ref ADP 008) which includes technical documents not specifically covered in other CDRLs that are produced in the course of the work on this contract. The contractor shall document the rationale for design assumptions and decisions. The Engineering Design Notebook is a compendium of working-level documents normally produced in support of the contractor's system design definition efforts. Examples of the types of documents within the notebook include: peer review minutes, analyses, trade study reports generated during this contract and studies conducted on the existing radar system or systems from which the LRDR design is derived, technical memoranda, hack-up data for presentation material, and subcontractor or third party selection criteria. (b)(4)

(b)(4)

3.3.5 Open Systems

3.3.5.1 Open Systems Architecture

The contractor shall generate, update, and execute an Open Systems Management Plan (OSMP) (CDRL A043) that describes and documents its modular open system and open architecture design approaches. The contractor shall demonstrate compliance with the OSMP during all design reviews. The contractor shall identify in the OSMP all Commercial-Off-the-Shelf/Non-development Item (COTS/NDI) components, their functionality and proposed use in the system, and provide copies of license agreements in the OSMP related to the use of these components. If a vendor no longer supports the product versions used in the LRDR environments, the contractor

shall, with Government concurrence, provide a technical assessment of risks involving unsupported product usage, and shall provide assessment of transition to upgrades with resulting retest and installation impacts.

The contractor shall develop and maintain an architecture that incorporates appropriate considerations for modularity, data accessibility, scalability, reconfigurability, portability, maintainability, technology insertion, vendor independence, reusability, interoperability, upgradeability, producibility, testability, and long-term supportability as defined by the Open Architecture Computing Environment Design Guidance v1.0, MIL-STD-1472G (Human Engineering), and the MAP. The contractor's design approach shall be applied to all subsystems and components.

The OSMP shall describe and the contractor shall implement the strategy for reducing supportability costs, provide evidence that COTS or NDI products are logistically supported, and verify the availability of commercial repair parts, repair services, and facilities. The contractor shall provide methodology for pass-through of COTS warranties to the Government in the OSMP.

3.3.5.2 Modular Open Systems Approach (MOSA)

The contractor shall implement a Modular Open Systems Approach into the design and document this approach in the OSMP. This approach shall emphasize life-cycle sustainment and affordability in the selection of modular components. The contractor shall obtain Government approval in writing regarding the use of limited or restricted rights products prior to utilization.

3.3.5.3 Design Information Documentation

The contractor shall use industry standard formats for all modeling and design activities. The contractor shall use tools that are capable of exporting model information into a standard format. The contractor shall identify the standards and formats to be used in the OSMP. The contractor shall maintain the design information, including any models used, so that the design information and models are current with the as-built system.

3.3.5.4 Reuse of Pre-existing and Common Items

The contractor shall identify the reuse of pre-existing and common items in the OSMP. The contractor shall plan, establish, manage, control, and monitor the software reuse program in accordance with IEEE 12207 (Standard for Systems and Software Engineering – Software Life-Cycle Processes) and to systematically exploit reuse opportunities.

3.4 Specialty Engineering (CLIN 0001, 0010, 1000*, 1010*, 1200*, 1210*, 2000*, 3000*, 5000*, 6000*) (*-Priced Option)

3.4.1 Quality Assurance (QA)

Quality provisions for each CLIN shall comply with MDA-QS-001-MAP Rev B (MAP) dated 13-Jun-14 (as tailored by the Government-provided LRDR Requirements Applicability Matrix Appendix A.2 of Attachment J-21). Attachment J-21 will be referenced as the MAP throughout this document.

3.4.1.1 Quality Plan

The contractor shall implement, maintain and execute a quality system in accordance with the MAP, ISO 9001:2008, and AS9100. The contractor shall submit a Quality Program Plan (QPP) (CDRL A044) meeting the requirements of the MAP, ISO 9001 Quality Management Systems – Requirements (entire document), and AS9100 Rev C. If the QPP references internal contractor documents, then those documents shall also be provided with the QPP submission. The Government shall be provided copies of internal contractor documents when such documents are used as tailoring documents for the MAP. The contractor shall not modify internal documents in such a way as to adversely impact compliance with the MAP.

3.4.1.2 Mission Critical and Safety Critical Hardware

The contractor shall utilize Failure Modes, Effects, and Criticality Analysis (FMECA) and criteria below to identify and control mission and safety critical items. A Failure Mode Effects and Criticality Analysis (FMECA) shall be conducted on all manufactured hardware and mission and safety critical design features per the MAP. The contractor shall update the system level FMECA, as necessary, to include new failure modes discovered during FRACAS analyses to ensure all potential failure modes are addressed appropriately. The contractor shall prepare the FMECA with failure rates quantified for all identified failure modes and shall update previously prepared FMECAs to address the impact of engineering design changes and manufacturing changes as a result of corrective actions or re-design/configuration changes.

The contractor shall use, as a minimum, the following criteria to identify mission and safety critical items:

- All Items with failure modes assigned to FMECA Severity Categories I and II.
- Impact of potential failure on safety, readiness, mission success, and demand for maintenance/logistics support.
- Item has a critical failure mode.
- Item performance approaches its design limits with applicable safety factors or the item's inherent reliability is degraded by transient stress.

- Item's criticality ranking is not mitigated by Built-In-Test, or other means, to prevent or substantially reduce probability of a successful mission or operational requirement.
- Application of new technology, new materials, new processes, or advanced state-of-the-art techniques.
- Complex production or technical complexity.
- Limited source, limited material, or sole source availability.
- Physical properties of the item are stability sensitive, requiring tight process control.
- Any component whose failure or improper function would render the system less than dual fault tolerant for catastrophic or critical severity hazards.

Methods for controlling and testing mission and safety critical items shall be established and documented in the QPP. Controls may include supplier surveillance, configuration control/process change reporting, problem reporting, and agreed to tests and inspections. Examples of mission and safety critical items include, but are not limited to: LRUs whose failure results in loss of threshold capability; items having limited operating life (controlled items); one-of-a-kind hardware devices; items causing single points of failure; and items that cannot be tested before use. All single points of failure shall be identified, catalogued, tracked and submitted to the Government in the monthly Corrective Action Board (CAB) throughout period of performance of the contract. This submittal shall include planned efforts to eliminate each single point of failure.

Key characteristics shall be defined as an attribute or feature of a material, part, assembly, installation, or system whose variation has a significant influence on product form, fit, function, performance, service life, or manufacturability and that requires specific actions for the purpose of controlling variation. Key manufacturing processes shall be defined as one that is the only known method that will result in the production of an acceptable item, leading edge technology processes without proven repeatability or production capability, all processes unique to the LRDR program such as all assemblies and test activities regardless of where they are performed, and processes for which the product design conformance cannot be or is not verified by inspections or test specimens, and if deviated from, could affect product performance or safety.

3.4.1.3 Quality Assessment Reporting

The contractor shall present monthly, a Quality Assessment Report (CDRL A045) to the Government at the CAB held at the contractor's facility to provide Government insight into program quality, production, hardware and software issues - including root cause corrective action progress and implementation status, FRACAS, and the presentation of monthly MAP metrics reports for the prime and subcontractors. The contractor shall collect data for generating the required metrics as identified in MAP section 3.1.4 and flow the requirement for quality staffing, cost of quality and Foreign Object Debris (FOD)/Foreign Object Elimination (FOE)

incident metrics down to its subcontractors and all of its critical sub-tier suppliers. These metrics shall be updated monthly and delivered monthly.

The monthly CAB shall begin after the CDR and shall include discussion of quality issues and significant production events that may affect the form, fit, function or reliability of the product and will continue until the end of the contract. The monthly CAB shall also include discussion of internal audit findings at the contractor, subcontractors, and all critical sub-tier suppliers. FRACAS discussions shall include FRACAS events identified the previous month and all subcomponent, component, and radar-level ATP failure events by type reviewed by the contractor.

The Contractor shall identify all mission and safety critical hardware, safety and mission critical suppliers, hardware with key characteristics (as defined in SOW Paragraph 3.4.1.2) and hardware incorporating critical technologies (as defined in the Department of Defense TRA Deskbook dated July 2009). The Contractor shall update, maintain, and deliver the above list monthly (CDRL A045). The list shall include the following data: Name of the contractor company, name of the mission & safety critical components/elements and/or service(s) the company provides, the next higher assembly name and part number, the company's CAGE code, the contractor's city, state, county, and country (if foreign), and if the contractor is the sole supplier of the element/component. The initial list shall minimally include the Radome, Array Cooling Hardware, Radiating Element and Circulator, T/R Module, Power LRU, Distributed Receiver/Exciter (DREX), Beam Steering Hardware (on DREX), Digital Beamformer (on DREX & Column Processor), and Calibration Hardware (on T/R Module & DREX).

The CAB agendas shall include all special topics identified by the Government.

Meeting logistics (scheduling, location, security requirements, agenda and content) are subject to Government approval. The contractor shall place read ahead material and presentations on the IDE preceding the CABs three business days before the meeting. The contractor shall place additional Presentation Materials and Action Items on the Government IDE following the CABs. The contractor shall update Action Item status including closure plans weekly.

3.4.1.4 MDA Assurance Provisions (MAP) Implementation

The contractor shall fully implement and execute the MAP. The contractor shall assure the appropriate MAP requirements are flowed down to all subcontractors, sub-tier suppliers, and purchase orders responsible for fabrication/supply of mission and safety critical hardware/software as defined in SOW paragraph 3.4.1.2. The Contractor shall describe in their QPP the method by which MAP requirements are flowed down to their subcontractors and sub-tier suppliers of mission and safety critical hardware/software. The Contractor shall describe in their QPP how they verify that the requirements are understood by the subcontractors and the

sub-tier suppliers of respective subcontractors. The Contractor shall also describe in their QPP how they assure continued compliance to the MAP requirements throughout the performance of the contract.

3.4.1.5 Non-Conforming Hardware

Should hardware be fabricated, built, or assembled incorrectly, the contractor shall replace or rework the non-conforming hardware to the original product specification. For hardware that cannot be reworked to the original product specification, the contractor shall submit a waiver to the Material Review Board (MRB) requesting "use-as-is" or non-standard repair condition. A nonconformance is the failure of a characteristic to conform to the requirements specified in the contract, drawings, specifications, or other approved product description. When a serialized LRU has experienced or gone through two rework operations, the contractor shall seek MRB approval prior to subsequent rework operations. Standard Repair Procedures (SRP), as defined in MAP Paragraph 3.11.1, are authorized for use only after Government approval. For the first usage of SRP for a particular failure type, the contractor shall conduct a root cause analysis of the manufacturing anomaly and implement the corrective action process improvement, and the contractor shall provide the results of the Root Cause/Corrective Action (RC/CA) effort to the Government in a TIM NLT 60 days from the date of the anomaly. In the event the root cause of a manufacturing process anomaly is determined to be a limitation in the state of the art of the manufacturing process capabilities, a detailed discussion of the technology limitation is required via a TIM provided to the Government representatives 60 days after the process anomaly.

3.4.1.6 Foreign Object Elimination (FOE)

The contractor shall establish, maintain, and implement a Foreign Object Elimination (FOE) program per MAP paragraph 3.12.5.2.3. Upon occurrence of a FOD event which results in hardware damage or personnel injury, MDA/SNQ and MDA/QS shall be immediately notified, respectively, and a root cause/corrective action plan will be presented at the next monthly Corrective Action Board (CAB) or at an emergency session of the CAB depending upon the seriousness of the event from the Government perspective. All FOD events shall be documented throughout the period of contract performance and such documentation be made available to the MDA for safety and failure investigations within the Quality/Mission Assurance Working Group (QMAWG).

3.4.1.7 Product Acceptance System

The contractor shall plan, develop, implement, and/or maintain a product acceptance system that demonstrates compliance to the technical and contractual requirements. The product acceptance system shall address system and subsystem component requirement verification, in-process inspection, and final acceptance testing at all levels, including lower tier subcontractors and suppliers. All items shall successfully complete acceptance testing prior to delivery to the Government or as specified in test program planning. The product acceptance system shall be

approved by the Government. End item Acceptance Test Procedures (ATPs) and equipment, including Special Inspection Equipment (SIE) and Special Test Equipment (STE), shall be validated by the Government prior to use for delivery of hardware. The contractor shall notify the Government no later than two weeks before the scheduled event. The contractor shall prepare validation plans in accordance with DI-MISC-80759. Safety and mission critical hardware ATP's and Line Replaceable Unit (LRU) ATPs shall be prepared IAW DI-QCIC-80553A and submitted for review no later than ten working days prior to the acceptance test". Changes to acceptance test procedures and/or associated equipment, vendor changes, line relocations, production disruptions, or downtime exceeding 12 months shall be revalidated.

3.4.1.8 First Article Qualification Testing

The contractor shall perform first article test and inspection on manufactured or purchased hardware per MAP Paragraph 3.12.8.2 and DI-NDTI-81307A. First article test and inspection shall be conducted prior to initiation of a production run and on the first items produced using new or modified tooling or processes. First article test and inspection shall consist of a comprehensive test and inspection to verify production capability; proper use of materials, parts, and process controls; to demonstrate product compliance to specified requirements; and to verify the validity of applicable documentation.

3.4.1.9 Test Readiness Review (TRR)

The contractor shall conduct Test Readiness Reviews per MAP Paragraph 3.4.1.9, Test Readiness Review.

3.4.1.10 Quality Escape/Non-Conformance Reporting

The contractor shall review and resolve production quality escapes at the monthly MDA CAB. A quality escape is defined as a component failure at the next higher level subassembly test where the component previously passed the component level acceptance test. The contractor shall review all production non-conformances that occur at select suppliers as defined in the last sentence of this paragraph at the monthly MDA quality review. In addition, non-conformances shall be tracked for potential production process failure trends and reported at the MDA monthly quality review. The quality escape requirement and non-conformance requirement applies to all safety and mission and safety critical parts/suppliers, all subcontractors and their sub-tier suppliers to the second level, and all electronic component Purchase Order suppliers with a production requirement over twenty-five units and a combined contract cost of over \$250K.

3.4.1.11 Mission Focused Audits

The contractor shall provide information upon request to MDA in the conduct of (6) Mission Focused Audits lasting no more than three days and associated corrective action follow-up visits lasting one day executed in compliance with the MAP. The Audits will be targeted and scheduled by the Government in response to the major subcontractors or sub-tier suppliers that

have experienced production or reliability issues. The focus of the audit will depend on the issue being experienced, such as FOD, tool control, fabrication processes, non-conforming material, management systems or quality escapes. MDA will document the issues and the contractor shall identify root causes for the non-conformance and provide corrective action to be reviewed in the follow-up visit. MDA QS reserves the right to unrestricted and unfettered access to the Prime's facilities and all subcontractors per MDA Policy Memorandum #73, MDA Policy for Quality, Safety, and Mission Assurance Directorate Access Authority dated 16-Sep-13 and the FAR 52.247.

3.4.1.12 Product Assurance (PA)

The contractor shall plan and conduct a PA program that integrates PA requirements into the design, manufacture, and test of all LRDR System hardware and software. The contractor's PA program shall be based on best practices to establish the necessary PA processes, controls, and approval authority to ensure that product quality, reliability, safety, and other system attributes are not compromised. Audits and analyses shall be conducted to ensure the major subcontractors and vendors are compliant with the PA program. The contractor shall prepare and submit PA program process reports as a part of the Quality Program Plan.

3.4.1.13 Quality Assurance Provisions (QAPs)

The Contractor shall establish QAPs as necessary for it and its suppliers/subcontractors (including purchase order suppliers) to monitor and control mission and safety critical hardware items. QAPs shall include the applicable MAP requirements and the contractor's corporate QAP requirements.

3.4.2 Parts, Materials, And Processes Mission Assurance Plan (PMAP)

The contractor shall execute the design, development, production, deployment and post deployment operations in accordance with the MDA-QS-003-PMAP-Rev B, MDA Parts, Materials, and Processes Mission Assurance Plan (PMAP) dated 2-Mar-12. The Prime shall develop and deliver a Parts, Materials and Processes Plan (CDRL A046) and As Designed Parts, Materials and Processes List (CDRL A047) in accordance with PMAP appendix F. The contractor shall establish and support a PMP Control Board (PMPCB) for the contract term of the program, submit and adjudicate parts for approval consistent with program schedules and milestones, attend semi-annual MDA PMP Board (PMPCB) meetings, and provide all PMP reporting and information as required in the PMAP.

3.4.2.1 MDA Parts, Materials, and Processes Plan (PMAP)

All parts, materials, and processes selections shall be processed in accordance with the MDA PMAP to hardware category D requirements. In addition to all PMAP requirements, the contractor shall:

1. Have a lead-free management program that detects, prevents, controls and documents the use of pure tin per CDRL A046. The requirements of this paragraph shall be flowed down to all suppliers/subcontractors and purchase order suppliers.
2. Have a counterfeit parts program that prevents the introduction of counterfeit parts in LRDR hardware. All microcircuits and discrete semiconductor parts shall be procured from authorized franchised distributors. Procurement of these parts from non-franchised distributors is PROHIBITED unless approved by the MDA/SN Parts, Materials, and Processes Control Board (PMPCB). The requirements of this paragraph shall be flowed down to all suppliers/subcontractors and purchase order suppliers. The LRDR contractor shall continue to notify MDA prior to procurement of electronic parts from unauthorized sources by non-COTS mission critical suppliers that procure electronics. Similarly, the supplier shall get prior approval from the LRDR contractor before parts from unauthorized sources are procured and installed. In addition to compliance to PMAP Rev B, the contractor shall comply with MDA Policy Memorandum #50, MDA Policy on Purchasing Electronic Parts dated 7-Oct-13.

3.4.2.2 Parts, Materials, and Processes Plan (PMAP) Compliance

The contractor PMP organization shall perform, with Government participation, on-site PMP assessments of subcontractors of mission and safety critical hardware semiannually until the subcontractor has satisfied delivery requirements. The Government will evaluate the list (CDRL A045) at PDR and down select to a maximum of six subcontractors for PMAP compliance assessment. The purpose of these on-site PMP assessments is to verify compliance to PMAP management and control practices as defined in the approved subcontractor PMP plan. The initial assessment shall focus on PMAP implementation while the second assessment shall verify and validate corrective action implementation to issues opened during the first assessment. If there are no significant minor or major issues opened during the first assessment then the contractor is not required to perform the second assessment. If the subcontractor has satisfied all requirements for delivery prior to second assessment and with no open issues from the first assessment then the contractor is not required to perform the second assessment. Non-conformances shall be mitigated and submitted by a specified date that shall be determined by the contractor PMP/subcontractor. All non-conformances shall be tracked to closure at the PMPCB. The contractor shall provide technical expertise semiannually in support of PMAP compliance assessments at their principle facility over the life of the contract. The initial assessment shall focus on PMAP implementation while the second assessment shall verify and validate implementation of corrective actions of issues opened during prior assessment. The MDA/SN QS Parts Lead shall be notified of each assessment fourteen (14) working days prior to each assessment.

3.4.3 Counterfeit Parts Avoidance

In conjunction with the on-site PMP assessments, the contractor shall perform, with Government participation, counterfeit part avoidance assessments of subcontractors of mission and safety critical hardware semiannually until the subcontractor has satisfied delivery requirements. The purpose of these on-site counterfeit avoidance assessments is to verify compliance to PMAP management and control practices as defined in the approved subcontractor PMP plan which shall include documented processes that address the prevention, detection, and control of counterfeit parts and materials.

3.4.4 Reliability, Availability, Maintainability and Testability (RAM-T)

The contractor shall implement proven tools and techniques in accordance with company best practices and industry standards to incorporate RAM-T early into the Radar design, eliminate deficiencies during assembly and test, and collect and maintain operational RAM-T performance data for LRDR hardware and software. The contractor shall provide this data upon Government request through the Reliability, Availability, Maintainability and Testability (RAM-T) Working Group monthly meeting for formal Government RAM-T scoring and service acceptance activity.

3.4.4.1 RAM-T Program Plan

The contractor shall develop, maintain, and execute a RAM-T Program Plan (CDRL A048) fully describing the contractor's reliability plans, processes, and procedures tailored to the LRDR and encompassing hardware and software. Each RAM-T topic shall be defined in-depth such that the Government may understand the proposed RAM-T program and how it promotes acquisition of a LRDR that meets RAM-T requirements at the lowest possible total ownership cost (not just lowest initial acquisition cost).

Each reliability task shall be defined in-depth such that the Government may understand the proposed reliability program. The RAM-T Program Plan and report shall comply with DI-SESS-81613 and shall describe the Contractor's RAM-T organization, testing and analysis functions, duties, responsibilities and communication strategy for the LRDR effort (internal reviews and external reporting to the Government) reporting requirements in place to ensure LRDR radar is designed, produced and fielded that is capable of meeting Reliability, Maintainability, Testability and Operational Availability requirements at the lowest possible total ownership cost. The LRDR RAM-T performance projection shall be substantiated by system/component data, such as verifiable field data (possibly from a similar fielded system), test data (life testing), verifiable historical data, and technical predictive analyses.

The RAM-T Program Plan (ref CDRL A048) shall address at a minimum the following topics:

- Challenges and/or obstacles to achieving the required Operational Availability (A_0) as mandated in the LRDR Element Specification (ES)
- The approach/methodology for achieving the required A_0

- Lessons learned through historical experience in meeting or exceeding predicted RAM-T performance
- The plan by which A_O will be maintained during replacement of each hot swappable LRU in the LRDR design and any system/personnel requirements needed to safely execute the exchange of such hardware
- Design and maintenance concepts to be implemented in the LRDR program
- The approach to implementing Fault Detection/Fault Isolation (FD/FI) in the LRDR design for mission critical and single point failure components
- Software design and test strategies in support of the LRDR RAM-T projection
- The plan for implementing the Testability Program
- The plan for Reliability/Maintainability/Testability functional involvement throughout the design and development process, to include but not be limited to requirements development, parts selection, production/assembly, and test
- The plan for implementing Highly Accelerated Life Testing / Highly Accelerated Stress Screening (HALT/HASS)
- The plan for conducting failure reporting, investigation and corrective action implementation during all phases of the program
- The planned Reliability, Maintainability and Testability modeling tools and procedures (with detailed descriptions), and a description of planned A_O modeling methods, tools and assumptions
- Innovative RAM-T techniques deemed promising for implementation on the LRDR with supporting justification
- Risks associated with the proposed RAM-T approach and proposed risk mitigations

3.4.4.2 Subcontractor Control

The contractor shall establish management procedures, product acceptance and inspection procedures and design controls, including allocation of reliability, maintainability, testability and availability requirements, which will ensure that products obtained from subcontractors shall meet specified requirements in accordance with MAP section 3.13, Supplier Management. Subcontractor product RAM-T performance shall be collected, maintained and delivered upon request through the RAM-T Working Group.

3.4.4.3 Design Reviews

The contractor RAM-T engineering representatives shall attend program meetings/reviews, including the post award conference, IPT meetings, concurrent design team meeting support, and test reviews applicable to RAM-T. RAM-T information provided shall include the status of the RAM-T program, identification of problems/risks/deviations from the RAM-T Program Plan, and reliability/maintainability evaluations pertaining to the topics under discussion.

3.4.4.4 Failure Reporting, Analysis, and Corrective Action System (FRACAS)

The contractor shall establish, implement and execute a proactive closed-loop Failure Reporting, Analysis, and Corrective Action System (FRACAS) for conducting failure investigations, failure reporting, failure trends, failure analyses, corrective action implementation, review, and closure processes. This closed loop FRACAS shall be per ANSI/AIAA Performance-Based FRACAS Requirements standard S-102.1.4-2009e, and shall be applied during the build-up/manufacture of all hardware in a lab/factory environment and during all testing to include design verification, qualification, acceptance and field testing, to ensure reporting, analysis, and correction of all hardware and software failures. All design verification and hardware qualification test failures shall be subject to FRACAS. Highly Accelerated Life Test (HALT) failures shall be analyzed as part of FRACAS with primary consideration given to the observed failure modes and not the stress level at which the failure modes were discovered. The contractor shall ensure that all subcontractors and suppliers develop and implement a closed loop FRACAS system. The contractor shall analyze the failure data to identify failure trends, root cause, and problem areas.

The contractor shall develop a FRACAS database to specifically address all contractor, subcontractor, supplier, and Government reported failure incidents. The contractor shall recommend corrective action to address root cause and preclude recurrence for pattern failure and track changes through the configuration management process. Each reported failure shall be tracked in the database and shall require Government concurrence, unless otherwise delegated, for specific corrective action implementation prior to closure. System and subassembly failure trend analyses shall be thoroughly monitored, and a comprehensive summary shall be prepared.

The contractor shall develop a milestone schedule that indicates when corrective actions will be implemented and ensure that this is tracked in the FRACAS database and provided to the Government through monthly FRACAS meetings. The contractor shall allow the Government to have electronic on-line access to the FRACAS database, with query capabilities available to conduct comprehensive analyses of system, subsystem, and component failure trends, failure histories, and corrective action effectiveness. FRACAS reports shall be detailed down to the lowest level necessary to determine the true root cause of a failure and to assure adequate corrective action has been instituted. The contractor shall present a status summary of reliability FRACAS activity at all FRACAS meetings, RAM-T WG, PDRs, CDRs, In-Process Reviews (IPRs) and PRRs.

The contractor shall prepare and submit FRACAS reports (ADP 013). The contractor shall submit all production test failures of mission critical hardware to the Government for evaluation and final determination of FRACAS events to be investigated. A test failure is defined as an LRU acceptance test failure. All component failures occurring during integration and post integration shall be investigated as a FRACAS event.

3.4.4.5 Reliability Modeling

The contractor shall develop a System Reliability Model that accounts for specific mission parameters and operational constraints as defined by the ES. At a minimum, the System Reliability Model shall be used to:

- (1) Generate and update the reliability allocations from the system-level down to lower indenture levels.
- (2) Aggregate system-level reliability based on reliability estimates from lower indenture levels.
- (3) Identify single points of failure.
- (4) Identify reliability-critical items and areas where additional design or testing activities are required in order to achieve the reliability requirements.

The contractor shall update the System Reliability Model when new failure modes are identified, failure definitions are updated, operational and/or environmental load estimates are revised, or design and manufacturing changes occur during the contract period of performance. Detailed component stress and damage models shall be incorporated.

3.4.4.6 Reliability Allocations

The contractor shall allocate reliability requirements down to the LRU level. All COTS hardware shall meet or exceed allocated reliability requirements, to include adjustments in failure rate expected due to the operating environment of the system relative to the nominal operating environment of COTS hardware.

3.4.4.7 Reliability Prediction

The contractor shall develop detailed component stress models/predictions representative of each functional mode required for mission success. Comparative analysis shall be performed for each configuration using data from reliability handbooks, field results, similar equipment history, laboratory test data, or best engineering judgment in the absence of these data. These estimates shall be documented and shall account for quality factors, temperature considerations, environmental conditions, and other operational issues, requirements, and constraints as discussed in the LRDR ES. Design solutions and corresponding reliability estimates shall be presented at each technical review. The contractor shall develop and submit Reliability Prediction Reports in the RAM-T Analysis Report (ADP 014).

3.4.4.8 Single Failure Points or Reliability Critical Hardware and Software Failure Modes

The contractor shall identify, analyze, and evaluate the hardware and software failure modes, their criticality and safety hazard analysis, Built-In-Test (BIT) testability, and the resultant effect on system performance in order to eliminate or minimize their effect as early in the design process as possible. Single failure points of critical hardware and software shall be tracked. A single failure point is the failure of an item which will result in failure of the system and is not compensated for by redundancy or alternative operational procedure. Risk assessment rankings, severity categories, and probability levels shall be defined per MIL-STD-882E, Section 4, Tables I, II, and III.

The contractor shall update the system level FMECA, as necessary, to include new failure modes discovered during FRACAS analyses to ensure all potential failure modes are addressed appropriately. The contractor shall address FMECA results (ADP 015) at all PDRs, CDRs, IPRs, PPRs, and RAM-T WG meetings, and IPTs.

3.4.4.9 Fault Tree Analysis (FTA)

The contractor shall perform Fault Tree Analysis (FTA) (ADP 016) for mission and safety critical LRDR hardware/software that starts with a particular undesirable actual/potential event and provides an approach for analyzing the cause of the event. The undesired event constitutes the top event in a fault tree diagram and represents a complete or catastrophic failure of the product. The contractor shall perform and document comprehensive FTA from the start of component design and development through declaration of Robust Homeland Defense capability.

3.4.4.10 Reliability Critical Items

The contractor shall prepare a list of hardware and software items critical to reliability (ADP 017) and present this list at all SETRs. The contractor shall also implement additional controls to mitigate reliability concerns with reliability critical items. Critical items shall include at a minimum:

- (1) Items having limited operating life or shelf life (e.g., components whose projected life may be decreased by stresses during testing and operation)
- (2) Items difficult to procure or manufacture (e.g., single source, custom built, excessively complex, state-of-the-art, or employ state-of-the-art manufacturing processes)
- (3) Items with unsatisfactory operating history (e.g., previous experience indicates an item fails much sooner than expected when used in the same manner and environmental conditions)

- (4) Items of new technology with little reliability data
- (5) Single source items
- (6) Items exceeding derating limits
- (7) Items that cause, or have the potential to cause, single points of failure
- (8) High volume items which, if of poor reliability, would compromise system reliability

3.4.4.11 Reliability Growth

The contractor shall develop and implement a formal reliability growth management program to meet specified system requirements. Mission critical hardware or software failures and operating hours accumulated during field testing and operational deployment shall be collected, analyzed, and used for assessing reliability growth and related TPMs. The Government and the contractor will review test data and score/determine which failures and hours are applicable to determining reliability growth. Reliability growth shall be plotted at periodic intervals to ensure reliability requirements are being met. The contractor shall develop and deliver these reliability growth plots (ADP 018) at a frequency specified dependent on the intensity of testing activity during a given period. These reliability growth plots shall provide management with the information needed to increase emphasis as necessary, should the actual reliability growth fall below the projected growth.

3.4.4.12 Reliability Demonstration

The Contractor shall perform a system level LRDR reliability demonstration using MIL-HDBK-338B for guidance unless reliability growth efforts provide confidence that reliability requirements have been met. The demonstration shall be planned as an operationally realistic test which reflects actual usage and environmental conditions. The Radar reliability shall be verified at 80% lower confidence level. The contractor shall complete the Reliability Demonstration, to include submission of reports (ADP 091), no later than 120 days prior to end of contract.

3.4.4.13 Highly Accelerated Life Testing / Highly Accelerated Stress Testing (HALT/HAST)

The contractor shall provide to the Government at System PDR a list of mission and safety critical items planned to undergo HALT/HAST as part of the HALT/HAST Plan (ref CDRL A044). The contractor shall perform HALT/HAST on mission and safety critical components and subassemblies as well as reliability critical items for which HALT/HAST test data does not exist to assure margin to specified stress levels and to find weaknesses in designs for corrective action prior to design release. The contractor shall prepare a detailed HALT/HAST Plan as a

part of the QPP (ref CDRL A044). The HALT/HAST data shall be used in development of Environmental Stress Screening (ESS) hardware profiles.

3.4.4.14 Environmental Stress Screening / Highly Accelerated Stress Screening (ESS/HASS)

The contractor shall develop and implement ESS on all electrical and electromechanical tactical hardware with emphasis on testing at the lowest level possible. For items which have undergone HALT testing, HASS techniques shall be considered and implemented when their use will improve the overall effectiveness of the ESS/HASS program. ESS shall also be implemented on mission critical COTS hardware where no evidence of an appropriate vendor ESS has been performed. The contractor shall prepare a detailed ESS/HASS Program Plan as a part of the Quality Program Plan (ref CDRL A044) that defines hardware indenture level of ESS, selected environmental profiles and rationale, power on/off application, and metrics to be used for evaluating ESS effectiveness.

3.4.4.15 Maintainability/Testability Program

The contractor's maintainability and testability plans, processes, and procedures shall be developed and maintained in the comprehensive RAM-T Program Plan (ref CDRL A048) in conjunction with SOW paragraph 3.5.10. The contractor shall develop design criteria to be used in the design process to achieve the requirements defined in the LRDR ES. As part of the RAM-T Analysis Report (ref ADP 014), the contractor shall develop and submit a design analysis showing failure modes, failure rates, ease of access, modularity, and the capability to achieve the fault detection/isolation and false alarm rate requirements. The contractor shall plan, update and conduct a Maintainability program that ensures all maintainability requirements defined in the LRDR ES are achieved. The contractor shall plan and conduct a Testability Program in the RAM-T Program Plan to ensure all system fault detection, fault isolation, and Built-In-Test (BIT) and Built-In-Test-Equipment (BITE) requirements defined in the LRDR ES are achieved. Lessons learned shall be documented and utilized to ensure known deficiencies are corrected at the component, assembly, subassembly and end item levels. The contractor shall provide the lessons learned data prior to CDR through the RAM-T WG.

3.4.4.16 Maintainability Modeling

The contractor shall develop a maintainability model that reflects the construction and configurations of the design. The model shall provide links to the testability/diagnostic design characteristics that link to the maintainability parameters. The contractor shall use this maintainability model to generate maintainability and testability predictions.

3.4.4.17 Maintainability and Testability Prediction

The contractor shall develop maintainability and testability predictions using estimates for repair and access time developed and documented using historical data and engineering estimates for

each module and configuration. Equipment/system fault detection and isolation capabilities shall be determined by analysis of FMECA data, replaceable modules, failures modes, and status diagnostics. Results shall be reported at each technical review per ADP 014. The contractor shall develop and submit the Maintainability and Testability Predictions Report as part of the RAM-T Analysis Report (ref ADP 014).

3.4.4.18 Maintainability and Testability Demonstration

The contractor shall perform a maintainability and testability demonstration prior to DD-250. This demonstration shall verify that the LRDR meets all maintainability and testability requirements identified in the LRDR element specification. The contractor shall include maintainability and testability demonstration requirements in the logistics demonstration plan. The contractor shall include maintainability and testability results in the logistics demonstration report (ref ADP 091). A demonstration outline shall be presented during the PDRs and CDRs.

3.4.4.19 Fault Tolerant Design

The contractor shall provide a fault tolerant design which results in a system with the ability to operate, perhaps at a degraded but acceptable level, in the presence of hardware or software faults. The fault tolerant design shall be discussed at all SETRs and should include a discussion of the fault tolerant design techniques being implemented to detect, diagnose, confine, mask, compensate, and recover from faults.

3.4.4.20 Operational Availability (A_O)

The contractor shall design and deliver a system meeting the Operational Availability (A_O) requirement defined in the LRDR ES, when operated and maintained according to the conditions and constraints as defined by the LRDR ES. In order to facilitate A_O assessment, the contractor shall collect date- and time-stamped continuous equipment state data (i.e., operational modes and state changes as recorded by the system) whenever power is applied and shall provide this data following initial fielding in accordance with the Monthly Quality Assessment Report (ref CDRL A045).

During design and development, the contractor shall model system-level A_O in a representative operational environment and provide results of this activity as an appendix to the RAM-T Analysis Report (ref ADP 014). Following initial fielding, the contractor shall compute a monthly system-level A_O as specified herein and provide this data in accordance with Monthly Quality Assessment Report (ref CDRL A045).

3.4.5 Configuration Management (CM)

3.4.5.1 Configuration Management Program Plan

The contractor shall establish, implement, adhere to and maintain a Configuration Management (CM) Program Plan for hardware Configuration Items (CIs), software CIs, and firmware per the MAP, PMAP, the LRDR CM Plan, and MDA Manual 3500.01-M. The contractor shall develop and submit a Configuration Control Item List (CCIL) (CDRL A049). The CCIL shall identify all mission critical items (as defined in SOW Paragraph 3.4.1.2) in the LRDR design solution as CIs and include “MC” in the configuration identifier nomenclature for such items. The contractor shall generate a contractor CM Plan (ref CDRL A016) to document the CM program. The CM program shall include: CI Definitions; configuration change control and configuration status accounting procedures; allocated, functional and product baselines; and planned configuration audits. The contractor shall allow the Government access to its baseline data, configuration control and configuration status accounting data, and software tools via the IDE.

3.4.5.2 Functional Baseline (FBL) Allocated Baseline (ABL) & Product Baseline (PBL) Documentation

The contractor shall develop, maintain, and update the FBL, ABL, and PBL until each baseline is formally accepted by the Government. The contractor shall generate and submit all Engineering Change Proposals (ECPs) in accordance with the MAP and the CM Plan (ref CDRL A016).

3.4.5.3 Parts Library Management (PLM) System

The contractor shall incorporate into the Logistics Management Information Database (LMID) a PLM system for the LRDR indented (parent/child) Bill of Materials. The PLM shall produce a single collaborative version of the LRDR BOM allowing the contractor and the Government to immediately see current as designed/as built status including change history on the part or assembly. The PLM shall be capable of making the complete parts list searchable and running dynamic data reports, tracking the complete bill of materials, its assemblies, and their histories.

The PLM shall also be capable of addressing and tracking pending and implemented PCN/ECN notices including the ability to see sub-supplier part changes. The contractor shall provide Government access to the LMID.

The contractor shall populate the PLM with the Configuration Control Item List (CCIL) (ref CDRL A049). The PLM shall be maintained during design, development, production, integration, calibration and Radar Acceptance. The final “as built” reports shall be delivered with the radar upon DD-250. All deficiencies, which are not in compliance with contract requirements, shall be corrected prior to radar delivery unless a waiver or deviation is granted.

3.4.5.4 Configuration Status Accounting (CSA)

The contractor shall establish and maintain the CSA System per MAP section 3.10.5 throughout the product's life.

3.4.5.5 Configuration Reviews and Audits

The contractor shall comply with Government configuration audits per MAP section 3.10.6. The contractor shall accommodate subsystem Functional Configuration Audit/Physical Configuration Audit (FCA) and (PCA) before each Factory Acceptance Test event. The contractor shall accommodate a final system FCA and PCA 30 days prior to DD-250 of the Radar. The contractor shall correct all FCA and PCA discrepancies prior to each Ship Readiness Review (ShRR) and prior to DD-250 issuance. The contractor shall propose, subject to Government approval, the scheduling, location, security requirements, agenda, and content of all subsystem FCA/PCAs. The Government will define the scheduling, location, security requirements, agenda, and content of the final system FCA and PCA. The contractor shall place read ahead material (ADP 001) on the contractor IDE seven days preceding each audit, and the final presentation material no more than seven days following the audits. The contractor shall generate and submit Minutes (ADP 002) on the contractor IDE to capture and manage all Government and contractor Action Items from each audit. Contractor Action Items from each audit shall be updated at least weekly until closure. The Government will have approval authority over Action Item closure.

3.4.6 Safety

3.4.6.1 System Safety Program

The contractor shall generate, implement, and maintain a System Safety Program in accordance with MIL-STD-882E, the MAP and the MDA Sensors (SN) System Safety Management Plan (SSMP). Safety investigating and reporting shall be in accordance with MDA Instruction 6055.02, Accident and Mishap Safety Investigations and Reporting, dated 22-May-13.

The contractor shall describe the methodology and process for doing system safety and software safety in the System Safety Program Plan (SSPP) (CDRL A050), in accordance with MIL-STD-882E Task 102. Specific items to be emphasized include but are not limited to the following:

- Hazard identification (including environmental), analysis, hazard tracking and developing mitigation in accordance with the MAP, MIL-STD-882E, and MIL-STD-1472G
- Safety metrics & reporting in accordance with MAP and MDA Instruction 6055.02

3.4.6.2 Safety Assessment/Safety Audits

The contractor shall support, to include the delivery of documentation, safety reviews, assessments and certifying activities by MDA and other certifying entities, to ensure compliance

with all applicable federal, state and service safety requirements. These activities include pre-operative inspections, on-site inspections at manufacturing locations and the radar site, safety release, safety certification, and transition to lead service.

The contractor shall plan and conduct safety audits as a part of the SSPP. The contractor shall comply with MDA Policy Memorandum #73, MDA Policy for Quality, Safety, and Mission Assurance Directorate Access Authority dated 16-Sep-13.

3.4.6.3 Hazard Analysis and Risk Assessment

All hazards, as defined in MIL-STD-882E, shall be logged, identified and reported to the Government during the design review process in the System Safety Hazard Analysis Reports (CDRL A051). The contractor shall report all HIGH and SERIOUS to the MDA/SN Safety Lead as soon as practical, but no later than the next design review.

The contractor shall perform safety assessments and develop hazard tracking logs and report the results in the Safety Assessment Report (SAR) (CDRL A052). The contractor shall develop and deliver a Health Hazard Assessment Report (ADP 019) in accordance with 4.1.2.7.MIL-STD-882E Task 207.

The contractor shall present all hazard classifications, mitigations and risk levels for approval through the MDA SN System Safety Working Group (SSWG). The SSPP shall comply with the safety risk acceptance levels as defined in the MAP and the SN SSMP. The contractor shall provide any internal information related to system safety hazard classification and risk levels upon request.

Safety hazards shall be eliminated or mitigated to an acceptable hazard category as defined using the system safety design order of precedence in MIL-STD-882E and MAP.

The contractor shall appoint a System Safety Lead (SSL) in writing with the concurrence of the COR at least 90 days prior to SRR. The contractor shall assure that the SSL has direct access to the contractor's Program Manager and Lead System Engineer for the system. The SSL is the contractor's primary point of contact for all safety efforts and issues. The SSL shall identify and manage compliance for all system safety and environmental requirements applicable to the system. The SSL shall provide a detailed safety report of all safety hazards and their mitigation strategies at the SSWG and brief LRDR issues in all SSWG meetings.

The contractor shall use the MDA Hazard Tracking Database to meet the requirements found in MIL-STD-882E. The contractor shall generate and provide the following safety documentation in accordance with MIL-STD-882E:

- Preliminary Hazard Assessment (ADP 020)
- System Requirements Hazard Analysis (SRHA) (ADP 021)
- Safety Assessment Report (ref CDRL A052)
- Health Hazard Assessment Report (ref ADP 019)
- Failure Modes, Effects, and Criticality Analysis (FMECA) Report (ref ADP 015)
- System Safety Hazard Analysis Reports (ref CDRL A051)
- Operations and Support Hazard Analysis (O&SHA) (ADP 022)
- Functional Hazard Analysis (ADP 023)
- Sneak Circuit Analysis Report (ADP 024)

3.4.6.4 Safety Review of Design Changes

The contractor shall review all design changes in hardware and software CIs for safety impact and notify the Government of a decrease in level of safety in accordance with MIL-STD-882E. The SSPP shall define the involvement of contractor safety personnel in the change and issue resolution processes. All design changes in hardware and software configuration items that impact safety shall be documented through new hazard analyses or updates to existing hazard analyses and submitted for approval through the SN SSWG.

3.4.6.5 Safety Verification

The contractor shall define and perform tests and demonstrations on safety critical hardware, software, and procedures to verify compliance with safety requirements in accordance with MIL-STD-882E Task 401. For all system level testing and testing involving the release of energy, the contractor SSL shall review the test plans, test procedures, data collection, and testing objectives to ensure that system safety requirements are properly identified and verified as part of the testing. The contractor SSL shall prepare system safety test objectives for each test event, specify pass/fail criteria approved by the Government, and document the results in the appropriate test plans.

3.4.6.6 Sneak Circuit Analysis

For safety critical hardware, the contractor shall establish the methodology in the SSPP to ensure that latent hardware and software paths are not present that may cause unwanted functions or that adversely impact safety functions at all component assembly and subassembly levels. The contractor shall generate and submit a Sneak Circuit Analysis Report (ref ADP 024).

3.4.6.7 Hazardous Material Management

The contractor shall generate, implement and maintain a Hazardous Material Management Program (HMMP) Plan (CDRL A053).

3.4.7 Human Systems Integration (HSI)

The contractor shall employ Human Systems Integration (HSI) principles during system design, development and sustainment engineering efforts in accordance with MIL-STD-1472G. The contractor shall incorporate (1) Human Factors Engineering (HFE), (2) Manpower, (3) Personnel, (4) Training, (5) Environment Safety and Occupational Health (ESOH), (6) Personnel Survivability, and (7) Habitability domain requirements into the layout, design, and development of equipment (hardware and software) having a maintainer interface.

3.4.7.1 Human Systems Integration (HSI) Program Plan

The contractor shall generate, execute and maintain a Human Systems Integration Program Plan (HSIPP) (ADP 025) in accordance with MIL-STD-1472G and industry best practices. The HSIPP shall describe the approach to developing and managing HSI requirements, elements and functionalities to meet all HSI domain objectives. The HSIPP shall outline the HSI activities to coordinate with Systems Engineering and Logistics efforts.

3.4.7.2 Human Engineering System Analysis Report

The contractor shall generate a Human Engineering System Analysis Report (HESAR) (ADP 026).

3.4.7.3 Human Engineering Design Approach Document - Maintainer

The contractor shall develop and maintain the Human Engineering Design Approach Document – Maintainer (HEDAD-M) (ADP 027). The HEDAD-M shall describe the extent to which the requirements and applicable design criteria have been incorporated into the design, layout, and installation of equipment having a maintainer interface, including related displays in accordance with the LRDR Maintenance Plan. Maintenance Task Analysis (MTA) shall be presented as part of the rationale supporting the layout, design, and installation of the equipment.

3.4.8 Environmental

3.4.8.1 Environmental Compliance

The contractor shall make available via the IDE information to the Government such as data, studies, and reports necessary to demonstrate full compliance with all Federal, State, and Local environmental laws including all known and potential non-compliance issues associated with system manufacturing, testing, operations, and disposal. The contractor shall make available information about its corporate environmental management system and procedures via the IDE.

3.4.8.2 Environmental Laws

The contractor shall comply with all federal, state, and local environmental laws, regulations, and policies for all activities defined in this SOW, whether conducted at Government or contractor facilities. The contractor shall manage the efforts under this contract so that the

system design, development, test, production, and operation activities prevent, mitigate, or control adverse environmental impacts, including industrial pollution and hazardous wastes.

3.4.8.3 Analysis Reporting

The contractor shall provide qualitative and quantitative data to support the required Government analyses needed to assess potential environmental impacts and issues at the radar site (that have not been previously analyzed or approved) under the provisions of the National Environment Protection Act (NEPA) 42 U.S.C. 4321-4370d, implementing regulation (40 C.F.R. 15000-1508).

3.4.8.4 Pollution Prevention and Sustainable Design

The contractor shall generate, execute and maintain a Pollution Prevention Plan (ADP 028). The Pollution Prevention Plan shall address the requirements for elimination or reduction of all forms of pollution to minimize environmental impacts and the life-cycle costs associated with environmental compliance. The Pollution Prevention Plan shall present the contractor's current and planned efforts in the development, design, construction, testing and sustainment of the LRDR for achieving pollution prevention through material sourcing, product substitution, material reuse, and recycling.

3.4.8.5 Electromagnetic Environmental Effects (E3) Control

The contractor shall establish, maintain and execute an Electromagnetic Environmental Effects (E3) Program Plan (ADP 029). E3 includes Electromagnetic Compatibility (EMC), Electromagnetic Vulnerability (EMV), Electrostatic Discharge (ESD), Radiation Hazards (RADHAZ), electromagnetic fields, intentional EMI and lightning. E3 studies and analysis reports (ADP 030) shall be documented and reported out at PDRs and CDRs.

3.4.8.6 Frequency Management

The contractor shall prepare and provide to the Government frequency certification data necessary to complete DD-1494 submission for all systems and subsystems designed to either emit or receive electromagnetic energy. The contractor is responsible for operation of equipment and performance of RF Survey to show that IEEE C95.1-2005, Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, requirements are met.

3.4.9 Technology, Production and Manufacturing

The contractor shall manufacture all hardware in compliance with the MAP and AS9100, including spares, support equipment, and test equipment provided under this contract. The contractor shall continuously assess the technological risk of the program using Manufacturing Readiness Levels (MRLs) and Technology Readiness Levels (TRLs) to provide a systematic metric/measurement system to assess the maturity and risk of a particular technology. The contractor shall pursue and report to the Engineering IPT all risk reduction efforts needed to

ensure that adequate technological maturity is reached before system CDR.

Mission and safety critical hardware and all identified critical technology elements (as defined in the Department of Defense TRA Deskbook dated July 2009) shall achieve a TRL of 6 by System PDR and a TRL of 7 by System CDR. Technologies that fail to achieve a demonstrated TRL of 7 by CDR shall require metric based plans and risk-reduction activities to ensure that technologies reach the appropriate maturity levels prior to being incorporated into the program baseline.

Mission critical hardware and hardware identified with a key process shall achieve a MRL of 6 by System PDR, MRL of 7 by System CDR, and a MRL of 8 prior to a full rate production decision. Production processes that fail to achieve a demonstrated MRL of 8 prior to the build of radar hardware shall require a risk assessment including risk mitigation plans. Rationale for establishing each MRL level shall be provided in the Manufacturing Technology Demonstration Plan (ADP 031) for Government review.

3.4.9.1 Production Engineering and Planning

The contractor shall conduct a Process Failure Mode Effects Analysis (PFMEA) per Automotive Industry Action Group (AIAG) FMEA-3 Format (ADP 032). Through the use of the PFMEA, all manufacturing processes and work instructions shall identify and eliminate or control, with process metrics, all failure modes that pose unacceptable risk to the hardware. The FMECA and PFMEA analysis shall be included in all PDRs and CDRs.

Key processes may be derived by analysis and/or as an outcome of the Production Readiness Reviews (PRRs).

3.4.9.2 Producibility

The contractor shall establish and maintain a system for measuring and reporting manufacturing costs to ensure cost goals are met. Metrics shall be established throughout the contract to measure manufacturing progress and performance and shall be reported on a monthly basis (ref CDRL A045).

3.4.9.3 Transition/Manufacturing Plan

The contractor shall develop and implement a Transition/Manufacturing Plan for the transition from the Design activities to Manufacturing activities (CDRL A054). The Transition/Manufacturing Plan documents methods by which the design is to be transitioned into production subject to program status as documented by required technical reviews and required maturity levels. The Transition/Manufacturing Plan shall contain sequence and schedule of events at contractor and subcontractor levels that define use of materials, fabrications flow, test equipment, tools, facilities, throughput rates and personnel. The Plan shall reflect consideration and incorporation of manufacturing requirements in the design process and includes identification and assessment of design and manufacturing facilities.

3.4.9.4 Production Qualification / Production Readiness Risk Assessment

The contractor shall prove-out production representative manufacturing processes, test and inspection equipment, tooling, test procedures, work instructions, and inspection procedures for the radar at the component, subsystem, and system level for all mission critical hardware and all key production processes by conducting a Production Readiness Review (PRR). PRRs shall be conducted in accordance with MAP Paragraph 3.4.1.12, Fabrication and Quality, to verify production processes are monitored with metrics, they are stable, controllable, repeatable and in accordance with the design, manufacturing, inspection, and test documentation (CDRL A055). PRRs shall be contractor led with Government participation. A PRR shall be performed by the manufacturer at each appropriate subcontractor facility for mission critical radar hardware and those with key processes prior to delivery of production hardware to the contractor and shall reflect the documentation/tooling used during fabrication of the production hardware.

PRR documentation shall be contained in individual folders and include actual inspection data. PRR folders shall be available for review upon request and shall be kept as baseline documentation. The Government will lead up to ten Product/Process Verification Reviews (PPVRs) on select PRR folders at the manufacturing site of the mission critical supplier/sub-suppliers and those facilities where key processes have been identified. The control of key design and process characteristics shall also be demonstrated during the PRR. PRRs and PPVRs shall be completed prior to System CDR.

Upon completion of PRRs and PPVRs, the Government and contractor will conduct a Baseline Production Readiness Risk Assessment (BPRRA) at each appropriate contractor/subcontractor

facility for mission critical radar hardware and those with key processes to assess program risks based on planned schedules, resources and capacities. The BPRRA will down-select the supply chain to determine those suppliers that pose the greatest risk to program success. The outcome of the BPRRA is a list of suppliers who will undergo a Government led Production Readiness Risk Assessment (PRRA). The PRRA examines a program to determine if the design is ready for production (MRL 8) and if the contractor and major subcontractors have accomplished adequate production planning without incurring unacceptable risks that will breach thresholds of schedule, performance, cost, or other established criteria. The review examines risk; it determines if production or production preparations identify unacceptable risks that might breach thresholds of schedule, performance, cost, or other established criteria and will include an Industrial Capabilities Assessment. The review evaluates the full, production-configured system to determine if it correctly and completely implements all system requirements. The review determines whether the traceability of final system requirements to the final production system is maintained. PRRA success criteria will be based upon DODI 5000.38: Production Readiness Reviews and will include affirmative answers to the following exit questions:

1. Has the system product baseline been established and documented to enable hardware fabrication and software coding to proceed with proper configuration management?
2. Are adequate processes and metrics in place for the program to succeed?
3. Are the risks known and manageable?
4. Is the program schedule executable (technical/cost risks)?
5. Is the program properly staffed?
6. Are all technologies mature enough for production?
7. Is the detailed design producible within the production budget?
8. Are the production facilities ready and required workers trained?
9. Is detail design complete and stable enough to enter low rate production?
10. Is the supply chain established and stable with materials available to meet planned low rate production?
11. Have manufacturing processes been demonstrated and proven in a pilot line environment?
12. Have all producibility trade studies and risk assessments been completed?
13. Is the production cost model based upon the stable detailed design and been validated?
14. Are the ESOH residual risks known and manageable?

3.4.9.5 Manufacturing / Process Change Management

The contractor shall notify the Government of manufacturing or process changes that affect mission or safety critical hardware, hardware with key characteristics, and hardware that is manufactured with a key process. The contractor shall:

1. Communicate process changes with the Government.

2. Request approval from the Government prior to implementing anticipated material or process changes.
3. Request approval from the Government prior to implementing internal or Sub-tier manufacturing location changes.
4. Identify sub-tier Supplier issues and proactively inform the Government of them.
5. Notify the Government of potential supply/capacity issues or single-source hardware production problems.
6. Proactively (within 5 working days) notify the Government when mission critical hardware undergoes:
 - A significant change to a mission critical or key process or to the test procedures used in that process,
 - A degradation in hardware quality for mission critical hardware or LRU's with a value over \$500.00,
 - A substantial change to equipment and or facilities that fabricate, test or control a mission critical process change to construction or material,
 - Parts produced at different / additional locations,
 - a. A Sub-supplier location change,
 - b. A Sub-supplier material change
 - A tooling capacity change,
 - An unauthorized tooling transfer

3.4.9.6 Recurring Manufacturing Assessments / Manufacturing Process Verifications

The contractor shall provide technical expertise for ten (10) manufacturing assessments on established key processes. These assessments shall not exceed two (2) days for the initial assessment followed by a one-day corrective action verification follow-up visit at select manufacturing facilities throughout the contract period of performance after production initiates in accordance with MDA Manufacturing Assessment Plan Rev A dated 11-Mar-2014. The contractor shall develop and submit manufacturing assessment documentation (ADP 033). The Contractor shall also plan on six (6) manufacturing process verifications targeted at agreed to "key processes" that have undergone change as defined by the MDA Manufacturing Process Qualification Plan dated 19-March-2013.

3.4.9.7 Special Tooling (ST), Special Test Equipment (STE), Special Inspection Equipment (SIE), and Peculiar Support Equipment (PSE)

The contractor shall minimize the use of ST, STE, SIE, and PSE to the extent possible. If ST, STE, SIE, and PSE are required, the contractor shall ensure conformance with production configuration and meet production rates and provide sufficient equipment to support both production and post-DD250 sustainment. If the ST, STE, SIE or PSE has any influence on the operational availability of the radar, it shall be an integral part of the RAM-T Program Plan. During the design of the STE, SIE, and PSE, consideration shall be given to standardization of

common components to reduce spare parts required for production. When ST/STE are used as medium of inspection, the calibration, verification, and re-verification procedures of the ST/STE shall be included in the quality program planning. The contractor shall include the ST, STE, SIE, and PSE on the CCIL (ref CDRL A049).

3.4.9.8 Validation of ST, STE, SIE and PSE

All ST, STE, SIE and PSE and associated software and documentation for deliverable hardware and software shall be verified by the contractor and validated by the Government prior to use for accepting hardware used. The contractor shall contact the Government a minimum of 10 working days prior to scheduled verification. Upon completion of the ST/STE/SIE/PSE validation, the contractor shall maintain control of the ST/STE/SIE/PSE. This process includes configuration control, tamper proofing, and location following validation. The contractor shall notify the Government of all approved changes to validated ST/STE/SIE/PSE for the purpose of determining if re-verification and validation are required.

3.4.10 Supplier Management/Field Surveillance Program

The contractor shall implement a supplier management system per the MAP section 3.13, Supplier Management. The contractor shall demonstrate visibility into its supply chain for mission and safety critical components and key processes, an understanding of the risks to that supply chain, and its implementation or its plans to implement risk mitigations to counter those risks. The contractor shall document how QS requirements flow down and verify flow down to their subcontractors and sub-tier suppliers. The Government reserves the right to verify the flow down of mission and safety critical requirements per MAP section 3.13.

The contractor shall conduct the necessary planning to implement, execute and maintain a Field Surveillance Program prior to CDR to identify the mission and safety critical system component, key processes and associated testing. The Field Surveillance Program shall include a plan for the serialization of radar components. The planning shall include an automated traceability system so that, if a systematic problem is found with a range of components, the fielded equipment that contains these parts can be identified and recalled for appropriate corrective action.

3.4.11 Diminishing Manufacturing Sources and Material Shortage

The contractor shall generate and execute and maintain a Diminishing Manufacturing Sources and Material Shortage (DMSMS) Plan (ADP 034) using DoD DMSMS Guidebook. The contractor shall conduct DMSMS Forecasting and generate solutions. The contractor shall document DMSMS findings and metrics in the EDN (ref ADP 008).

3.4.12 Out-of-Production Mitigation

The contractor shall, by execution of MDA PMAP out-of-production mitigation requirements, not purchase parts or assemblies which are planned to become obsolete or go out of production during the performance of this contract and two years beyond contract closure. The contractor

shall ensure the Government remains informed of the progress and status of mitigation plans and redesigns that are being conducted for out-of-production issues through the PMPCB process where options for mitigation shall be provided to the Government for approval. The contractor shall provide notification to the Government when it is determined during production that items are non-procurable, out of production, or that sources not yet qualified cannot meet technical or delivery requirements. The contractor's out-of-production and notification plan shall include early notification of the IPT and Contracting Officer upon discovery of the issues. Changes to the TDP/MDP due to out-of-production issues shall be processed prior to radar delivery.

3.5 Logistics (CLIN 0001, 1000*, 1200*)

3.5.1 Integrated Product Support (IPS)

The contractor shall provide Integrated Product Support in accordance with AFI 63-101/20-101, Integrated Life Cycle Management, in order to design, deploy, and maintain readiness and operational capability of the LRDR system. The contractor shall ensure a transparent transition of all system operation and sustainment functions in the event another contractor will perform operation and sustainment support.

3.5.1.1 Logistics Management

The contractor shall provide Logistics management to ensure all logistics activities are controlled, scheduled, monitored, and reported in support of the development and deployment of the LRDR system. The contractor shall provide to the Government access to contractors logistics Standard Operating Procedures (SOPs) and Logistic Management Information Database (LMID). The contractor shall provide the Government with real-time read only access via portal database user accounts to the LMID. Access must include the ability to export data into a Government usable format.

3.5.2 Supply Support

3.5.2.1 Readiness Based Sparing Analysis

The contractor shall perform a Readiness Based Sparing Analysis (ADP 035) in accordance with DoD 4140.1.R for the LRDR system components and equipment shelter. The Analysis shall identify the spares that are required in sufficient quantities to meet radar operational availability and reliability requirements for a 3 year period after DD-250 delivery. The contractor shall develop a sparing model approved by the Government. The model shall validate the sparing analysis and provide sensitivity capability to address variation in stocking levels.

3.5.2.2 Initial Spares (CLIN 0010, 1010*, 1210*) (* - Priced Option)

The contractor shall deliver the initial spares as listed in Section J. The list shall include spares for the radar system components and LRDR Equipment Shelter.

3.5.2.3 Government Property and Item Unique Identification (IUID) (CLINs 0010, 1010*, 1210*, 2000*, 3000*, 5000*, 6000*) (* - Priced Option)

The contractor shall track and manage Government-furnished equipment (GFE) in accordance with FAR 52.245-1. The contractor shall provide the following Contract Data Requirements Lists (CDRLs): (1) Physical Inventory Schedule and Reports (CDRL A057) and (2) Property Inventory Report (CDRL A056). The contractor shall provide an electronic status report, in accordance with the applicable CDRL, describing the condition and usage status of Government-furnished property (GFP) received under this contract. CDRL reporting shall exclude material purchased by the contractor for use in deliverable end items and scrapped material consumed in

testing. In the report, the contractor shall also document part numbers and National Stock Numbers (NSNs), when available, and justify any requested GFP changes in requirements compared to the GFP list in the contract. The contractor shall notify and coordinate the repair and test of GFE items as required to support the program.

The contractor shall mark the components, parts, and end items with Item Unique Identification (IUID) as required by Defense Federal Acquisition Regulation Supplement (DFARS) 252.211-7003. The contractor shall follow all marking instructions additionally required in accordance with the terms and conditions of the contract. The contractor shall ensure the IUID markings are machine readable and meet MIL-STD-130 (current version), "Department of Defense Standard Practice Identification Marking of U.S. Military Property." The contractor shall verify IUID numbers are not duplicated in the IUID Registry, develop IUID-compliant marking tags, and enter the IUID and required data elements into the IUID Registry. The contractor shall update and report to the IUID Registry for GFP as directed in DFARS 252.211-7007.

3.5.2.4 Final Government Property Inventory Report (CLINs 0010, 1010*, 1210*, 2000*, 3000*) (* - Priced Option)

The contractor shall electronically provide the Final Government Property Inventory Report (ref CDRL A056) in accordance with FAR 52.245-1. The inventory report shall include all tangible real and personal property including software. The contractor shall provide the report within 30 days of completion of the final physical inventory of all Government Property (Government Furnished Property and contractor Acquired Property).

3.5.2.5 Contractor Acquired Property

The contractor shall identify and record all pertinent contractor acquired property (CAP) in the property management system in accordance with DFARS 245.402 and DFARS 245.103-72 Procedures Guidance and Information (PGI) using the format as provided in Attachment J-07.

3.5.2.6 Establish Property Management Procedures

The contractor shall develop, maintain and execute a Government Property Management and IUID Plan (ADP 036) that establishes procedures for safeguarding, accounting for and disposing of Government property in their possession in accordance with MDA Manual 4161.01-M "MDA Property Accountability and Reporting".

3.5.2.7 Establish Physical Inventory Plan and Schedule

The contractor shall electronically provide the Physical Inventory Plan/Schedule and Reports for GFP (ref CDRL A057) and any updates, to the MDA Accountable Property Officer per FAR 52.245-1 (Government Property). Initial submission of the contractor's inventory plan and schedule is due 90 days after contract award. Initial submission of the physical inventory reports due within 30 days after completion of the contractor's periodic inventory.

3.5.2.8 Demilitarization & Disposal (CLINs 0010, 1010*, 1210*, 2000*, 3000*, 5000*, 6000*) (* - Priced Option)

The contractor shall prepare and execute a LRDR Demilitarization, Disposal, Reclamation, and Migration Plan (ADP 037) in accordance with FAR 52.245-1 and DODM 4160.28 Defense Demilitarization Program. The plan shall address appropriate procedures for demilitarizing and disposing of LRDR materiel and equipment and Government property.

3.5.2.9 Warranties and Licenses (CLINs 0010, 1010*, 1210*, 2000*, 3000*, 5000*, 6000*) (* - Priced Option)

The contractor shall list and summarize warranties and licenses down through primary components to include the servicing and technical precautions prescribed by the manufacturers or contract document in order to keep warranties and licenses in force. Solicitations for commercial items shall require the contractor to offer the Government at least the same warranty terms in accordance with FAR 46.7.

Warranty of all technical data shall be delivered in accordance with DFARS 252.246.7001 Warranty of Data.

3.5.3 Maintenance Planning and Management

The contractor shall have a maintenance planning process to include preventive maintenance and corrective tasks that will identify and organize the maintenance support necessary to keep the LRDR, support systems and equipment ready to perform specific mission parameters and operational constraints as defined by the ES. The outcome will identify the actions and support resources needed to maintain the system and support equipment (to include training devices) in its modes of operation. Maintenance shall be done in accordance with DODD 4151.18 Maintenance of Military Materiel.

3.5.3.1 Two Level Maintenance Plan

The contractor shall develop and provide a two-level maintenance plan (ADP 038). The plan shall describe a system of maintenance actions that focuses on field (on-site) maintenance consisting of (line replaceable unit (LRU) and component replacement) and sustainment depot-level maintenance to identify the most cost-effective approach for maintaining the LRDR to meet or exceed the established operational availability. The plan shall combine Original Equipment Manufacturer (OEM) support and depot maintenance activities to expedite returning the LRDR system and subsystems to fully mission capable status.

3.5.3.2 Condition Based Maintenance Plus (CBM+) Maintenance Plan

The contractor shall develop and provide a Condition Based Maintenance Plus (CBM+) Plan (ADP 039) in accordance with DoDI 4151.22 using a CBM+ approach to maintenance that implements data collection and analysis to measure equipment sustainment performance characteristics to the LRU level and develop supporting measures of effectiveness through-out

life-cycle sustainment in order to continuously improve the reliability and maintenance effectiveness of the LRDR system and components. The approach should facilitate the implementation of an optimum mix of maintenance technologies (e.g. condition monitoring, diagnostics, and prognostics), best practices, RCM-based processes, and enablers (e.g. total asset visibility) within the integrated total life-cycle framework. The approach should also leverage open architectures and open standards where appropriate to facilitate the broad application of the CBM+. The CBM+ approach will use a systems engineering approach to collect data, enable analysis, and support the proactive decision-making processes for determining system failures before they occur, to enhance LRDR sustainment and operations.

3.5.3.3 Reliability Centered Maintenance (RCM) Analysis

The contractor shall perform a Reliability Centered Maintenance (RCM) Analysis (ADP 040) in accordance with DoDM 4151.22-M to develop a program to sustain and continuously improve the system and product support strategy. The analysis shall identify a structured process used to determine the optimal failure management strategies for LRDR, based on system reliability characteristics and the intended operating context. This analysis shall provide the health monitoring or prognostics necessary to support CBM+ decision making processes and technologies.

3.5.3.4 Level of Repair Analysis (LORA)

The contractor shall perform Level of Repair Analyses (LORA) and maintenance / support task distributions (CDRL A058) in accordance with MIL-HDBK-502A to identify the level of repair (repair, replace or discard) needed to effect repairs to the LRDR system and subsystems, considering cost, schedule, performance, and supportability, while minimizing overall life-cycle costs. The initial LORA models shall be run using actual reliability data from fielded material to the maximum extent possible and used to predict the optimum maintenance levels for repair actions and recovery of the end item and components. The LORA will consider A_0 as identified in the ES and requirements for additional tools, support equipment, and skills required to perform maintenance actions.

3.5.3.5 Maintenance Task Analysis (MTA) (CLINs 0001, 1000*, 1200*, 5000*, 6000*) (* - Priced Option)

The contractor shall conduct a Maintenance Task Analysis (MTA) (ADP 041) in accordance with MIL-HDBK-0502A. The MTA shall identify the steps, spares and materials, tools, support equipment, personnel skill levels and facility issues that must be considered for a given repair task and include the elapsed times required for the performance of each maintenance task. MTA shall cover both corrective and preventive maintenance tasks and, when complete, identify all physical resources required to support a system. The MTA shall be reviewed and updated annually during the O&S period.

3.5.4 Packaging, Handling, Storage, and Transportation (PHS&T) (CLINs 0010, 1010*, 1210*, 2000*, 3000*) (* - Priced Option)

The contractor shall use best commercial practices in the packaging, handling, storage, and transportation of all LRDR system components, support equipment, and training devices except where MIL-STD-2073-1E Standard Practice for Military Packaging applies.

3.5.4.1 PHS&T Plan

The contractor shall develop and provide a Packaging, Handling, Storage and Transportation (PHS&T) Plan (ADP 042) in accordance with MIL-STD-2073-1E and DOD 4140.1-R for the LRDR system. The PHS&T Plan shall identify the strategy for safely packaging, handling, storing, and transporting the system and support equipment, as well as any special requirements and interfaces with commercial and/or DoD components responsible for transporting the system, components, and spares. The contractor is responsible for PHS&T of all hardware including those items accepted at origin until they are received at the deployment site. The plan shall include on-site storage requirements for spares and support equipment where there is a need for on-site warehouse space to support the LRDR ES.

3.5.5 Interactive Electronic Technical Manuals (IETM)

The contractor shall develop Interactive Electronic Technical Manuals (IETMs) (ref CDRL A041) for operation and maintenance of the system that includes integrated training and diagnostic fault isolation procedures in accordance with Air Force Specifications MIL-DTL-S1000D-BR and AFI 36-2251. Contractor shall participate in a verification and validation of the IETMs.

3.5.6 Support Equipment Plan

The contractor shall develop and provide a Support Equipment Plan (ADP 043) in accordance with USAF Handbook 23-123 that identifies all equipment required to support LRDR system test and integration. This plan shall take into account the maintenance concept; identify ground handling, Test, Measurement, and Diagnostic Equipment (TMDE), meteorological and calibration equipment; and consider air conditioning and generator requirements. Planning shall include equipment calibration, preventive maintenance and repair support requirements.

3.5.7 Training & Training Support

The contractor shall provide training and training support for the contractor operation and maintenance of the LRDR system. Support must include detailed radar operations and maintenance training. The contractor shall also develop courseware to be incorporated into existing Sensor Management Training courses for BMDS and SSA system operators in accordance with AFI 36-2251, Management of Air Force Training Systems. As part of the strategy, plan, resource and implementation management actions the contractor is to identify, develop, and acquire training aids, devices simulators and simulations to maximize the

effectiveness of the manpower and personnel to operate, and sustain the equipment and software at the lowest total operating cost.

3.5.7.1 System Training Plan

The contractor shall develop and provide a detailed LRDR System Training Plan (STP) (ADP 044) in accordance with AFI 36-2251 “Management of Air Force Training Systems”, which includes the technical training required for radar operations and maintenance to ensure the LRDR performs in accordance with the LRDR ES. The contractor shall incorporate all changes and updates that occur into the STP. The contractor shall provide two instructor-lead training courses for key personnel.

3.5.7.2 Maintenance Training

The contractor shall develop and provide maintenance training to qualify contractor maintenance personnel on the LRDR system in accordance with approved LRDR maintenance manuals and operations tasks identified in the STP. This training shall be designed to optimize system operation and maximize operational availability as required by the LRDR ES. The maintainer must also be capable of tasking the system on-site in the event that a critical communication issue occurs.

3.5.7.3 Operator Training

The contractor shall provide LRDR system operations training to both Warfighter and contractor personnel as identified in the STP, in accordance with AFI 36-2251 Management of Air Force Training Systems, in support of the LRDR ES. The contractor shall provide operator training to qualify contractor operator personnel on the LRDR system in accordance with approved LRDR operator manual(s) and tasks as identified in the STP. Warfighter operator courseware shall be developed and formatted to be incorporated into existing Sensor Management Training courses and will be based upon operationally tasking the system to perform its BMDS and SSA missions from a fully independent location physically separated from the LRDR system operational hardware and software.

3.5.7.4 Training Devices

The contractor shall identify, provide (manufacture as required), and make available all LRDR system training devices/tools, schematics, as-built drawings and software based on the training tasks identified in the STP. The contractor shall provide a Maintenance Plan (ADP 045) and Acceptance Test Procedure (CDRL A085) for all system training devices/tools.

3.5.8 Manpower and Personnel

The contractor shall identify, plan, resource and acquire personnel with the skills required to operate and maintain the LRDR equipment. This includes all roles and responsibilities associated with system administration.

3.5.8.1 Manpower Estimate for Operations and Sustainment

The contractor shall determine the appropriate number of personnel required to properly operate and sustain the LRDR in accordance with the LRDR ES. The contractor shall develop a Manpower Estimation Plan (MEP) (ADP 046) that identifies the amount of manpower to operate and maintain the LRDR system.

3.5.9 Computer Resource Support

The contractor shall provide, maintain and execute a Computer Resource Support Management Plan (CSRMP) (ADP 047) that identifies all manpower, personnel, hardware, software, licenses and services associated with the information technology and infrastructure required to operate and maintain the LRDR system.

3.5.10 Logistics Demonstration

The contractor shall provide and support a Logistics Demonstration Plan (CDRL A059) describing how all Logistics elements including RAM-T components are designed into the system. Logistics Demonstrations (LDs) shall be conducted in conjunction with other planned reviews such as PDR, CDR, PRR, and DD-250. LDs will be conducted by the Government using the logistics assessment checklist (Section J attachment) derived from the United States Air Force (USAF) ILA handbook sections D-5 through D-14 and D-16, to confirm that sufficient resources, planning and tasks are in place for product support and sustainment of the LRDR. The contractor shall provide all supporting data in an LD report (ref ADP 091).

3.6 Software (CLINs 0001, 1000*, 1200*, 2000*, 3000*, 5000*, 6000*) (*- Priced Option)

The contractor shall design, develop, integrate, test and deliver all software and firmware products IAW the contract requirements. All software shall be considered safety and mission critical. The contractor shall develop and deliver the software IAW the MAP, to include all plans, processes, documentation, and other work products. The Government will determine safety and mission critical software exclusions via the IPT process.

The contractor shall maintain at least CMMI level 4 certification in the area of software development throughout the period of performance and conduct the Software Development activity in accordance with the processes and practices documented in that certification.

The contractor shall design the radar software using scalability features such as soft switches and adjustable parameters to accommodate Future Growth as defined in the LRDR ES. The contractor shall document software scalability in the Software Design Description (SDD) (ref CDRL A036), present software scalability in SETRs, and demonstrate software scalability in HWIL testing. The software and software design shall support local and remote functionality, to include test, training, simulation, and operations.

All firmware and software executable, object, and source code shall be delivered to the Government (CDRL A040).

3.6.1 Software Architecture

The contractor shall develop the software architecture consistent with the Open Systems Management Plan (ref CDRL A043).

3.6.2 Software Development

The contractor shall develop, maintain, and execute the Software Development Plan (SDP) (CDRL A060). The SDP shall address all software and firmware, including subcontractor developed items. The SDP shall address software change management and comply with the Contractor's CM Plan (ref CDRL A016).

The contractor shall develop, maintain, and execute the Software Build Plan (SwBP) (CDRL 061) that identifies all engineering releases, incremental Builds, and deliverable Builds. The SwBP shall be updated and delivered in response to technical and schedule baseline changes. The SwBP shall clearly map each build capability to requirements in the current DOORS® database. The SwBP shall consistently align with the IMS and SEMP. The SwBP shall include Software Lines of Code (SLOC) Estimates that map to Contract Estimate at Completion (EAC) updates. For each build, the SwBP shall indicate percentages of code that is new, modified, reuse, and auto-generated.

The contractor shall develop, maintain, and execute CI Software Build Plans (CSBPs) (ADP 048) that flow from the SwBP and include SLOC Estimates for each Software CI, as well as unit and integration test schedules. The CSBP shall clearly map each CI build capability to requirements in the current DOORS® database. For every CI, the CSBP shall indicate percentages of code that is new, modified, reuse, and auto-generated. The CSBPs shall map to the software change management tracking system.

The SDP shall include a Software Metrics Plan. The Software Metrics Plan shall apply to the software development methodology and be time phased according to the software development life cycle. The Government will approve the time phasing for these metrics. The contractor shall implement the metrics as documented in the Software Metrics Plan. These metrics shall be formatted in a Government approved format that is compliant with the MDA STARS Report and delivered on a monthly basis.

At all SETRs, the contractor shall demonstrate consistency and synchronization of the software development activity with the system development activity through a decomposition and flow-down of the system architecture and design into the software architecture and design. This flow-down shall include a discussion of the system and software development, integration, and test

sequence. The contractor shall demonstrate how requirements were derived from system and software architecture, system operational concepts, trade studies, and design decisions.

3.6.3 Software Documentation

The contractor shall develop, implement, maintain and deliver to the Government the identified documentation products, in addition to those listed elsewhere. Format, delivery schedule, and approval requirements are documented in the associated CDRLs and ADPs.

- PIDS (CDRL A030)
- SRS (CDRL A033)
- IRS (CDRL A034)
- SDD (CDRL A036)
- Software Development Plan (CDRL A060)
- Software Build Plan (CDRL A061)
- Software Test Plan (CDRL A063)
- Software Acceptance Plan (CDRL A067)
- Software Maintenance Plan (CDRL A068)
- Software Installation Plan (CDRL A069)
- STR and SCR Burn Down Plan (ADP 049)

The contractor shall develop, implement, maintain, and deliver to the Government the following documentation products for each qualification and regression test:

- Software Inventory List (CDRL A023)
- Software Source and Executable Code (CDRL A040)
- Software User's Manual (CDRL A062)
- Software Test Reports (CDRL A064)
- Software Test Description (CDRL A065)
- Software Change Requests (CDRL A066)
- CI Software Build Plan (ADP 048)
- List of Software Trouble Reports and Software Change Requests (ADP 050)
- Raw Software Test Data (ADP 051)
- Software Version Description (ADP 052)
- Processed Software Test Data (ADP 053)
- Software Evaluation and Data Reduction Tools (ADP 054)
- Software Trouble Reports (ADP 055)

3.6.4 Software Test

The contractor shall perform Software Testing throughout all phases of the software development process with emphasis on early and frequent testing of incremental capability.

Qualification Software Testing shall verify all software requirements in the PIDS and SRS. The contractor shall provide insights into software test planning associated with PIDS and SRS level requirements verification at Engineering IPT meetings. The contractor shall notify the Government 10 days prior to PIDS and SRS level software testing where formal verification is anticipated. The contractor shall receive approval from the Government prior to thread-based "shall" verification. The contractor shall accommodate Government witness and evaluation of events where "Shalls" or "Shall Parts" are tested. All test events shall be scheduled to support efficient and effective program execution of program milestones.

The contractor shall develop and deliver the Software Test Plan (STP) (ref CDRL A063) that includes a description of the top level test strategy, test environments, configurations, schedules, and processes. For each CI integration, qualification, and regression test, the contractor shall develop and deliver a Software Test Description (STD) (CDRL A065). Each STD shall identify the methods and procedures used to verify requirements compliance IAW the STP. The contractor shall conduct test and evaluation in accordance with the approved LRDR STP and STDs. The contractor shall document the results of testing in Software Test Reports (STR) (CDRL A064).

The contractor shall provide Raw Software Test Data (ADP 051), Processed Software Test Data (ADP 053), Software Evaluation and Data Reduction Tools (including simulations) (ADP 054), and results that are used to verify requirements to the Government for independent evaluation. Raw Software Test Data shall be posted to the IDE within 24 hours of test completion. Processed Software Test Data shall be posted to the IDE within 10 days of test completion.

Prior to conducting PIDS and SRS-level testing, the contractor shall conduct a software Test Readiness Review (TRR). At the software TRR, the contractor shall review planned software test objectives, methods, procedures and statistical analyses. The contractor shall also present the results of prior testing along with insight into the level of formality achieved during these run-up events. Government approval is required to conduct test events where PIDS or SRS "Shall" or "Shall Parts" will be verified. The contractor shall execute PIDS level testing IAW the Software Acceptance Plan (CDRL A067).

All testing of major software Builds, Build updates, and incremental Builds shall include regression testing. The contractor shall present specific regression test content, configuration and analysis planning to the Government for approval prior to conducting the regression test.

The contractor shall document regression testing of Major software Builds, Build updates and incremental Builds in the SwBP (CDRL A061).

3.6.5 Software Maintenance

The contractor shall develop, execute, maintain and deliver a Software Maintenance Plan (CDRL A068). The Software Maintenance Plan shall address software's transition to sustainment, to include the following: Post Deployment Software Support; maintenance activities; maintenance discrepancies and software trouble reports; software obsolescence; technology refresh; and the software process improvement and modifications approach. The contractor shall flow down the requirements of the Software Maintenance Plan to all subcontractors.

3.6.6 Software Trouble Report (STR) and Software Change Request (SCR) Tracking

The contractor shall maintain a single software change management tracking system and database to capture all STRs and SCRs (CDRL A066) against all software and firmware products and map each report back to the affected DOORS® requirement entry. For each STR and SCR, the tracking system shall track system, other software CI, safety, and documentation impacts. The tracking system shall track each STR and SCR to resolution IAW the Contractor's CM Plan (ref CDRL A016). The contractor shall maintain the tracking system and database on the IDE. The contractor shall update the tracking system to include all corrective actions taken. The tracking system shall contain pertinent attachments of STRs and SCRs. If the pertinent attachments cannot be placed in the tracking system, they shall be clearly identified and placed in the appropriate files and their location clearly identified.

The contractor shall develop and submit a time-phased STR and SCR burn down plan (ADP 049) monthly to the IDE. The current burn down plan shall be part of the software change management tracking system. The burn down plan shall map to the Software Build Plan and Software Test Plan. Prior to each build, the contractor shall submit a list of SCRs and STRs addressed in that build (ADP 050). The contractor shall follow a severity disposition process consistent with MAP Appendix B, B.4.7.2 Defect Profile.

3.6.7 Software Prototyping

Prior to System PDR, the contractor shall conduct software prototyping. The prototype shall have the level of fidelity required to assess the design complexity and interfaces of the eventual product. The contractor shall also use data generated from prototyping to assess the planned software development effort and hardware and software architecture. The contractor shall present their findings from software prototyping to the Government at the System PDR.

3.6.8 Software Quality Assurance (SQA)

Throughout the software development and software life cycle, the contractor shall implement, manage, and track Software Quality Assurance. The contractor shall include the SQA plan in the QPP (ref CDRL A044). SQA shall apply to all software and firmware.

The contractor shall plan and perform software qualification. The contractor shall generate and deliver a Software Test Report (CDRL A064) upon completion of qualification testing. The contractor shall re-establish software qualification when a change is made to the software.

3.6.9 Firmware Development Plan

The contractor shall provide as a part of the SDP (ref CDRL A060) the methodology for firmware development of digital electronics.

3.6.10 Software and Firmware Supplier Management

The contractor shall provide Software and Firmware Supplier Management. The contractor shall generate, maintain, and submit the Software Inventory List (ref CDRL A023) of all GOTS/COTS software products and software components used in the LRDR mission equipment, to include the following elements: operating system(s); antivirus and other security software; application software; commercial and non-commercial (e.g. Free and Open Source Software) application libraries; developmental analysis tools; and contractor developed software. This listing shall include software name, developer/publisher, and specific version information for each entry. All items included on the Software Inventory List shall be compliant with all cyber security requirements.

3.6.11 Regression Tests

The contractor shall provide data to show the software has successfully completed unit test prior to conducting regression testing. The contractor shall provide regression test suites, test results, and criteria for determining the extent of regression testing required to the Government.

3.6.12 Software Installation

The contractor shall establish and maintain a Software Installation Plan (CDRL A069) that includes the plan and procedures for the installation of software products and upgrades. The contractor shall provide a Software User's Manual (CDRL A062). The Software Installation Plan and Software User's Manual shall be written so that the user can install, update, maintain and operate the LRDR software. The contractor shall develop and deliver a Software Version Description (ADP 052) prior to each installation that includes all pertinent build information and limitations.

3.6.13 Software Acceptance

The contractor shall develop and deliver a Software Acceptance Plan (CDRL A067).

3.6.14 Software Reliability

The contractor shall address Software Reliability in the SDP, SwBP, STP, Software Acceptance Plan, and the Software Maintenance Plan. The contractor shall develop and execute software design and test strategies to ensure software reliability. Single failure points, high risk software, and high complexity software shall be tracked at Engineering IPTs. The contractor shall

demonstrate software reliability through high stress software test cases, such as extended operation endurance testing and extended operation under peak load and boundary requirements.

3.6.15 Software Independent Verification and Validation (IV&V)

The Government will conduct continuous, in-phase IV&V of all LRDR software throughout the software development cycle, to include verification and validation of planning, requirements, design, STR and SCRs, and testing, as well as independent data analysis, code inspection, and independent testing. IV&V will be conducted continuously throughout the software development cycle in-phase with the development effort. The Government will submit unique STRs found during IV&V to the contractor. The contractor shall include the unique STRs in the software change management tracking system.

The contractor shall support Government IV&V efforts, including providing work products and associated documentation. The contractor shall provide IV&V access to the software development and test environments. Planning for IV&V efforts and participation shall be integrated into the existing plans, processes and schedules proposed by the contractor.

3.7 LRDR Hardware Design and Development (CLINs 0001, 0010, 1000*, 1010*, 1200*, 1210*, 5000*, 6000*) (*-Priced Option)

This section describes the work required to execute the design, production and test of LRDR components, assemblies and subsystems prior to shipment to the LRDR installation/integration site. The contractor shall conduct development tests witnessed by the Government, and participate in design reviews of key components and subsystems.

The contractor's LRDR design and development program shall ensure that required LRDR capabilities are translated into a documented, integrated design solution in accordance with MAP Section 3.2. LRDR interoperability with C2BMC shall be designed, developed and tested and approved by the Government in accordance with MAP Section 3.2.5.

Drawings and specifications shall be generated to document the design solution and shall be controlled in accordance with MAP Section 3.10.

Requirements of this section apply to new designs, redesigns, block changes, and modifications.

3.7.1 Radar Design

The contractor shall design the radar architecture and hardware to meet all requirements described in the LRDR Element Specification (ES), including accommodation for Future Growth. The overall design shall utilize power efficiently. The LRDR design shall ensure functional and performance requirements and internal and external interfaces are identified, classified, achieved, and controlled. The design shall use IPPD and an iterative systems

engineering approach to ensure all desired outcomes are achieved and all aspects of the LRDR's life-cycle are considered.

(b)(4)



The overall design shall include built-in test diagnostics in accordance with the LRDR ES and include a resident near-field probe available for each face. On-site calibration procedures shall at least be capable of utilizing the near-field probe to facilitate performance and reliability monitoring and enable periodic and on-demand calibration assessment throughout the expected lifetime of the LRDR.

3.7.1.1 Obsolescence and Spiral Development Redesign

The contractor's obsolescence redesign shall address supportability issues as required in the PMAP and MIL-HDBK-502A. All identified obsolescence issues and recommended redesigns shall be presented to the Government for consideration and approval. The contractor shall address logistics support costs and optimize maintenance and supply support, while concurrently addressing parts obsolescence issues.

The contractor shall work with the sustainment and operational stakeholders to analyze, design, plan, and implement life-cycle logistics strategies that address current demands and those identified in the development of the radar. The design approach shall include analyzing alternative support strategies and developing solutions that do not sacrifice performance - from concept design, sourcing, and operations to disposal.

The contractor shall consider total life-cycle cost change management challenges by specifically targeting the system/subsystem cost drivers that affect LRDR system life-cycle costs. The contractor's design shall address obsolete parts in a manner that establishes a common baseline configuration of the LRDR system to reduce the impact and frequency of performing obsolescence upgrades on LRDR or follow-on systems, thereby reducing life-cycle sustainment cost.

The contractor shall design the radar hardware – including support equipment – to facilitate future spiral development and hardware refresh of subsystems and components.

3.7.1.2 LRDR Embedded Simulation, Test and Training

The contractor shall design and integrate test, training and simulation capability into the LRDR per the LRDR ES to support local and remote test and training. The LRDR design shall provide capability to stimulate the radar with simulated, internally generated digital data.

3.7.1.3 Software Update to Support Installation

The contractor shall design into the LRDR the ability to utilize remote transfer of software and firmware updates to the LRDR site to expedite hardware and software upgrade, test, troubleshooting, and corrective action. This data transport mechanism shall operate at the requisite classification level.

3.7.2 Development Testing

The contractor shall test LRDR components and subsystems during development at various production stages and levels of integration or assembly to establish confidence in the LRDR design and construction prior to integration at the LRDR site. Testing shall be performed incrementally starting at the component and subassembly levels and progressing to the major assembly and subsystem levels to assure that each item characteristic is completely verified.

The contractor shall plan and conduct the tests, demonstrations, inspections and analyses required for verification of LRDR conformance to the LRDR Element Specification, the requirements in Sections 3.2, 3.7 and 3.12 of the MDA Assurance Provisions, and the terms and conditions of this contract.

The contractor shall plan for Government participation in all aspects of testing. The contractor shall provide sufficient on-site working space to accommodate Government personnel to witness tests. The contractor shall provide the Government, at the contractor's location, the use of both classified and unclassified computer workstations connected to the Internet and the contractor's networks, along with licensed analysis software needed to verify test results.

3.7.2.1 Development Test - Planning

The contractor shall prepare the LRDR Development Test and Evaluation Test Plans and Procedures (DT&E TPP) (CDRL A070) in accordance with the Test & Evaluation Strategy (see Section J-11 attachment). The contractor shall execute the DT&E TPP to verify the compliance of components and subsystems with the following LRDR documents:

- Prime Item Development Specifications (ref CDRL A030)
- Hardware Requirements Specification (ref CDRL A032)
- Interface Requirements Specification (ref CDRL A034)
- Hardware Design Description (ref CDRL A035)
- Interface Design Description (ref CDRL A037)
- Software Requirements Specification (ref CDRL A033)

The DT&E TPP shall include:

- Flow diagrams, or equivalent, indicating sequence of production operations showing tests, inspections, and process control points with statistical process control charts;

- Reference to procedures used for acceptance test and inspection;
- Identification of the part or identifying number and name for each item providing traceability; and
- Identification of items requiring environmental stress screening, burn-in tests, production assessment testing, and any other special tests.

The contractor shall maintain the DT&E TPP to indicate tests and inspections to be conducted during all phases of fabrication, from source or receiving, through final acceptance. Fabrication points at which tests and inspections are to be made shall be specifically identified in fabrication flow documentation. Sufficient examination points shall be specified to ensure tests and inspections are conducted before work operations that will preclude detection and correction of deficiencies or result in excessive rework or repair. The extent of tests and inspections shall be consistent with criticality of the item to mission success of the LRDR.

3.7.2.2 Development Test - Test Readiness Review

The contractor shall conduct a Test Readiness Review (TRR) in accordance with section 3.4.1.9 of the MDA Assurance Provisions for each critical LRDR subsystem. The contractor shall review planned test objectives, methods, procedures and statistical analyses and examine lower-level test results, test planning, test objectives, test methods and procedures to verify the traceability of planned tests to program requirements, and to ensure that required test resources have been properly identified and coordinated.

3.7.2.3 Development Test - Execution

The contractor shall conduct test and evaluation in accordance with the approved DT&E TPP.

The contractor shall document the results of testing in Test/Inspection Reports (ADP 056).

The contractor shall provide all Test Data, evaluation tools (including simulations) and results to the Government for independent evaluation of performance (ADP 057).

The contractor shall notify the Government of planned test events not later than ten (10) business days prior to testing to support Government participation. The contractor shall notify the Government of any changes to planned test events not later than five (5) business days before the test.

3.7.2.4 Development Test - Corrective Actions

The contractor shall identify, document and correct all hardware and software defects found during execution of Development Testing. The contractor shall generate Development Test Trouble Reports (ADP 058).

The contractor shall submit all Trouble Reports to the LRDR Project Office Configuration Control Board in accordance with the Configuration Management process.

The contractor shall refer defects to the FRACAS process to determine root-cause, proposed corrective actions and estimated impact to schedule.

3.7.3 Pre-shipment Factory Testing and Inspection

The contractor shall ensure that all components and subsystems have completed requisite testing according to the DT&E TPP prior to shipment to the LRDR site. The contractor shall include with the shipment a summary report of the items to be shipped containing evidence of all documentation which verifies compliance with required pre-shipment testing (ADP 059). Electronic copies of the summary reports shall be placed on the contractor's IDE.

3.7.3.1 Pre-Shipment Reviews

Prior to each shipment of components, assemblies and/or subsystems to the LRDR site, the contractor shall conduct a Pre-Shipment Review witnessed by the Government to provide evidence of completion of required tests, documents, pack and ship preparation, hardware configuration audit, and site readiness to accept the shipment. The Government will assess the pre-shipment data and provide approval to ship.

The contractor shall prepare the following records to support and document the Pre-Shipment Review exit criteria:

- a. An end item data package which reflects the final configuration. The end item data package is reviewed, including disposition of outstanding action items.
- b. Analysis that interfaces between units (inter/intra-subsystem, inter-segment, and inter-system) have been completed.
- c. User guides and operations manuals incorporating the final testing lessons learned before shipment.
- d. Hazards identification and analysis of system hardware and software, the system environment, and its intended use are completed.
- e. Mishap risk assessments are completed to define severity and probability of each identified hazard on personnel, facilities, equipment, operations, the public, the environment, and the system itself.
- f. Compliance with ground operations safety requirements verified.
- g. Certification that equipment to be used at the LRDR site (including test equipment, tooling, and Ground Support Equipment) is calibrated and proof-loaded prior to shipment and is compliant with site requirements.

h. Completeness of the Packing, Handling, Storage and Transportation (PHS&T) Plan (ref ADP 042).

i. Identification of Customer-owned and Government Furnished Equipment.

3.7.4 Shipping, Delivery and Installation

The contractor shall pack and ship approved components, subassemblies and subsystems to the LRDR site in accordance with the contractor developed PHS&T Plan (ref ADP 042).

3.8 Modeling & Simulation (M&S) (CLINs 0001, 1000*, 1200*, 2000*, 3000*, 5000*, 6000*) (*-Priced Option)

The contractor shall maintain at least CMMI level 4 certification in the area of software development throughout the period of performance and conduct the M&S Software Development activity in accordance with the processes and practices documented in that certification. The contractor shall generate, maintain, and execute the Modeling and Simulation (M&S) Plan as part of the SEMP (ref CDRL A026). The M&S Plan shall describe the efforts to develop an Open System Architecture Sensor Model (OSM) sensor model representing the LRDR system and subsystems (OSM-L Gold Disk, CDRL A071). The M&S Plan shall describe the efforts to develop the Open System Architecture Signal Injection (OSI) model representing LRDR system and subsystems (OSI-L Gold Disk, CDRL A072).

The contractor shall generate, maintain, and deliver an M&S Software Development Plan (CDRL A073).

3.8.1 Open Systems Architecture Sensor Models (OSM)

OSM is a suite of sensor models that includes two variants (signature and metric) with different intended uses. Both variants can be run in stand-alone mode and also interface to the Agency's framework, Objective Simulation Framework (OSF), as described in OSF Interface Control Document (ICD). The signature variant is a high-fidelity algorithm suite used for performance-level analysis including (but not limited to) BMDS Performance Assessment (PA), Flight Test (FT) Pre-mission Analysis, operational analysis, Ground Test (GT) excursion analysis, and tactical software pre-deployment assessment. The metric variant is a medium-to-low-fidelity algorithm suite used for real-time events including (but not limited to) exercises, training, wargames, and element developmental engineering. An OSM suite is the set of necessary software components of OSM and an OSM string is dedicated hardware hosting the OSM suite.

The contractor shall enter into an Associate Contractor Agreement (ACA) in accordance with Contract Clause H-33 with the developer of Open Systems Architecture Sensor Models (the OSM contractor) in order to obtain an OSM package. An OSM package consists of OSM baseline software and documentation set. The contractor shall add applicable LRDR-specific

OSM data to the OSM package to develop, integrate, maintain, and verify the LRDR Model Component (OSM-L) within the LRDR OSM baseline. At least once every 12 months, the contractor shall perform integration checkouts and deliver analysis to the Government and the OSM contractor (via the ACA) showing currency of the LRDR OSM baseline. The contractor shall participate in OSM-L integration into the OSM developer suite no later than 6 months prior to DD-250, and this integration shall be complete prior to DD-250. The contractor shall deliver an OSM package that includes the OSM-L component, including the modified software and documentation set (ref CDRL A072).

3.8.1.1 OSM-L Hardware

The contractor shall use the OSM Hardware Requirement Specification (attachment J-04) to design, develop, procure, install, and integrate the hardware components for three OSM strings. One string shall be used for OSM-L development at the contractor's LRDR development lab. One string shall be installed at the SNEA Lab. One string shall be installed to support PA events, as identified in the Integrated Master Test Plan (IMTP).

3.8.1.2 OSM-L Systems Engineering

The contractor shall develop and deliver two variants of OSM-L: Metric and Signature (ref CDRL A071). Both variants shall be executable in stand-alone mode and also interfaced to the Agency's framework, OSF.

3.8.1.2.1 OSM-L Build Planning

The contractor shall perform systems engineering for the OSM-L build for use in performance-level assessment and real-time events. The contractor shall develop and execute an OSM-L Build Plan (ADP 060).

3.8.1.2.2 OSM-L Documentation and Reviews

The contractor shall prepare and maintain documentation per CDRL A071. The contractor shall prepare and deliver OSM documentation and engineering artifacts for the OSM-L System Requirements Review (SRR), System Preliminary Design Review (PDR), and System Critical Design Review (CDR). The contractor shall conduct a Test Readiness Review (TRR) prior to the verification process for each build. The contractor shall deliver verification artifacts at a Government-conducted Functional Configuration Audit (FCA). The FCA will be held prior to the delivery of each build.

3.8.1.2.3 OSM-L Testing and Verification

The contractor shall perform testing, integration, and verification in accordance with MDA Directive 8315.01 and MDA Directive 8315.02. The contractor shall develop and deliver both draft and final versions of the M&S Test & Verification Plan (CDRL A074). The contractor shall develop and deliver both draft and final M&S Test & Verification Reports (CDRL A075).

All test cases, methods, and plans shall be documented and delivered to the Government. The Verification Reports will be utilized by the Government to aid in the validation, certification, and accreditation of the OSM-L build.

3.8.1.2.4 OSM-L Software Maintenance

The contractor shall perform corrective and preventive OSM-L software maintenance. The contractor shall track and report defects (ADP 061).

3.8.1.2.5 OSM-L Software Delivery

The contractor shall deliver each OSM-L build with capabilities and default configuration aligned to the tactical configuration (ref CDRL A071). The contractor shall deliver executables, source code, installation files, build files, software patches, and three complete sets of scenario input/output files for “dot builds” and engineering releases.

3.8.1.3 OSM-L Stakeholder and Event Support

3.8.1.3.1 OSM-L String Support

The LRDR contractor shall provide technical expertise and interface documentation (ref CDRL A071) for annual OSM-L installation and checkout at the SNEA Lab. The contractor shall provide on-site installation support, helpdesk support, and reach back support for this installation at the MDA/SNEA Lab. Helpdesk and reach back support shall be available within one business day of a request by the Government. Helpdesk and reach back support will not exceed 32 hours monthly.

3.8.1.3.2 OSM-L Performance-Level Events

The contractor shall provide OSM-L technical expertise, briefings and documentation (ADP 062) for BMDS-level simulations for Pre-Mission Testing (PMTs), Post-Flight Reconstructions (PFRs), PA events, operational assessments, and operational tests, as defined in the IMTP, starting 30 months after contract award. The contractor shall perform test planning, integration, test, code fixes, execution, and analysis reports (ADP 063) supporting these events.

3.8.1.3.3 OSM-L Real-Time Events

The contractor shall provide the OSM-L technical expertise, briefings and documentation (ADP 064) for applicable LRDR Exercises, Ground Tests, Wargames, and Training events, starting 30 months after contract award. The contractor shall perform planning, integration, test, code fixes, and execution to support event objectives. The contractor shall perform and deliver analysis reports (ADP 065) for event integration, issue resolution, and post-test analysis. The LRDR

contractor shall provide OSM-L technical expertise for Element Developmental Engineering events, to include integration test, code fix, and execution as defined in the IMTP.

3.8.1.3.4 OSM-L Validation Support

The contractor shall develop and deliver scenarios, databases, data, analysis, and documentation (ADP 066) to aid the execution of the Government Verification, Validation, and Accreditation (VV&A) activities detailed in the Government OSM-L Verification and Validation Plan, including OSM-L system-level benchmarking and anchoring. The contractor shall perform benchmarking and anchoring runs of the individual OSM-L subsystems. The contractor shall provide data and documentation within the requested timeline to the SN Certification agent throughout the VV&A process. The contractor shall review methodology, process, and acceptability criteria to ensure sufficient evidence is provided to support product accreditation.

3.8.2 Open Systems Architecture Signal Injection (OSI)

Open Systems Architecture (OSA) Signal Injection (OSI) is a suite of signal injection models that interface to each radar's Signal Processor and to the Agency's framework, Objective Simulation Framework (OSF), as described in the OSF Interface Control Document (ICD). Intended uses include, but are not limited to, Ground Test, System Post-Flight Reconstruction, Flight Test Pre-Mission Test, and operational events.

The contractor shall develop, integrate, maintain, and verify an OSI-L model for LRDR that injects In-Phase and Quadrature data into the LRDR tactical signal processor in real-time, as specified in the OSI-L Capability Document. The LRDR contractor shall deliver the software and documentation set (ref CDRL A072).

The LRDR contractor shall enter into an Associate Contractor Agreement (ACA) in accordance with special clause H-33 with the developer of OSI. The LRDR contractor shall conduct technical interchanges and share documentation with the OSI developer.

3.8.2.1 OSI-L Hardware

The contractor shall design, develop, procure, install, and integrate the hardware components for one OSI-L and LRDR tactical hardware string for M&S use at the Sensors Test and Analysis Requirements and Simulation (STARS) lab. Initial installation shall conclude 6 months after OSI-L IOC.

3.8.2.2 OSI-L Systems Engineering

3.8.2.2.1 OSI-L Build Planning

The contractor shall perform systems engineering for the OSI-L for use in performance-level assessment and real-time events. The contractor shall develop and execute an OSI-L Build Plan (ADP 067).

3.8.2.2.2 OSI-L Documentation and Reviews

The contractor shall prepare and maintain documentation per CDRL A072. The contractor shall prepare and deliver OSI-L documentation and engineering artifacts for the SRR, System PDR, and System CDR. The contractor shall conduct a TRR prior to the verification process for each build. The contractor shall deliver verification artifacts at a Government-conducted FCA. The FCA will be held prior to the delivery of each build.

3.8.2.2.3 OSI-L Testing and Verification

The contractor shall perform testing, integration, and verification in accordance with MDA Directive 8315.01 and MDA Directive 8315.02. The contractor shall develop and deliver both draft and final M&S Test & Verification Plan (ref CDRL A074). The contractor shall develop and deliver both draft and final M&S Test & Verification Reports (ref CDRL A075). All test cases, methods, and plans shall be documented and delivered to the Government. The Verification Reports will be utilized by the Government to aid in the validation, certification and accreditation of the OSI-L.

3.8.2.2.4 OSI-L Software Maintenance

The contractor shall perform corrective and preventive software maintenance. The contractor shall track and report defects (ADP 068).

3.8.2.2.5 OSI-L Software Delivery

The contractor shall deliver each OSI-L software build (ref CDRL A072). The contractor shall deliver executables, source code, installation files, build files, software patches, and complete sets of scenario input/output files for three different scenarios for “dot builds” and engineering releases.

3.8.2.3 OSI-L Stakeholder and Event Support

3.8.2.3.1 OSI-L String Support

The contractor shall provide on-site installation support, helpdesk support, and reach back support for integration of the OSI-L and LRDR tactical hardware string at the Sensor Test Analysis Requirements and Simulation (STARS) Lab. Helpdesk and reach back support shall be available within one business day of a request by the Government. Helpdesk and reach back support will not exceed 32 hours monthly.

3.8.2.3.2 OSI-L Event Support

The contractor shall provide OSI-L support for applicable LRDR events, as specified in the SOW sections 3.11 and 3.14.

3.8.2.3.3 OSI-L Validation Support

The contractor shall develop and deliver scenarios, databases, data, analysis, and documentation (ADP 069) to aid the execution of the Government Verification, Validation, and Accreditation (VV&A) activities detailed in the OSI-L Verification and Validation Plan, including OSI-L system-level anchoring. The LRDR contractor shall perform anchoring through its individual subsystems. The contractor shall provide data and documentation within the requested timeline to the SN Certification agent throughout the VV&A process. The contractor shall review methodology, process, and acceptability criteria to ensure sufficient evidence is provided to support product accreditation.

3.9 LRDR Equipment Shelter (LES) and Mission Control Facility (MCF) Equipment Installation (CLINs 0001, 1000*, 1200*) (* - Priced Option)

Provision of the LRDR equipment and facilities will be a joint effort by the LRDR contractor and by a Government MILCON construction contractor. The LRDR contractor is responsible for the LRDR Equipment Shelter (LES) and all radar and radar support equipment in both the LES and the in the Mission Control Facility (MCF). The Government MILCON contractor is responsible for the construction of the MCF, the LES foundation, utility buildings (emergency power plant, etc.), and other supporting infrastructure.

The LES shall be an enclosed structure which shall support the following: the radar array faces; radar processing equipment requiring close proximity to the array faces; cooling and heat piping; electrical and electronics cable routing; and interfaces to site utilities and infrastructure. The initial LES design (CLIN 0001) shall support the full range of LRDR sensitivity requirements (from Threshold to Future Growth as defined in the LRDR Element Specification) without requiring structural modifications. The initial LRDR system (CLIN 0001) shall include heating and cooling equipment to support Objective Sensitivity operation for both array faces.

The MCF will include work areas for and interfaces to LRDR equipment as described in the Government-furnished Facility Requirements Document (FRD) (attachment J) available to the contractor.

The contractor shall design and assemble the LES structure and radar components, and shall install radar and radar support equipment into the LES and the MCF

The contractor shall review and utilize the Government-furnished FRD as a basis for determining the general scope and interfaces for their Delta Facility Requirements Document (Δ FRD) and facility design. Based on this, the contractor shall arrange and host a Facility Requirements Review (FRR) not more than 90 days after contract award. The contractor shall generate a Δ FRD incorporating the facility requirements to design the LES and other additions to the MCF. The contractor shall present the draft Δ FRD to the Government for review. The contractor shall participate in USACE design reviews and conferences (anticipate 35%, 65%, 95%) and final review of all design packages.

The contractor shall develop, maintain, and submit a Δ FRD for the LES and MCF equipment installation, and provide draft, updates and final reviews of the Δ FRD (ref CDRL A031).

The contractor shall design the LES and MCF Equipment Installation per the FRD. These Design Drawings, Construction Specifications, and Design Analyses shall be delivered in a package as part of the 35%, 65% and 95% Design Reviews (ADP 070). The contractor shall update, finalize and present design analyses with calculations necessary to substantiate and support all site design documents submitted. Review comments shall be adjudicated within 20 working days after the conference. The LRDR contractor shall conduct a final design review (not conference) to adjudicate the comments from the 95% Design Review. The LRDR contractor shall submit the final 'For Construction' Facility Design (ADP 071) to successfully exit the final hack-check design review. The contractor shall obtain written Government approval to commence construction.

The contractor shall provide the As Built Drawings (CDRL A076) to the Government.

3.9.1 Contractor Construction Manager Responsibilities

The LRDR contractor shall provide a Construction Manager to coordinate requirements with the Government Site Manager. The contractor shall provide technical expertise to verify radar specific interfaces and construction for radar installation.

The contractor Construction Manager shall be present on site during MILCON construction of the LRDR MCF and Equipment Shelter foundation to coordinate activities with the Government Site Manager. The contractor shall notify the Government Site Manager of discrepancies in writing.

The contractor shall implement the equipment assembly and installation in accordance with the Government-approved design. The contractor shall furnish for review by the Government, not later than 60 days before the start of on-site work, the Contractor Quality Control (CQC) Plan (ADP 072). The plan shall identify personnel, procedures, control, instructions, tests, records, and forms to be used. The contractor shall provide a means to track implementation of the three-

phase Quality Control System (including preparatory, initial and follow-up), prepare daily reports, identify and track deficiencies, document progress of work, and support other CQC requirements. The contractor shall maintain this data on the contractor IDE on a daily basis and provide daily summaries of construction and QA and QC activities. Submittals for major equipment shall be reviewed for approval by the contractor QA and provided "for information" to the Government.

The contractor shall present proposed facility changes to the Government in accordance with the BMDS Facilities Configuration Management Plan for adjudication and documentation of changes to the baseline.

At the end of the MILCON project, the Government will provide Facility System and Operations and Maintenance Manuals (FSOMM), and facility as-built drawings to the contractor. Thereafter, the contractor shall update this documentation consistent with the Government-identified format through completion of their LRDR assembly and installation work. The contractor shall submit one consolidated set of FSOMM & Installed Equipment List (CDRL A077) and editable as-built drawings (ref CDRL A076) for all construction material and equipment specifically applicable to this Contract. The contractor shall organize and present information in sufficient detail to clearly explain Operations & Maintenance (O&M) requirements at the system, equipment, component, and subassembly levels, including information for preventive maintenance to minimize corrective maintenance and repair, and include an index preceding each submittal.

The contractor shall list and provide the terms and conditions of all warranties and include the servicing and technical precautions prescribed by the manufacturers or contract documents in order to keep warranties in force.

The contractor shall provide information from the manufacturer that is needed for use in training designated personnel to properly operate and maintain the equipment and systems. The contractor shall provide O&M Training for all mechanical, electrical and other maintainable equipment. Training manuals, suitable for use as training material for the scope of the work, shall be prepared and provided 1 week prior to training (ADP 073). The contractor shall deliver lists of spare parts and supplies recommended for maintenance and repair (ADP 074) to ensure continued service or operation without unreasonable delays (based on mean time to repair) and spare parts and supplies that have a long lead-time to obtain.

The contractor shall procure mechanical and electrical spares for Real Property Installed Equipment (RPIE) and other architectural products as required by the ΔFRD.

3.9.2 LRDR Installation and Integration Planning

The contractor shall develop, maintain, and submit the LRDR Installation Plan (CDRL A078). The plan shall identify all interfaces required to demonstrate compatibility with the FRD and ΔFRD. The contractor shall prevent damage to facility power and cooling systems during all phases of installation and integration. In addition, the plan shall identify support requirements, by item, for handling and storage and align consistently with the LRDR PHS&T Plan (ref ADP 042). The contractor shall produce an LES Installation Design Package (ADP 075) and LES Interface Control Document (ADP 076).

3.9.3 LES – Ancillary and Support Equipment

In addition to the major systems described in section 3.9, the LES design shall accommodate the following:

- a. Cooling distribution piping for LRDR hardware. Heating water will be available (in the MCF) and is preferred for external array surface defrost.
- b. Sufficient space for routing all LRDR cables, power, and piping.
- c. Sufficient space for equipment installation and removal, and personnel access for operations and maintenance.
- d. Safety controls as defined in the FRD as required by the Site and LRDR System Safety Program Plan.

Refer to the Government FRD for further description of interfaces.

3.9.4 Transportation and Installation

The contractor shall transport the LES components, documentation, installation and test equipment and associated spare parts to the deployment site in accordance with the LRDR Installation Plan (ref CDRL A078). For equipment arriving at the site prior to installation, the Government will provide a nearby storage container laydown area (outside on gravel pads) per the FRD.

3.9.5 LES Installation and Integration Testing

3.9.5.1 Test Planning

The contractor shall generate an LES Installation Test Plan & Procedures (CDRL A079) to enable verification testing of the requirements in the Government approved final design, to include all subsequent Government approved changes of the LES. The plan shall verify interfaces, the ΔFRD and include what is to be tested, test methodology, and the criteria for passing the test. The contractor shall ensure all Configuration Items of the LES are integrated, calibrated and maintained.

The contractor shall provide staffing, test resources and equipment necessary to conduct the required testing and to collect and analyze the data.

The Government will provide workspace per the FRD for ten (10) contractor-provided workstations (excluding workstations necessary for radar control) within the LRDR Mission Control Facility during the period of LES Installation testing.

3.9.5.2 Test Execution

The contractor shall perform test and evaluation of the LES in accordance with the LES Installation Test Plan & Procedures (ref CDRL A079).

The contractor shall document and submit the results in LES Installation Test Reports (CDRL A080). The contractor shall provide evaluation tools (including simulations) (ADP 077), to the Government for independent performance evaluation. The contractor shall generate a Test Summary Report (ADP 078) that documents the completion of all test events and requirements verification.

3.9.5.3 Corrective Actions

During execution of LES testing, the contractor shall identify all defects found and generate a LES Trouble Report (ADP 079) for each defect. The reports shall include proposed corrective actions and schedule impact. The contractor shall submit all Trouble Reports to the Government. Prior to DD-250 of the LRDR, the contractor shall implement all Government-approved corrective actions.

3.10 LRDR Installation and Acceptance Testing at the LRDR Site (CLINs 0001, 1000*, 1200*) (* - Priced Option)

The contractor shall develop, maintain, and submit the LRDR Site Integration and Acceptance Test Plan (CDRL A081) in accordance with MAP Section 3.7. The LRDR Site Integration and Acceptance Test Plan shall:

- Describe the organization and management of the Integrated Test and Evaluation Program.
- Include a summary of tests, including test type, test level, and test objective.
- Include schedules for tests, relating test program milestones to major program milestones.
- Include schedules for special test facilities/equipment, test items, and test documentation.

The contractor shall place all LRDR integration and test documents on the Contractor's IDE.

3.10.1 Equipment Installation and Integration

The contractor shall coordinate with the Government the deployment of personnel and materiel to the LRDR site prior to deployment. Verification of readiness of facilities, storage, laydown

area, Base Support Requirements List (BSRL) and site readiness will be reviewed by the contractor and the Government and will be jointly agreed to. The Government will develop and furnish to the contractor the initial BSRL; the contractor shall update and deliver the BSRL (CDRL A082).

The Government will establish the conditions for Joint Occupancy of facilities at the LRDR site. These conditions will include joint inspections with the contractor, MDA, and the United States Army Corps of Engineers (USACE) to confirm and document remaining construction activities and a plan for completion of MILCON work while the contractor performs equipment installation.

3.10.1.1 Pre-Installation Inspection, Test and Corrective Action

Incoming equipment shall be inspected by the contractor and the contractor shall generate Inspection Reports (ADP 080). The contractor shall identify damage incurred during packing or shipping and document said damage in the Inspection Reports. The reports shall also include the proposed corrective actions and estimated impact to schedule. The contractor shall correct all damage incurred during packing or shipping prior to final LRDR acceptance testing. The Government reserves the right to inspect and verify any reported damaged items.

3.10.1.2 LRDR Installation and Integration Testing

The contractor shall install LRDR hardware and firmware, software and associated equipment at the LRDR site in accordance with the LRDR Site Integration and Acceptance Test Plan (ref CDRL A081).

The contractor shall conduct LRDR integration in accordance with the LRDR Site Integration and Acceptance Test Plan (ref CDRL A081) and document the results weekly in LRDR Integration and Test Reports (ADP 081). These reports shall track the progress of integration and subsystem test activities as the LRDR is built up to final configuration.

The contractor shall provide all Test Data, evaluation tools (including simulations) and results to the Government for independent evaluation of performance (ADP 082).

The contractor shall generate a weekly LRDR Integration and Test Summary (ADP 083) that documents the completion of subsystem integration and test events.

3.10.1.2.1 LRDR Integration Testing – Subsystem Test Readiness Reviews

The contractor shall conduct a Test Readiness Review (TRR) in accordance with section 3.7 (and its applicable subsections) of the MDA Assurance Provisions for each critical subsystem integrated into the LRDR. The contractor shall review planned test objectives, methods, procedures and statistical analyses and examine lower-level test results, test planning, test objectives, test methods and procedures to verify the traceability of planned tests to program

requirements, and to ensure that required test resources have been properly identified and coordinated.

3.10.2 LRDR Acceptance Testing leading to DD-250

The contractor shall conduct and the Government will witness Acceptance Testing of the completed LRDR at the installation site as specified in the LRDR Site Integration and Acceptance Test Plan (ref CDRL A081) and in accordance with Section 3.7 of the MDA Assurance Provisions and its applicable subsections. The contractor shall track, document, and report test results in accordance with LRDR Acceptance Test Reports (ADP 084).

The contractor shall conduct LRDR Acceptance Testing to demonstrate performance of the LRDR and its successful interoperability with other affected MDA systems. Acceptance Testing shall be conducted with the LRDR in a state which matches the operational BMDS configuration and environment. The hardware and software configurations and support equipment shall be well-defined, documented, and under configuration management control. Test setups shall be configured to provide expected operational scenarios and operational environments. Acceptance Tests shall be performed with software in operational configuration to reflect performance of actual software execution paths. The contractor shall notify the Government of any changes to planned test events not later than ten (10) business days before the test. The contractor shall schedule weekly meetings during the acceptance test phase to review schedule, test results, and upcoming events.

The contractor shall conduct a comprehensive post Acceptance Test evaluation addressing all aspects of LRDR performance and include not only LRDR Element Specification compliance but also system robustness and margin. Analysis shall include all interactions with BMDS command and control, performance of all LRDR subsystems, and performance and suitability of the LRDR Equipment Shelter. Any out-of-family performance, anomalies, and non-conformances for critical deployment site infrastructure shall be identified, documented and assessed. The contractor shall implement a process that captures lessons learned.

The contractor shall provide all Test Data, evaluations, evaluation tools (including simulations), and results to the Government for independent evaluation of performance (ADP 085).

The contractor shall generate an LRDR Acceptance Test Summary (ADP 086) that documents the completion of all test events and LRDR requirements verification.

3.10.3 Pre-Acceptance Activities

The contractor shall disconnect and remove all temporary construction materiel and equipment not required for LRDR operations and sustainment unless the Government authorizes otherwise. The contractor shall remove from the site and disposition in accordance with Government instruction all installation equipment and hardware not required for LRDR sustainment. The

contractor shall remove, pack and place identified Government property to an on-site location designated by the Government.

3.11 BMDS Ground Test & Integration

3.11.1 BMDS Ground Test Strings

3.11.1.1 Test Hardware Development (CLIN 0001)

The contractor shall acquire, develop, deliver, install and conduct benchmark testing through framework integration for two (2) HWIL test strings at the Government-provided test facilities in Huntsville, AL prior to the end of FY18. The contractor shall coordinate this effort with the laboratory contractor for installation and trouble shooting. The contractor shall provide updated hardware and software to the Huntsville laboratories to remain consistent with the configuration maintained at the LRDR installation site. The contractor shall provide all training manuals, maintenance manuals, procedures, or checklists that are created for LRDR representation string operation to the Government (ADP 087).

3.11.1.2 HWIL Test String Operations (CLIN 2000*) (*- Priced Option)

The contractor shall sustain two (2) HWIL test strings that model the tactical hardware and software to include, but not limited to:

- a. Maintaining the LRDR component hardware and software to represent the tactical hardware and software according to the Government provided Approved Test Configuration (ATC).
- b. Deliver LRDR string component configuration certifications for test events.
- c. Troubleshooting hardware and software failures, determine root cause, oversee the repairs of the hardware, and certify that hardware again meets the requirements of that LRDR component.
- d. Implementing the FRACAS process for LRDR test strings.
- e. Providing LRDR test resource scheduling inputs.
- f. Providing Change Request (CR) documentation to request a change to the LRDR system test configuration.
- g. Providing information upon request for Government audits and Certification and Accreditation (C&A) efforts.

Once test hardware development is complete, the contractor shall conduct tests in support of BMDS test events, wargames and other exercises. The contractor shall perform the following activities: (1) load information assurance updates to LRDR radar software, (2) integration tests with other BMDS elements, (3) wargames/exercises, (4) element only testing in support of the LRDR Product Office or (5) BMDS testing. The contractor shall perform data "quick looks" to determine status of test runs and data for the string utilized in testing. LRDR HWIL test string support shall include on-call Subject Matter Expert (SME) reach back support to troubleshoot

hardware/software issues, oversee repair and certify that hardware meets the LRDR representation requirements.

3.11.2 BMD System-Level Ground Testing (CLIN 2000*) (*- Priced Option)

The contractor shall support IMTP ground tests that have LRDR participation, currently expected to start with the GT-08 test series in FY19.

Testing covered by this SOW includes BMDS Ground Tests, Focused (GTX); Ground Tests, Integrated (GTI); and Ground Tests, Distributed (GTD). The LRDR test and evaluation program will be aligned with the IMTP.

The contractor shall meet the data handling requirements outlined in MDA Directive 3200.06, Missile Defense Test Data/Information Management.

3.11.2.1 Test Planning - Ground Testing

The contractor shall conduct Sensor Element test planning from pre-test to post-test in support of BMDS GTX, GTI, GTD, as required by the IMTP and subsequent updates thereto, and short-notice Ground Tests with LRDR participation.

The contractor shall review and comment on MDA test requirements and planning documents such as test objectives, test scenarios, configurations, test resources, scenario data requirements, Objective Simulation Framework (OSF) integration testing requirements with respect to test executability, the detailed test plan, architecture, Approved Test Configuration (ATC), test provisioning approach, data requirements, data delivery requirements, data management approach, test analysis approach, and Analysis Execution Plan (AEP).

The contractor shall develop and maintain a LRDR Test Plan (CDRL A083) to document the LRDR test objectives traceable to MDA/DE test objectives and Critical Engagement Conditions (CEC) / Empirical Measurement Events (EME), sensor hardware and software configurations, model configurations, and mission plans, sensor interfaces, LRDR support for pre-test predictive analysis against collection of CEC/EMEs, LRDR test schedule, LRDR test personnel, LRDR test issues, LRDR test risks, and applicable BDRs. The contractor shall deliver a detailed draft of the LRDR Test Plan (ref CDRL A083) prior to Phase 2 EIPR-2 and a final plan prior to the Phase 3 EMR.

The contractor shall coordinate test event scheduling with the Government Test Product Lead.

The contractor shall provide technical expertise to the Government in support of MDA test planning and design meetings such as Scenario Design Working Groups (SDWG), Assessment Integrated Product Team (AIPT), BMDS-level test planning EWGs, BMDS-level test design

reviews, and BMDS-level end of phase reviews and executive reviews as defined by the Ground Test CONOPS.

For each BMDS System Ground Test event the contractor shall provide the following inputs (one per test event):

- a. MDA/DT-conducted Event Working Group (EWG) meetings, weekly status meetings, and TRR in MDA briefing format
- b. JAT pre- and post-mission analysis, reporting and reviews (contractor format partnered with SN)
- c. Status Reports to SN Mission Manager following each run day during Engineering Benchmark 4/5 (EBM 4/5), Integration Runs (IT), Dry Runs (DR) and Runs for Records (RFR) in contractor format
- d. MDA Executive Test Review in MDA briefing format
- e. MDA/SN test-related Risk and BMDS Discrepancy Report (BDR) boards in MDA briefing format
- f. Brief of Pre-Test Predictions (SN analysis review or equivalent) at completion of Phase 2 Test Planning and Integration in contractor format
- g. Brief of test readiness (SN TRR or equivalent) prior to entering DR and RFR
- h. Certification Data Package (CDP) for each test event no later than 14 calendar days prior to the start of DR in MDA briefing format
- i. Brief of Post-Test Analysis (SN analysis review or equivalent) to the SN JAT lead at least 3 calendar days prior to presentation to the MDA Phase 4 review in contractor format

3.11.2.2 Test Execution – Ground Testing

The contractor shall execute LRDR Element tests for each BMDS GTI, GTD, GTX and short-notice ground test events, to include: engineering benchmarking activities to a final element-level configuration necessary to support the ground test, find and fix, pre-test coordination with internal and external components/elements; development of test checklists; BMDS integration test runs; DRs, RFRs and Operational Test Agency (OTA)/Warfighter runs documentation and resolution of lessons learned; and data collection and distribution in accordance with the IDMP and DHP.

The contractor shall participate in test execution working group meetings. The contractor shall review and comment on the MDA test execution plan, test execution checklists/procedures, test resource plans, scenarios, TCDD, IDMP, DHP, AEP, asset management coordination, range safety documentation, waivers, and the integrated test schedule with respect to mission executability.

The contractor shall participate in benchmarking, Final Qualification Testing (FQT) for the OSF, integration test runs, DR, RFR and OT/warfighter runs in accordance with each event's integrated test schedule.

The contractor shall document and track all test discrepancies and support the BDR process. The contractor shall ensure that the run data is collected and distributed in accordance with the event's IDMP and DHP.

3.11.2.3 Test Analysis – Ground Testing

The contractor shall conduct post-test data analysis of LRDR performance to include comparison to pre-test predictive runs, IT runs, DR, RFR and OT/Warfighter Runs for Record for each ground test with LRDR participation. The contractor shall support BMDS JAT processes and products. Prior to delivery of formal SN inputs to the JAT, the contractor shall brief the SN JAT lead. The contractor shall conduct analysis in support of system engineering objectives, risk management, CEC/EME collections, and element and agency reporting products.

The contractor shall develop and deliver 90-day LRDR Test Evaluation Reports (TER) (CDRL A084) for each ground test event. The contractor shall present their LRDR analysis findings to a Phase 3/4 review for all ground test events.

3.11.3 Additional Test Support (CLIN 2000*) (*- Priced Option)

The contractor shall provide additional test support to complete the required test planning, execution and analysis for four targets of opportunity and one short-term ground test to be named by the Government.

3.12 LRDR Turnover (CLIN 0001, 0010, 1000*, 1010*, 1200*, 1210*) (* - Priced Option)

3.12.1 Pre-DD 250 Turnover Review

At the last quarterly PMR prior to DD-250, the contractor shall review with the Government the status of the totality of products (hardware, software, documentation) to be delivered to the Government upon DD-250 in accordance with the terms of the contract encompassing LRDR design, development, production, installation, test, and BMDS integration. The contractor shall develop and deliver to the Government a Final Government Property Inventory Report (ref CDRL A056) no later than 30 days prior to the Turnover Review.

3.12.2 DD Form 250 (Material Inspection and Receiving Report)

The LRDR and all items identified in the Final Government Property Inventory Report (ref CDRL A056) will be delivered via DD Form 250 to MDA as a single line item.

3.13 O&S Period 1 (CLIN 5000*) (*-Priced Option)

The contractor shall operate and sustain the LRDR and its associated equipment 10 hours per day, 5 days per week in accordance with the LRDR ES and shall apply flexible scheduling to meet Government test objectives. The contractor activities shall include operating the LRDR in response to MDA and operational command direction, to include coordinating downtimes. The contractor shall inform MDA/SN and COCOMs of the system's status via Daily site Status and Logistics Reports (SITREPs) in accordance with STRATCOM Instruction 538-1 Vol 2.

The contractor shall conduct a spares provisioning assessment at the end of this period.

The contractor shall ensure a transparent transition of all system operation and sustainment functions in the event another contractor will perform operation and sustainment support.

3.13.1 Logistics Systems Engineering

The contractor shall perform the following functions when necessitated by engineering change proposal or change notice implementation:

- Perform analyses down to the LRU level using MIL-HDBK 502A as guidance.
- Document functional and task analyses in accordance with GEIA-STD-0007B and recorded via the DAL. The data reports shall be made available on the contractor's IDE.
- Evaluate related Change Notices/Class 1 Engineering Change Proposals (ECPs) for logistics impacts and participation in engineering release and configuration change boards and implement as required.
- Provide a Logistics Impact Statement (contractor format) for each ECP / change notice selected for implementation.
- Provide the Government with real-time read only access via portal database user accounts to the Logistics Management Integrated Database (LMID). Access shall provide the ability to export data into a Government usable format.

3.13.2 Engineering Support-Obsolescence, Field Returns

The contractor shall identify and provide notification to the Government of obsolescence as it affects the procurement or repair of the hardware and impacts LRDR. The contractor shall conduct the following obsolescence support functions:

- Notify the Government and the development program concerning obsolescence notices that impact procurement or repair and return operations. If the contractor determines that a part is unavailable due to obsolescence issues, the contractor shall provide end-of-life notifications and all impacts to the Government through the Integrated Product Team process.

- Present each obsolescence notice on a case-by-case basis to Government.
- Provide the Government alternatives regarding obsolescence mitigation as specified by the PMAP.
- Implement the obsolescence mitigations as approved by the Government.
- Provide quarterly Diminishing Manufacturing Sources Prediction Report in contractor's format in the DAL that identifies all vulnerable or high risk components and COTS equipment and coordinate findings with all applicable contractor including development, manufacturing and operations & sustainment.
- All microcircuits and discrete semiconductor parts shall be procured from authorized franchised distributors per MDA PMAP and Policy Memorandum No. 50 requirements. Procurement of these parts from non-franchised distributors is prohibited unless approved by the MDA/SN Parts, Materials, and Processes Control Board (PMPCB). The requirements of this paragraph shall be flowed down to all prime suppliers/subcontractors.

3.13.3 Government Property Inventory Report

The contractor shall electronically provide the Final Government Property Inventory Report (ref CDRL A056) in accordance with FAR 52.245-1. The inventory report shall include all tangible real and personal property including software. The contractor shall provide the report within 30 days of completion of the final physical inventory of all Government Property (Government Furnished Property and contractor Acquired Property).

3.13.4 Packaging, Handling, Storage, and Transportation (PHS&T)

The contractor shall use best commercial practices in the packaging, handling, storage and transportation of all LRDR system, support equipment, and training devices except where MIL-STD-2073-1E Standard Practice for Military Packaging applies. The contractor is responsible for PHS&T of all hardware including those items accepted at origin until they are received at the deployment site.

3.13.5 Operational Availability Assessments

The contractor shall perform data collection for the monthly A_S (Scheduled Availability – see the LRDR Performance Incentive Plan) calculation and conduct monthly reviews with the Government. The contractor shall:

- Utilize both MDA readiness reporting systems and automated radar status data collection methods to support MDA scoring and assessment activities.
- Augment the MDA source data with all operational timelines and FRACAS data to support MDA scoring assessments.
- Provide on a monthly basis operating times derived from elapsed time meters on the radar for all active radiation time. This data shall be provided in Microsoft Excel.

These submissions shall include clock hours for the current month and prior months when available that date back to initial fielding.

- Provide formal minutes from the MDA scoring and assessment events (ADP 088). These minutes shall include copies of formal MDA scoring results, MDA readiness reports and Event Owner Worksheet summaries, as provided by the Government in DAL. The formal minutes shall be used to record the contractor's achieved A_S.

3.13.6 Configuration Management

The contractor shall adhere to the configuration management processes for the LRDR compliant with the MAP, QPP, and the LRDR CM Plan.

3.13.6.1 Change Notification Processes

The contractor shall adhere to the change notification process for the LRDR compliant with the MAP, QPP, and the LRDR CM Plan.

3.13.6.2 Technical Data Packages

The contractor shall maintain an As Maintained Configuration Record (ref CDRL A041) and ensure LMID remains current. The contractor shall:

- Document the as maintained configuration in accordance with the LRDR Configuration Control Item List (ref CDRL A049).
- Update all LRDR technical documentation as required.
- Provide the Government with access to LMID and electronic copies of manufacturer's technical manual for any new equipment acquired under this contract through a Data Accession List. When electronic access is not possible, the contractor shall make available copies of technical manuals when requested by the Government.

3.13.7 Offsite Logistics Support Operations

3.13.7.1 Depot Maintenance

The contractor shall provide sustainment support above field maintenance capability at the radar site, to include equipment maintenance of the LRDR radar hardware. The LRDR Depot Maintenance shall execute line replaceable unit repair and return via contractor facilities. This type of LRDR hardware support shall include providing for the repair of COTS failed assets repaired at the OEM level and/or providing for COTS maintenance to maintain reliability and availability as outlined in the LRDR ES. Associated with depot maintenance the contractor shall:

- Provide non-conformance identification and tracking.
- Provide semi-annual spares analyses to identify a cost effective spares inventory and update the LMID.

- Support the development of MDA/DoD partnered agreements.
- Support the implementation of MDA/DoD partnered agreements to establish depot core competency support using best business practices.

3.13.7.2 Post Deployment Software Support (PDSS)

The contractor shall provide PDSS and software releases as required but no less than once annually to address software issues post DD-250 to TCD. The contractor shall execute the Software Maintenance Plan (ref CDRL A069). All software developed and delivered under PDSS shall comply with the Software Development Plan.

3.13.7.3 Training and Technical Orders

The contractor shall provide trained and qualified personnel to operate and maintain the radar. The Contractor shall provide updates to the operations and maintenance technical orders and training materials (ADP 090) for both contractor and Government training courses to reflect changes to the LRDR.

3.14 BMDS Flight Test Support (CLIN 3000*) (* - Priced Option)

The contractor shall prepare and submit presentation material (ADP 001) and provide subject matter expertise to the following flight test WGs, to include:

- Event Working Group
- Scenario Design Working Group
- Mission Readiness Working Group
- Target Requirements Working Group
- Test Readiness Working Group
- Test Execution Working Group

3.14.1 BMDS Flight Testing

The contractor shall support IMTP flight tests with LRDR participation, currently expected to start with the FTX-26 test in FY20.

The LRDR test and evaluation program will be aligned with the IMTP and subsequent updates thereto.

The contractor shall meet the data handling requirements outlined in MDA Directive 3200.06, Missile Defense Test Data/Information Management.

The contractor shall provide the following flight test inputs:

- LRDR Test Procedures: Initial 30 calendar days prior to mission best estimated test date (BETD). Final prior to mission Dress Rehearsal, nominally 2 calendar days prior to the BETD (contractor format, Government on-site review)
- Certified Data Package (CDP): Draft CDP (not signed) 5 business days prior to Mission Readiness Review (MRR) and the final signed CDP 5 business days prior to the Executive Mission Execution Review (EMER)
- MDA Phase 1, 2, 3 and 4 reviews in MDA briefing format
- Pre-Test predictions (BMDS Mission Analysis Review (MAR), Aegis or SN equivalent) to include transmitter/receiver Electromagnetic Interference/ Electromagnetic Compatibility (EMI/EMC) predictive assessment for each mission at the completion of MDA Phase 2, nominally held at 90 calendar days prior to mission BETD in contractor format
- SN readiness reviews, EMER, Launch Readiness Reviews (LRR) and MAR or equivalent as required in MDA briefing format
- MDA Executive Mission Planning Review (EMPR), Executive Mission Readiness Review (EMRR), EMER, Executive Quick Look Brief (EQLB), Executive Mission Data Review (EMDR), the supporting technical reviews, and Operational Test Readiness Reviews (OTRR) for operational flight tests in MDA briefing format
- JAT pre- and post mission analysis, reporting and reviews
- MDA/SN for test related risk and BDR boards conducted by MDA in MDA format
- Status Reports to MDA/SN Mission Manager following each day during mission walkup in contractor format, Site team input
- MDA Flash Report following mission execution in the MDA Report format and utilizing site team input.
- Post-Test Analysis (SN Pre-Phase 3 Review or equivalent) to the SN JAT lead at least 3 calendar days prior to presentation to the MDA Phase 4 review utilizing a contractor presentation format.

3.14.1.1 Test Planning - Flight Testing

The contractor shall conduct test planning in support of BMDS level flight test missions with LRDR participation.

The contractor shall review and comment on MDA test requirements and planning documents such as test objectives, test scenarios, configurations, test requirements including test resources, scenario data requirements, test case requirements, OSF integration testing requirements with respect to pre-mission test executability, the detailed test plan, architecture, ATC, test provisioning approach, PMT/SPMT Plan, AEP, asset management coordination, range safety documentation, test constraints documentation, environmental documentation, pre-mission data delivery requirements, test data and truth data requirements, target requirements (including studies that drive target requirements), data management approach, and test analysis approach.

The contractor shall develop and maintain an LRDR Test Plan (ref CDRL A083) to document the LRDR test objectives traceable to MDA/DE test objectives and CEC/EMEs; test and data requirements; LRDR participants, LRDR locations, LRDR hardware and software configurations, model configurations, and mission plans, LRDR interfaces, LRDR support for pre-test predictive analysis against CEC/EMEs; LRDR support for pre-test digital End-to-End (E2E) analysis, and HWIL SPMT; LRDR support to EMI/EMC evaluation; sensor Joint Satellite Track (JST) plans; analysis plans; data management plans; LRDR test schedule, LRDR test personnel, LRDR test issues, LRDR test risks, and applicable BDRs. The contractor shall deliver a detailed draft of the LRDR Test Plan (ref CDRL A083) prior to the end of Phase 1 and a final plan prior to the Phase 2 MAR.

The contractor shall coordinate test event scheduling with the Government Test Product Lead.

The contractor shall conduct initial predictive analysis using test objectives, target information and scenario documentation such as launch point/aim point, sensor locations, trajectory, and countermeasures as furnished by the Government. This advanced planning will produce, but is not limited to, the initial predictive analysis for LRDR participation in each mission identifying the projected viewing times, azimuths, elevations, signal-to-noise ratios (SNR), constraints, CEC/EME assessment, and LRDR supportability. This initial predictive analysis will be refined during later phases with Monte Carlo analysis and pre-mission testing.

The contractor shall develop the LRDR Test Profile to support tests with LRDR participation. The contractor shall integrate the Sensor component software, mission plan, and SAPs in a BMDS System Test Lab (STL).

The contractor shall provide technical expertise to the Government for MDA test planning and design meetings such as BMDS-level Target Requirements Working Groups, BMDS-level Test Planning Working Groups, BMDS-level Mission Readiness Working Groups, BMDS-level Test Design Reviews, and BMDS-level end of phase reviews and executive reviews.

3.14.1.2 Test Integration - Flight Testing

The contractor shall conduct LRDR test integration in support of BMDS level flight test missions with LRDR participation. The contractor shall participate in the detailed design and readiness assessment for the event as defined during test event planning.

The contractor shall participate in MDA test readiness working group meetings conducted by the MDA Mission Director. The contractor shall review and comment, as necessary, on the MDA test execution plan, test execution checklists/procedures, test scenarios, EMI/EMC interoperability analysis execution plans, test resource plans, pre-mission data delivery

requirements, IDMP, DHP, AEP, asset management coordination, and the integrated test schedule with respect to mission executability.

In coordination with the SN Government Test Team, and other participating elements, the contractor shall accomplish Sensors participation in predictive analysis for each scenario against the test objectives and CEC/EME requirements. The contractor shall develop and integrate the required scenarios, and execute predictive scenario runs per the AEP using digital and HWIL models as available. The contractor shall ensure that LRDR pre-test predictions are complete.

The contractor shall prepare, verify and deliver to the IDE the Monte Carlo output files for each scenario, and associated configuration files (Mission Plan, Discrimination Database, SAPs, and Environmental Variables). The contractor shall support digital E2E predictive modeling. The contractor shall provide LRDR output files for each test scenario to MDA/BC for downstream use in E2E predictive modeling.

The contractor shall conduct an EMI/EMC assessment between all participating transmitter/receivers (to include range resources and other components with sensor operations). This EMI/EMC assessment will support MDA's overall EMI assessment and will provide recommendations to support the determination of the operational conditions.

The contractor shall document and track all test discrepancies during the conduct of HWIL SPMT DR and RFR and support the BDR process. The contractor shall provide for mission data distribution in accordance with the event's IDMP and DHP.

The contractor shall conduct a review of the LRDR pre-test predictions and test readiness activities with the SN Government Test Team. The contractor shall conduct a second review of the EMI/EMC assessment with MDA/DTF, to include applicable LRDR representations. The contractor shall present the LRDR pre-test predictions and test readiness activities at the MDA Phase 2 MAR and EMRR.

3.14.1.3 Test Execution - Flight Testing

The contractor shall conduct LRDR test execution in support of BMDS level flight test missions with LRDR participation.

The contractor shall participate in test execution working group meetings. The contractor shall review and comment on the MDA test viewing plan, MDA public affairs plan, LRDR test execution plan, test execution checklists/procedures, test resource plans, IDMP, DHP, AEP, asset management coordination, range safety documentation, waivers and deviations, test constraints documentation, and the integrated test schedule.

The contractor shall execute the LRDR participation in the HWIL SPMT in accordance with the MDA SPMT Plan. Prior to SPMT DR testing, the contractor shall complete and deliver the CDP inputs to the SN Government Test Product Lead, documenting the configuration to be used in the SPMT. The contractor shall ensure the LRDR HWIL resources are prepared for the SPMT runs and execute as required in support of the SPMT Plan.

The contractor shall provide the following inputs to the MDA test teams:

- LRDR participant test checklists and test procedures
- LRDR participation in all walk-up events. Data quality check on the JST data and make this data available to MDA and/or designated representatives
- LRDR Readiness status at readiness reviews prior to the BETD
- BDR and risk support
- LRDR daily status to the SN Mission Manager
- CDP inputs documenting the configuration to be used in the flight test event
- LRDR input to the MDA Flash Report following the live mission execution

The contractor shall document and track all test discrepancies during the conduct of CDTs, live testing, and support the BDR process. The contractor shall provide for mission data distribution in accordance with the event's IDMP and DHP.

3.14.1.4 Test Analysis - Flight Testing

The contractor shall conduct data analysis of LRDR performance to include HWIL SPMT, E2E predictive modeling, and CDTs for each BMDS level flight test mission with LRDR participation.

The contractor shall conduct LRDR test analysis efforts to include preparation of detailed analysis briefings addressing LRDR performance in meeting MDA/DE and Sensors objectives, CEC/EMEs, characterizing LRDR performance, and identification of test issues, anomalies or BDRs. The contractor shall deliver LRDR analysis reports consisting of a 48-hour quick-look briefing, a 21-day analysis briefing and a 30-day final report (ref CDRL A084).

The contractor shall participate and present preliminary LRDR analysis findings to the MDA JAT reviews. Prior to delivery of formal SN inputs to the JAT, the contractor shall brief the SN JAT lead. The contractor shall present their LRDR analysis findings to a SN pre-Phase 5 Review and MDA Phase 4 Review. If requested, the contractor shall participate in the MDA EMDR.

3.14.2 Additional Test Support

The contractor shall provide additional test support to complete the required test planning, execution and analysis.

Examples of the types of additional discrete test support are as follows:

- Configuration modifications which cause the need to re-plan a test or re-accomplish pre-mission analysis
- Target, threat or scenario changes which cause the need to re-plan a test or re-accomplish pre-mission analysis
- Prior to mission start, the Government may request the contractor analyze flight test missions for preliminary analysis and supportability by specific radars using test objectives, target information and scenario documentation as furnished by the Government
- Advanced planning for test campaigns beyond this Statement of Work's period of performance.
- Short notice contingent for unknown test efforts
- Other events that may cause the need for additional test support

3.15 O&S Period 2 (CLIN 6000*) (*- Priced Option)

The contractor shall operate and sustain the LRDR and its associated equipment to the operational availability defined in the LRDR ES to include necessary expertise reachback support until transition/transfer to the service. The contractor shall conduct LRDR operations, logistics support and inform MDA/SN and COCOMs of the system's status via Daily site Status and Logistics Reports (SITREPs) in accordance with STRATCOM Instruction 538-1 Vol 2.

The contractor activities shall include operating the LRDR in response to MDA and operational command direction, and coordinating downtimes with the Government via the asset management process.

The contractor shall ensure a transparent transition of all system operation and sustainment functions in the event another contractor will perform operation and sustainment support.

3.15.1 Logistics Systems Engineering

The contractor shall perform the following functions when necessitated by engineering change proposal or change notice implementation:

- Perform analyses down to the LRU level using MIL-HDBK-502A as guidance.
- Document functional and task analyses in accordance with GEIA-STD-0007B and recorded via the DAL. The data reports shall be made available on the contractor's IDE.
- Evaluate related Change Notices/Class 1 Engineering Change Proposals (ECPs) for logistics impacts and participation in engineering release and configuration change boards.
- Provide a Logistics Impact Statement (contractor format) for each ECP / change notice selected for implementation.
- Provide the Government with real-time read only access via portal database user

accounts to the Logistics Management Integrated Database (LMID). Access shall provide the ability to export data into a Government usable format.

3.15.2 Engineering Support-Obsolescence, Field Returns

The contractor shall identify and provide notification to the Government of obsolescence as it affects the procurement or repair of the hardware and impacts LRDR. The contractor shall conduct the following obsolescence support functions:

- Notify the Government and the development program concerning obsolescence notices that impact procurement or repair and return operations. If the contractor determines that a part is unavailable due to obsolescence issues, the contractor shall provide end-of-life notifications and all impacts to the Government through the Integrated Product Team process.
- Present each obsolescence notice on a case-by-case basis to Government.
- Provide the Government alternatives regarding obsolescence mitigation as specified by the PMAP.
- Implement the obsolescence mitigations as approved by the Government.
- Provide quarterly Diminishing Manufacturing Sources Prediction Report in contractor's format in the DAL that identifies all vulnerable or high risk components and COTS equipment and coordinate findings with all applicable contractor including development, manufacturing and operations & sustainment.
- All microcircuits and discrete semiconductor parts shall be procured from authorized franchised distributors per MDA PMAP and Policy Memorandum No. 50 requirements. Procurement of these parts from non-franchised distributors is prohibited unless approved by the MDA/SN Parts, Materials, and Processes Control Board (PMPCB). The requirements of this paragraph shall be flowed down to all prime suppliers/subcontractors.

3.15.3 Operational Availability Assessments

The contractor shall perform data collection for the monthly A_0 calculation and conduct monthly reviews with the Government. The contractor shall:

- Utilize both MDA readiness reporting systems and automated radar status data collection methods to support MDA scoring and assessment activities.
- Augment the MDA source data with all operational timeline and FRACAS data to support MDA scoring assessments.
- Provide on a monthly basis operates times derived from elapsed time meters on the radar for all active radiation time. This data shall be provided in Microsoft Excel. These submissions shall include clock hours for the current month and prior months

when available that date back to initial fielding.

- Provide formal minutes from the MDA scoring and assessment events (ADP 088). These minutes shall include copies of formal MDA scoring results, MDA readiness reports, and Event Owner Worksheet summaries, as provided to the Government in the DAL. The formal minutes shall be used to record the contractor's achieved A₀.

3.15.4 Configuration Management

The contractor shall adhere to the configuration management processes for the LRDR compliant with the MAP, QPP, and the LRDR CM Plan.

3.15.4.1 Change Notification Processes

The contractor shall adhere to the change notification processes for the LRDR compliant with the MAP, QPP, and the LRDR CM Plan.

3.15.4.2 Technical Data Packages

The contractor shall maintain an As-Maintained Configuration Record (ref CDRL A041) and ensure LMID remains current. The contractor shall:

- Document the as maintained configuration in accordance with the LRDR Configuration Control Item List (ref CDRL A049).
- Update all LRDR technical documentation as required.
- Provide the Government with access to LMID and electronic copies of manufacturer's technical manual for any new equipment acquired under this contract through the Data Accession List (DAL). When electronic access is not possible, the contractor shall make available copies of technical manuals when requested by the Government.

3.15.5 Offsite Logistics Support Operations

3.15.5.1 Depot Maintenance

The contractor shall provide sustainment support above field maintenance capability at the radar site, to include equipment maintenance of the LRDR radar hardware. The LRDR Depot Maintenance shall include line replaceable unit repair and return via contractor facilities. This type of LRDR hardware support shall include providing for the repair of COTS failed assets repaired at the OEM level and/or providing for COTS maintenance to maintain reliability and availability as outlined in the LRDR ES. Associated with depot maintenance the contractor shall:

- Provide non-conformance identification and tracking.
- Provide semi- annual spares analyses to identify a cost effective spares inventory and update the LMID.

- Support the development of MDA/DoD partnered agreements.
- Support the implementation of MDA/DoD partnered agreements to establish depot core competency support using best business practices.

3.15.5.2 Post Deployment Software Support (PDSS)

The contractor shall provide PDSS and software releases as required but no less than once annually to address software issues from TCD to transition/transfer to service. The contractor shall execute the Software Maintenance Plan (ref CDRL A068). All software developed and delivered under PDSS shall comply with the Software Development Plan.

3.15.5.3 Training and Technical Orders

The contractor shall provide trained and qualified personnel to operate and maintain the radar. The contractor shall update the operations and maintenance technical orders and training materials for both contractor and Government training courses to reflect changes to the LRDR.

3.15.6 Major Item Repair

The contractor shall manage and conduct major item repair and site restoration maintenance support in the event of major item failure - to be priced and approved by the Government prior to execution. A major item failure is defined as all repair activity and system verification testing that is beyond existing organizational, and contracted commercial sustainment support. The contractor shall:

- Identify the required resources based on historical failure and repair data from LRDR program.
- Implement its supplier management program and ensure that affected repair meets component performance requirements.
- Provide available repair and test data items in the subcontractor format on the DAL (ref CDRL A009).
- Prepare an Acceptance Test Plan and provide to the Government for review (no approval required) no later than 14 days prior to test. The Acceptance Test Plan shall specify specific test procedures, to include specified performance ranges as applicable.
- Following completion of the acceptance testing, the contractor shall prepare the items for transportation back to operational site.
- Perform Installation and Checkout (I&CO) testing at the operational site for Government acceptance.

3.15.7 Government Property Inventory Report

The contractor shall electronically provide the Final Government Property Inventory Report (CDRL A056) in accordance with FAR 52.245-1. The inventory report shall include all tangible

real and personal property including software. The contractor shall provide the report within 30 days of completion of the final physical inventory of all Government Property (Government Furnished Property and contractor Acquired Property).

3.15.8 Packaging, Handling, Storage, and Transportation (PHS&T)

The contractor shall use best commercial practices in the packaging, handling, storage and transportation of all LRDR system, support equipment, and training devices except where MIL-STD-2073-1E Standard Practice for Military Packaging applies. The contractor is responsible for PHS&T of all hardware including those items accepted at origin until they are received at the deployment site.

3.15.9 Level of Repair Analysis (LORA)

The contractor shall perform Level of Repair Analyses (LORA) and maintenance / support task distributions (ref CDRL A058) in accordance with MIL-HDBK-502A to identify the level of repair (repair, replace or discard) needed to effect repairs to the LRDR system and subsystems, considering cost, schedule, performance, and supportability, while minimizing overall life-cycle costs. The LORA models will be run using actual reliability data from fielded material to the maximum extent possible and used to validate the optimum maintenance levels for repair actions and recovery of the end item and components. The LORA will consider A_0 as identified in the ES and requirements for additional tools, support equipment, and skills required to perform maintenance actions.