AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. Contract ID Code	Page 1 Of 38
Cost Plus Incentive Fee (Cost Based)	

2. Amendment/Modification No.	3. Effective Date	4. Requisition/Purchase Req No.	5. Project No. (If applicable)
P00008	2013DEC20	SEE SCHEDULE	

6. Issued By Code W56HZV

U.S. ARMY CONTRACTING COMMAND
LUCINDA KLISZ
WARREN, MICHIGAN 48397-5000
HTTP://CONTRACTING.TACOM.ARMY.MIL

EMAIL: LUCINDA.KLISZ@US.ARMY.MIL

7. Administered By (If other than Item 6) Code S2305A

DCMA DETROIT
35803 MOUND ROAD
STERLING HEIGHTS MI 48310

8. Name And Address Of Contractor (No., Street, City, County, State and Zip Code)

GENERAL DYNAMICS LAND SYSTEMS INC.
38500 MOUND RD
STERLING HEIGHTS, MI 48310-3200

Code 7W356 | Facility Code

☐ **9A. Amendment Of Solicitation No.**

9B. Dated (See Item 11)

☒ **10A. Modification Of Contract/Order No.**
W56HZV-12-C-0322

10B. Dated (See Item 13)
2012SEP14

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ **The above numbered solicitation is amended as set forth in item 14. The hour and date specified for receipt of Offers**
☐ **is extended,** ☐ **is not extended.**

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing items 8 and 15, and returning _____ copies of the amendments: (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. Accounting And Appropriation Data (If required)

ACRN: AD NET INCREASE: $1,861,027.00

13. THIS ITEM ONLY APPLIES TO MODIFICATIONS OF CONTRACTS/ORDERS
It Modifies The Contract/Order No. As Described In Item 14.

☐ **A. This Change Order is Issued Pursuant To: The Changes Set Forth In Item 14 Are Made In The Contract/Order No. In Item 10A.**

☐ **B. The Above Numbered Contract/Order Is Modified To Reflect The Administrative Changes (such as changes in paying office, appropriation data, etc.) Set Forth In Item 14, Pursuant To The Authority of FAR 43.103(b).**

☒ **C. This Supplemental Agreement Is Entered Into Pursuant To Authority Of:** CHANGES CLAUSE 52.243-2

☐ **D. Other (Specify type of modification and authority)**

E. IMPORTANT: Contractor ☐ **is not,** ☒ **is required to sign this document and return _____ copies to the Issuing Office.**

14. Description Of Amendment/Modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

SEE SECOND PAGE FOR DESCRIPTION

Except as provided herein, all terms and conditions of the document referenced in item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. Name And Title Of Signer (Type or print)		16A. Name And Title Of Contracting Officer (Type or print)	
		LISA M. JONES LISA.M.JONES3@US.ARMY.MIL (586)282-6973	
15B. Contractor/Offeror _____ (Signature of person authorized to sign)	15C. Date Signed	16B. United States Of America By /SIGNED/ (Signature of Contracting Officer)	16C. Date Signed 2013DEC20

SECTION A - SUPPLEMENTAL INFORMATION

Buyer Name: LUCINDA KLISZ
Buyer Office Symbol/Telephone Number: CCTA-HBF-M/(586)282-7441
Type of Contract: Cost Plus Incentive Fee (Cost Based)
Kind of Contract: Research and Development Contracts
Type of Business: Large Business Performing in U.S.
Surveillance Criticality Designator: A
Weapon System: No Identified Army Weapons Systems
Contract Expiration Date: 2020APR01

*** End of Narrative A0000 ***

Bi-lateral Modification P00008

The purpose of bi-lateral modification is to add additional funding and revise the VHMS specification at C.32.9 in accordance with the Changes clause FAR 52.243-2.

Section B - Supplies or Services and Prices/Costs

CLIN 0001AA is modified to reflect the increase of the total estimated value, Total Target Cost, COM, and Target Fee, due to the expansion of the SOW for the VHMS.

Target Total Cost is increased from $357,289,845 to $358,975,283
COM is increased from $814,130 to $816,962
Target Fee is increased from $36,622,209 to $36,794,966
Total Target Price is increase from $394,726,184 to $396,587,211

Target Total Fee, Maximum Fee, Minimum Fee, and Share Ratio remain unchanged.

CLIN 0001AE is incorporated and funded in the amount of $1,861,027.00 to provide incremental funding in accordance with the terms of the contract under B.1 Funding.

Revised B.1 Funding.

Section C - Scope of Work, C.32.9 Vehicle Health Management Systems (VHMS) is modified as below:

Deleted:
The Contractor shall integrate VHMS capabilities to the level established at the VEM/5.0 CDR held on 25 July 2012 as shown in Attachment B Appendix Q.
When integrating the VHMS capabilities, the contractor shall use the following documents as reference:
1) HBCT VHMS GCS System View SV-2, System Communication Description; C1017-01-0195, Revision A
2) HBCT VHMS GCS System View SV-4, Functionality Description; C1017-01-0065, Revision D
3) HBCT VHMS GCS Operational View OV-7, Logical Data Model; C1017-01-0300

Revised C.32.9 For expanded and revised SOW

Section G - Contract Administration Data Contract funding is increased by $1,861,027.00 from $152,324,000.00 to $154,185,027.00.

All other terms and conditions, except those addressed in this modification, remain unchanged and if full force and effect.

*** END OF NARRATIVE A0011 ***

Name of Offeror or Contractor: GENERAL DYNAMICS LAND SYSTEMS INC.

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
	SECTION B - SUPPLIES OR SERVICES AND PRICES/COSTS				
0001	ABRAMS ECP 1 R&D TECHNOLOGIES				
	Cost Plus Incentive Fee Contract Target Total Cost: $358,975,283 COM: $816,962 Target Fee 10.25%: $36,794,966 Total Target Price:$396,587,211 Target Total Fee: 10.25% Maximum Fee: 13% Minumum Fee: 3% Share Ratio: 75/25 both overruns and overruns (End of narrative B001)				
0001AA	ABRAMS ECP1 R&D TECHNOLOGIES				$ 242,402,184.00 ESTIMATED
	SERVICE REQUESTED: ABRAMS ECP 1 R&D TECHNOLOGIES CLIN CONTRACT TYPE: Cost Plus Incentive Fee (Cost Based) PSC: AC45				The amount above is the amount left to be incrementally funded
	Abrams ECP 1 Technology Development The Contractor shall furnish all the supplies and services to accomplish the task specified in Section C: Description/Specifications/Work Statement (End of narrative B002)				
	Inspection and Acceptance INSPECTION: Origin ACCEPTANCE: Origin				
0001AE	INCREMENTAL FUNDING	1	LO		$ 1,861,027.00
	SERVICE REQUESTED: Abrams ECP 1 VHMS CLIN CONTRACT TYPE: Cost Plus Incentive Fee (Cost Based)				

Name of Offeror or Contractor: GENERAL DYNAMICS LAND SYSTEMS INC.

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
	PRON: 4736M21847 PRON AMD: 01 ACRN: AD				
	Inspection and Acceptance INSPECTION: Origin ACCEPTANCE: Origin				
	Deliveries or Performance DLVR SCH REL CD / QUANTITY / PERF COMPL DATE 001 / 1 / 01-APR-2020				
	$ 1,861,027.00				

B.1 FUNDING

B.1.1 The Contracting Officer will provide funds under this Contract covering the estimated cost on an incremental basis as provided for in the following funding schedule and pursuant to the contract clause entitled "Limitation of Funds". It is estimated that the incremental amounts are sufficient for the performance of work in each of the cited periods. The Government may, at its discretion, allot such funds on an incremental basis within each fiscal year. The Contractor shall so plan and execute the work required by this contract as to either expend or commit funds compatible with the schedule set forth below. Whenever the Contractor has reason to believe that the funds allotted to this contract for any cited period are either insufficient or excessive for the performance of work required in that cited period, the Government shall be notified. An allotment schedule by percentage is set forth below.

FY12: 20.2%
FY13: 18.3% Plus VHMS funding per Modification P00008 ($1,861,027.00)
FY14: 21.2%
FY15: 22.0%
FY16: 8.4%
FY17: 6.1%
FY18: 2.8%
FY19: 1.0%

*** END OF NARRATIVE B0001 ***

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C.1 General

The Contractor, as an independent contractor and not an agent of the Government, shall design and integrate the Phase 1 Engineering Change Proposal (ECP) technologies identified herein as the Abrams ECP 1 Program.

The Contractor shall manage and control the resources necessary to ensure timely achievement of the requirements in a manner that is both the most economical and beneficial to the Government.

C.1.1 Scope

This scope of work consists of efforts that shall be performed by the contractor during the design, development, integration, and qualification phases of this contract. This scope of work is a follow-on effort to the Abrams Evolutionary Design (AED) Work Directive M1042D1004 S3 which culminates in a System Requirements Review (SRR). The results of the SRR will be used as the baseline and starting point for this effort.

C.1.2 Contract Data Requirements

Data shall be delivered in accordance with the DD1423, Contract Data Requirements Lists (CDRLs), as set forth in Attachment A and as called out in the scope of work. Should data deliverables require revision after original delivery, and the date for delivery cannot be determined at time of award, the Contractor shall deliver the data on a date mutually agreed to by the parties. Except for those items that specifically require hard copy submission, all data specified in this contract shall be provided to the Government electronically.

C.2 Meetings/Conferences/Reviews

The Contractor shall participate in the required meetings, conferences and reviews as listed in this contract. Meetings shall be scheduled in tandem, or groups, to minimize personnel resources and travel expenses. All program and technical meetings, conferences and reviews shall be hosted by the Contractor. The Contractor shall prepare electronic, written or visual presentations for the meetings.

C.2.1 Administrative

C.2.1.1 Agendas

The Contractor shall submit an agenda no later than seven business days prior to the Design Reviews and Program Management Reviews (PMRs) in accordance with A001 for Contracting Officers Representative (COR) approval.

C.2.1.2 Meeting Minutes

The Contractor shall prepare and submit minutes, including action items, in contractor format for each of the meetings and reviews referenced herein and distribute to attendees within seven business days following the event in accordance with CDRL A002.

C.2.2 Start of Work Meeting

The Contractor shall be prepared to host the start of work meeting at its facility within ten business days after contract award. Date and time will be mutually agreed to by both parties.

C.2.3 Integrated Product Team (IPT) and Working Group Meetings

The Contractor shall participate in the joint Government-Contractor IPTs. Each IPT shall, be chartered, and shall have an established

process for performing work under the IPT. These IPTs include the Systems Engineering IPT with Sub-IPTs for Survivability, Lethality, Mobility, Vehicle Architecture & Software, and Auxiliary & Other Systems.

The Contractor shall also participate in the Government Abrams Modernization Overarching IPT, as well as, the Supportability, Test and Evaluation, and RAM IPTs.

C.2.3.1 Systems Engineering Integration Team (SEIT)
The Contractor shall administer and conduct regularly scheduled Systems Engineering Integration Team (SEIT) meetings. The SEIT shall be comprised of Government and Contractor participants to address technical development issues. The Contractor shall ensure that all tradeoffs and decisions are documented and receive COR concurrence. The SEIT will operate within allowable technical trade space as set forth in this contract. The SEIT does not have the authority to change the contract cost or schedule constraints. Meeting minutes shall be provided to the Government in accordance with CDRL A002.

C.2.3.2 Supportability IPT (SIPT)
A joint Government and Contractor ECP Supportability IPT (SIPT) shall be established to oversee the ILS program. The Contractor shall serve as Co-Chair of the IPT with the PM ILS Manager. The SIPT meetings shall be conducted on a quarterly basis at the contractors facility. The Contractor shall present ILS program status to include schedule at each meeting and document the results in the SIPT meeting minutes. The Contractor shall prepare and deliver minutes in accordance with CDRL A002.

C.2.3.3 Systems Safety Working Group (SSWG)
The Contractor shall participate in the Governments System Safety Working Groups (SSWGs), in an advisory capacity, on a semi-annual basis. The Contractor shall present and discuss issues affecting environmental, safety, and occupational health (ESOH) program implementation. During the SSWG meetings, the Contractor shall present program status and updates in the areas of ESOH, Hazard Tracking Log (HTL), and Hazardous Materials usage. The Contractor shall pursue through completion and close out any action items assigned by the COR that are within the scope of this program.

C.2.3.4 Interface Control Working Group (ICWG)
An Interface Control Working Group (ICWG) comprised of Contractor and Government representatives shall be formed within 30 days after contract award to assess system impacts of all proposed changes to the initial baseline. The ICWG shall provide written reports directly to the Systems Engineering Integration Team all impacts of changes to the interface baseline.

C.2.4 Reviews

C.2.4.1 Program Management Reviews (PMRs)
The Contractor shall conduct semi-annual PMRs that include senior-level program management, technical management and subject matter experts participation. The Contractor shall present cost, schedule, performance, and risk status at each PMR and be prepared for detailed discussion with the Government. PMRs may be held in conjunction with Technical Reviews to limit meeting proliferation. The Contractor shall submit read-ahead packages seven business days prior to the event in accordance with CDRL A003.

C.2.4.2 Integrated Baseline Review (IBR)
The Contractor and Government will engage in a joint IBR, at the Contractors facility. The IBR is a joint assessment of the Performance Measurement Baseline (PMB) by the PM and the Contractor to verify the baselines realism, accuracy, and technical content.The initial IBR shall be conducted no later than 28 June 2013. The review shall be based on the previous month's (e.g. May 2013 submission which is based on April 2013 data if IBR occurs in June 2013) acceptable CPR submission
The Contractor shall provide access to all records and data requested for IBR to the COR. Two weeks prior to the IBR, the Contractor shall provide the Government Cost Account Managers (CAMs) with a read-ahead copy of the IBR topics to be covered at the IBR, focusing on their assigned WBS elements.

A 12 month rolling wave detailed IMS plan shall be presented at the initial IBR. The COR has the right to accept or reject the detailed IMS plan. In the event that the detailed IMS plan is rejected, the Government will work with the Contractor to adjust the plan. After the initial IBR, the Contractor shall present a detailed IMS plan, per the Contractors EVM System Description.

C.2.4.2.1 Integrated Baseline Review (IBR) Training
The Contractor and Government will engage in joint IBR training at the contractors facility. The training shall be led by the Contractor and Government representatives. The training shall take place at least two weeks prior to the initial IBR.

C.2.4.3 Design Reviews
The Contractor shall conduct a Systems Functional Review (SFR), Preliminary Design Review (PDR), Critical Design Review (CDR) and System Verification Review (SVR). The Government-prepared Systems Engineering Plan (SEP), provided in Attachment B - Appendix A, provides high-level entrance and exit criteria for each technical review. The Contractor may reference the detailed Defense Acquisition University (DAU) Checklists in its approach to developing the review materials. The Contractor shall describe, in its proposal, its internal processes that shall be used to conduct the technical reviews. The Contractor shall finalize entrance and exit criteria jointly with the COR no later than 60 days after contract award for the SFR and 60 days after the previous technical review for the PDR, CDR, and SVR. The Government will have the sole authority to certify the successful completion of the reviews and provide authorization to proceed. The briefing material and final report for each review shall be delivered one week after each event in accordance with A004.

C.2.4.4 Software Reviews
The Contractor shall implement integrated software reviews, as defined by the Contractor in the IMS, addressing Contractor and subcontractor efforts and progress. These reviews shall be conducted at the completion of each software development phase. The reviews shall include requirements, software design and test readiness reviews.

C.2.4.5 Test Readiness Reviews (TRR)
The Contractor shall participate in the Government TRRs and in the resolution of discrepancies identified therein. The Contractor shall prepare and deliver the TRR Briefing Package in accordance with CDRL A005. Reviews shall be chaired by the Government and held at the Contractors facilities.

C.2.4.6 Reserved

C.2.4.7 Reliability and Maintainability Program Review (R/M)
The Contractor shall conduct Reliability and Maintainability (R/M) reviews with the Government R/M representatives.

C.2.4.8 Production Readiness Review (PRR)
The Government will be allowed to conduct an Abrams ECP 1 Production Readiness Review (PRR) at the subcontractors facility and will utilize the DoD Production Risk Assessment Checklist as a guideline. The PRR shall be conducted within seven calendar days following the System Verification Review (SVR).

C.2.5 Test Incident Reports (TIRs) Scoring and Assessment Conferences
Formal scoring and assessment conferences will be conducted by the Government. Scoring conferences will be conducted during and immediately after Government testing to assure that a proper and consistent determination is made for categorizing test incidents against Reliability and Maintainability (R/M) requirements in accordance with the Failure Definition and Scoring Criteria (FD/SC). Conferences may alternate between test sites. The Contractor shall attend all scoring and assessment conferences as part of their R/M program. During the scoring conference, each TIR revision shall be scored, to include revising the incident classification (Critical, Major, Minor, Information). At least 72 hours prior to the conference, the Contractor may present its TIR scoring recommendation(s) to the Government. Further discussions with the Contractor may be required to ensure full technical understanding of test incidents. All discussions with the Contractor shall be held separately from scoring and assessment activities. The Contractor shall not witness the actual scoring of the TIRs. The Government will notify the Contractor of the scoring conference results within twenty calendar days of the conference.

C.2.6 Review Boards

C.2.6.1 Risk Management Review Board
The Contractor shall conduct monthly Risk Review Boards with Government participation. The Risk Review Board shall decide which risks are accepted, approved, and tracked at the system level.

C.2.6.2 Corrective Action Review Board (CARB)
During and after Government testing, CARB meetings shall be held on a monthly basis to review the Contractors Failure Analysis Corrective Action Reports (FACARs) and Government responses. The CARB meetings shall be hosted by the Contractor. The Contractor shall prepare CARB packages for all meetings, including copies of all applicable FACARs and all responses that shall be discussed. The FACAR is addressed under Section C.30.2.1.

C.2.6.3 Safety Review Board (SRB)
The Contractor shall participate in the Governments Safety Review Boards (SRBs), in an advisory capacity, on a monthly basis. The Contractor shall present and discuss issues affecting environmental, safety, and occupational health (ESOH) program implementation. The Contractor shall pursue the issues through completion and close out any in scope action items assigned.

C.2.6.4 Safety Control Board
The Contractor shall establish a high level control board consisting of representatives from the Contractors design, quality, manufacturing, field service, engineering, safety, and other appropriate departments for the purpose of reviewing and formalizing all Critical Safety Items delivered to the Government.

C.3 Competition Plan
The Contractor shall provide a Competition Plan during the development effort, for Government approval, in accordance with CDRL A006. The Competition Plan shall be comprised of both an initial and long-term competition strategy to include selection of prototypes and production components.

The Contractor will conduct competition at the Line Replacement Unit (LRU) or component level. If the Contractors subsidiaries or business units request to compete, the Government reserves the right to monitor the source selection process to assure competition is conducted openly.

The Contractor shall execute the PCO approved Contractor Competition Plan.

C.4 Reserved

C.5 Program Management

C.5.1 Review and Access
The PCO or COR will have the right to review, both in-process and upon completion, all project efforts expended and documentation prepared under this contract. The Contractor shall also provide all records and data associated with this contract including those related to cost and schedules as required by the contract.

C.5.2 Security Classification Guidelines
The Contractor shall be required to operate in accordance with the procedures included in the Abrams Tank System, Security Classification Guide, dated 03 March 2011, and Contract Security Classification Specification, DD 254 (Attachment F).

C.5.3 Reserved

C.5.4 Design-to-Cost

C.5.4.1 Affordability Assessment
The Contractor shall conduct an initial manufacturing cost focused Affordability Assessment six months after contract award. At this session, the Contractor shall present the affordability management process for evaluating affordability objectives at PDR, CDR, SVR, and provide a detailed review (to at least the 4th level of the WBS) of the Contractors initial manufacturing cost estimate. The Contractor shall be prepared to provide documentation as to the basis for this production cost estimate. The Contractor shall identify cost drivers from both a hardware perspective and a requirements perspective. The Contractor shall provide an assessment of the likelihood of meeting the target Unit Manufacturing Cost (UMC) and shall describe risks that may impact the ability to meet the target. The Contractor shall identify cost reduction opportunities that would result in incremental overall UMC reductions of 5%, 10%, and 15%. These opportunities may be a combination of technical requirement adjustments, programmatic adjustments, technology investments, or other Contractor identified initiatives. The Contractor shall perform a production rate analysis whereby the relationship between UMC and alternative production rates are defined, specifically assessing production durations from five to ten years in length. As part of this analysis, the Contractor shall recommend the optimal economic order quantity rate of production and shall indentify facility and/or tooling costs required to achieve this rate. The Affordability Assessment shall be updated and presented at the PDR, CDR, and SVR.

C.5.4.2 Unit Manufacturing Cost
The Government has determined that the UMC objective for the Abrams Phase I ECP technologies is $0.91 million (expressed in Government fiscal year 2012 constant dollars). The Contractor shall assume the first production year beginning in FY2017 (PY17) with a production quantity of 35, a quantity of 45 (PY2), and a quantity of 120 vehicles per year through completion. The Contractor shall design and integrate the Abrams ECP 1 technologies to achieve the objective. The Contractors affordability management process shall include a mechanism for reporting status against this goal/requirement during the Affordability Assessment, PDR, CDR, and SVR.

Key ground rules and assumptions related to the UMC are as follows: The manufacturing cost includes the costs of material, labor, and other expenses incurred in the fabrication, checkout, and processing of parts, subassemblies, and major assemblies/subsystems needed for the final system. The manufacturing cost also includes costs of subcontractors and purchased parts/equipment, costs of the efforts to integrate and assemble the various subassemblies into a working system, costs to install special and general equipment, and costs to paint and package the system for shipment to its acceptance destination. It also includes all transportation in order to assemble into a final system.

C.5.4.3 The Design to Cost reports and data requested under this section shall be submitted in accordance with CDRL A009.

C.5.5 Earned Value Management System (EVMS)
In the performance of this contract, the Contractor shall use an Earned Value Management System (EVMS) that complies with the EVMS guidelines in the DoD 5000.02, Defense Acquisition Guidebook, the American National Standards Institute/Electronic Industries Alliance Standard 748 (ANSI/EIA-748), DFARs clause 252.234-7001, DFARS Clause 252.234-7002, MIL-STD-881C, and the Contractors own documented System Description. If this contract has a value of $50,000,000 or more, the Contractor shall use an EVMS that has been formally reviewed and determined by the Defense Contract Management Agency (DCMA), to be in compliance with the EVMS guidelines in ANSI/EIA-748. EVM shall be used as a tool to identify and track program risks, manage cost, schedule, and technical performance.

C.5.5.1 Integrated Performance Management
The Contractor shall establish, maintain and use in the performance of this contract an integrated performance management system. Central to this integrated system is the Earned Value Management System (EVMS). To establish the integrated performance management

system, the EVMS shall be linked to and supported by the Contractors management processes and systems to include the Resource Loaded Integrated Master Schedule (IMS), Contractor Work Breakdown Structure (CWBS), change management, material management, procurement, cost estimating and accounting. 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. Integrated Performance Management shall be priced out separately from all other EVM components (C.5.5).

C.5.5.2 Contractor Work Breakdown Structure (CWBS) and CWBS Dictionary
The Contractor shall develop and maintain the CWBS and CWBS Dictionary in accordance with DI-MGMT-81334C, MIL-STD-881C, and CDRL A010. The CWBS shall be product-oriented. The Contractor shall extend the CWBS down to the appropriate level required to provide adequate internal management, surveillance, and performance measurement regardless of the reporting level stipulated in the contract for Government visibility. The Contractor shall use the CWBS as the primary framework for contract planning, budgeting, and reporting of the cost, schedule, and technical performance status to the Government. The Contractor shall keep the CWBS updated during the execution of the contract.

The CWBS Dictionary shall be updated and maintained throughout the life of the contract, as it is a living document. The definitions provided by the contractor for each level three WBS element must be traceable to the contract scope of work. An updated CWBS Dictionary shall be submitted no more frequently than CPR report submissions in accordance with CDRL A011. Changes to the CWBS or associated definitions, at all reporting levels, require approval of the COR prior to implementation.

C.5.5.3 Contract Performance Report (CPR)
The CPR is a contractually required monthly report containing original baseline, performance data, and actual costs. The CPR shall be developed and submitted at Level 3 of the CWBS, areas within the Level 2 Primary Vehicle element shall be reported at Level 4, in accordance with CDRL A011. Reporting at lower levels may be specified for high-cost, high risk and high variance items, at no additional cost to the Government, and will be required until the problem is resolved. The COR and the Contractor will periodically review and adjust the CWBS reporting levels. Thresholds for reporting Format 5 Variance Analysis shall also be periodically reviewed and adjusted by the COR.

C.5.5.4 Contract Funds Status Report (CFSR)
The CFSR shall be developed and submitted in accordance with DI-MGMT-81468 (CDRL A012). The Contractor shall reconcile reporting elements in the CFSR with the CPR when these documents are submitted in the same month. The Contractor shall provide a reconciliation of the CFSR with the CPR as an addendum to the CPR (DI-MGMT-81466A).

C.5.5.5 Integrated Master Plan (IMP) and Integrated Master Schedule (IMS)
The IMP and IMS shall be submitted in accordance with DI-MGMT-81650, DoD Integrated Master Plan and Integrated Master Schedule Preparation and the User Guide in accordance with CDRL A013. The Contractor shall develop and maintain an IMP. The IMP is an event-based plan consisting of a hierarchy of program events, with each event being supported by specific accomplishments, and each accomplishment reinforced by specific criteria that must be satisfied. The IMS shall roll up directly to the IMP and corresponding IMP event and criteria. The Contractor shall develop and maintain an IMS by logically networking detailed program activities. The schedule shall be consistent with the CWBS and contain the planned events and milestones, accomplishments, exit criteria, and activities from contract award to the completion of the contract. The IMS shall be resource loaded and clearly identify critical path activities and reflect those risks identified and documented in the Contractors risk management plan. All IMS/IMP monthly submissions shall include written schedule analysis.

The resource, status, and time-phasing of the IMS and the EVM Performance Measurement Baseline shall be consistent. The draft PMB is due on the 17th of the month following the end of the first full accounting month after contract award. The official PMB will reviewed by the COR at the IBR and either accepted as the official PMB or rejected. If rejected, the COR will work with the Contractor to adjust the PMB.

C.5.5.6 Over-Target Baseline (OTB) or Over-Target Schedule (OTS)
In exceptional circumstances indicated by contract performance, the Contractor shall submit a request for approval to initiate an over-target baseline for over-target schedule to the PCO. The request shall include a top-level projection of cost and schedule growth, a recommendation of whether or not performance variances shall be retained on record, and a schedule for implementing a new baseline. The Contractor shall not implement the OTB or OTS restructuring prior to receiving written approval from the PCO.

C.5.5.7 Application to Subcontractors
The Contractor shall flow-down EVM requirements to subcontractors meeting the applicable threshold (per DFARS 252.234-7001 and 252.234-7002). The performance information reported by the subcontractors shall be incorporated and integrated into the Contractors management system. The Contractor shall be responsible for reviewing and assuring the validity of all subcontractors reporting through surveillance.

C.5.5.8 Electronic Transmission of Data
The Contractor shall format the deliverable data for Electronic Data Interchange (EDI) in accordance with the ANSI X12 Standard or XML equivalent as indicated in CDRL A010. wInsight files are also acceptable. Format 5 should be submitted in a human readable form factor.

C.5.5.9 Program Management Cost Reporting (PMCR)

C.5.5.9.1 The Contractor shall systematically collect and report to the Government actual contract costs in the following reports:

CDRL	Title
A014	Program Management Cost Summary Report
A015	Functional Cost-Hour Report
A016	Progress Curve Report
A017	Contractor Business Data Report
A018	Software Resources Data Report: Initial Developer Report and Data Dictionary
A019	Software Resources Data Report: Final Developer Report and Data Dictionary

C.5.5.9.2 Contractor reports shall be prepared in accordance with the instructions contained in the above CDRLs and the Program Management Cost Reporting (PMCR) Plan (Attachment B - Appendix B).

C.5.6 Risk Identification and Management
The Contractor shall develop, implement, and deliver a Risk Management Plan in accordance with CDRL A020 following the concepts in the Risk Management Guide for DoD Acquisition, Sixth Edition (Version 1.0) dated August 2006. The Contractors Risk Management Plan shall include all program and system level efforts to identify and mitigate program risks in the areas of cost, schedule, and performance. The Contractors Risk Management Plan shall address:

Risk Management Strategy and Process
Responsible and Executing Organization
Risk Management Process and Procedures, to include Subcontractor Risks
Risk Identification
Risk Analysis (Likelihood and Consequence Criteria)
Risk Mitigation Planning
Risk Mitigation Plan Implementation
Risk Tracking
Risk as a Quantitative Impact on EVM

The Contractor shall manage risks to the program and technical baselines through examination of each element in the Contractors Work Breakdown Structure. The Contractor shall produce a list of risks that shall be evaluated, categorized and prioritized. The Contractor shall maintain a database of all risks and their status. The Contractor shall conduct risk assessments and systematically identify, analyze, and report risk mitigation activities for all moderate and high-risk areas during the Risk Review Board. The Contractor shall quantify the potential impact of risks to the program and the associated mitigation plan costs. The Contractor shall establish a strategy to mitigate each risk, along with a strategy for the allocation of resources to support the management of the risk. The Contractor shall develop and maintain a closure strategy for these risks. The Contractor shall deliver a Risk Management Status Report (CDRL A021) which will be reviewed with the Government during the monthly Risk Review Boards. The Contractor shall include risks identified by its subcontractors in the risk identification, tracing, and management listing above.

C.6 Systems Engineering

C.6.1 Vehicle Technical Baseline Description
The technical baseline vehicle configuration for the Abrams ECP 1 program is the M1A2 SEP v2 End Item 8750231 as identified in the Engineering Release Record (ERR) NO. GDMY3958 (dated June 09, 2011), Engineering Change Proposals (ECPs) approved post ERR (Attachment B - Appendix C), and the technical and design baseline additions of Vehicle Health Management System/Embedded Training/Mounted Soldier Systems (VEM), baseline defined by Abrams SEP v2 VEM CDR Briefing Package dated 25 Jul 2012 (Attachment B, Appendix Q), Data Distribution Unit (DDU), FBCB2 Joint Capabilities Release (JCR) and Joint Battle Command Platform (JBCP), Ammunition Data Link (ADL), baseline defined by ADL-Integration SSR/SFR Briefing dated 26 Jul 2012 (Attachment B - Appendix R), and 5.0 system software content.

C.6.2 Producibility
All items and systems must be designed to be producible. Producibility is the relative ease of producing an item or system, using a design that enables economical fabrication, assembly, inspection, and testing with available production technology. Some producibility characteristic examples are: specified materials, simplicity of design, commonality, flexibility in production alternatives, tolerance requirements, clarity and simplicity of the technical data package, design stability, and process controls. The Contractor shall provide a producibility analysis for each item or system developed or modified by this effort.

C.6.3 Technology Description
The Contractor, in its development and integration of technologies described herein, shall not cause or enable degradation of the operational performance, reliability, maintainability, human factors, safety, or producibility as documented in the Abrams System Specification (SA-SA00001D, dated 22 April 2004) and the Prime Item Product Fabrication Specification for the Tank, Combat, Full-Tracked and the 120MM Gun, M1A2 (SC-SA10010L, dated 24 May 2011). In the event that system degradation is unavoidable due to the integration of Government Furnished Material, the Contractor shall notify the COR. The Contractor shall provide the COR supporting analysis and modeling results to confirm the degradation. The PCO will determine whether to accept the degradation or to implement a contract

modification to eliminate the degradation.

The contractor shall comply with specification ATPD 2404 - Environmental Conditions for the Heavy Brigade Combat Team Tracked Vehicle Systems (Attachment B - Appendix D) and the MIL-STD-464C Tailored for Heavy Brigade Combat Team Vehicle Systems (Attachment B - Appendix E). These requirements shall apply to the equipment listed below:

1. Mission Control Unit (MCU)
2. Turret Control Unit (TCU)
3. Hull Control Unit (HCU)
4. Commander's Display and Control Panel (CDCP)
5. Gunner's Control Panel and High Resolution Display
6. Driver's Control Panel and High Resolution Display
7. Vetronics Power Distribution Box
8. Auxiliary Power Distribution Box
9. Buck/Boost Charger
10. Hull Remote Switching Modules (HRSM)
11. Turret Remote Switching Modules (TRSM)
12. Increased Amperage Generator
13. Auxiliary Power Unit (APU)
14. Slip Ring Assembly (SRA)
15. Prime Power Controller (PPC)
16. Voltage Regulator
17. Bus Bars
18. Power pack Disconnect Panel
19. Circuit Breaker 1
20. APU Fire Extinguisher Components
21. TALIN 3000 INU A-kit
22. JTRRS A-kit
23. CREW V3 A-kit

The component naming conventions listed above are referenced in the Abrams Jumpstart 0.0 Architecture Release of May 2012. These conventions and the architecture affecting them may change from the 0.0 Release throughout the program. Should the naming convention(s) change, the Contractor shall insure the replacement LRU/LRM (s) meet the requirements of ATPD-2404 and MIL-STD-464C.

The Contractor is not responsible under this contract for the noncompliances that are determined to be the result of unchanged legacy items. The ATPD-2404 defines six random vibration profiles which are planned to be revised by the government within six months after contract award. The revised random vibration shall be based on the operational stresses measured on the Bradley Fighting Vehicle, Abrams, and Paladin vehicles. The Contractor may define the program impact due to revising the vibration profile in the SEIT. Changes will be implemented by contract modification.

C.6.3.1 Command, Control, Computers, Communications, Intelligence, Surveillance and Reconnaissance (C4ISR) Systems

The Contractor shall develop an A-Kit design for integrating the Handheld, Manpack, Small-form-factor, Manpack Radio (HMS-MP) and vehicle mount, referred to as the B-Kit, into the platform. The design shall adhere to all platform-level and B-Kit functional and environmental requirements. Exceptions must be approved by the COR in writing. The A-Kit shall include the mounting provisions and the cables to provide power and signal to the B-Kit, battle command system, antennas, and the Vehicle Intercom System (VIS).

The system, along with the associated radio units, cables, antennas, power amplifiers, waveform specific accessories, and vehicle mounts shall be referred to as the B-Kit and will be provided as Government Furnished Equipment (GFE). The Government will provide pertinent equipment specifications and data Interface Control Documents as Government Furnished Information by System Functional Review to the support A-Kit design.

The HMS- MP B-kit will be composed of the following components: HMS-MP radios, two power amplifiers, associated radio and amplifier mounts, intra-system cables, Radio Frequency (RF) filters and required mounts, 2 tri-band whip antennas, and a Mobile User Objective System (MUOS) antenna. The radio shall be defined by JTRS HMS System Development and Demonstrations Phase, HMS HW Dual MP Tray ICD, Revision XB, Document No. 69-P53941R, 24 May 2013 (Attachment B - Appendix F). If the RF filter configuration specified in the ICD does not fit within the available ECP1 Tank volume, or creates secondary impacts on other vehicle components, the Contractor shall identify this to the COR for resolution.

The Contractor shall conduct vehicle level antenna analysis, and provide design information for the Government Co-site Interference Studies and antenna pattern analysis in order to determine the optimal location for the antennas on the vehicle turret and hull. The

Contractor shall deliver updated CAD Models (PRO-E) to support the Government conducted CERDEC Radio Frequency (RF) Antenna and jamming analysis and ARDEC Electromagnetic Environment Effects (E3) Hazards of Electromagnetic Radiation to Ordnance (HERO), Hazards of Electromagnetic Radiation to Fuel (HERF) and Hazards of Electromagnetic Radiation to Personnel (HERP) efforts. Data shall be provided as External Vehicle CAD Models in the following format: .stp, step, .sat, or .igs files. These models shall be delivered no later than 30 days prior to Preliminary Design Review in accordance with CDRL A022.

C.6.3.2 Electrical System Upgrade

C.6.3.2.1 Power Management System (PMS)
The Contractor shall upgrade the SEPv2 power management and distribution systems to provide power and load management capability to the vehicle. The Contractor shall consider Power Management Study (Attachment B - Appendix H) when designing the overall power management system.

The Contractor shall design the Power Management System (PMS) to provide the capability to automatically shed batteries. The PMS shall support combat overrides in accordance with the same methods as the M1A2 SEPv2 Tank. The Contractor shall redesign and integrate Remote Switching Modules (RSMs) to accommodate increased capabilities identified in the Power Management Study.

The Contractor shall deliver a States and Modes Analysis Report in accordance with CDRL A082

C.6.3.2.2 Battery Monitoring System (BMS)
The Contractor shall design and integrate a Battery Monitoring System (BMS) that meets the Purchase Description, Battery Monitoring System (Attachment B - Appendix I).

C.6.3.2.3 Increased Amperage Alternator
The Contractor shall consider the Power Management Study (Attachment B - Appendix H) to design and integrate a higher amperage alternator.

The alternator shall be sized to ensure the ECP 1 tank provides growth capability of at least 5600 spare watts of electrical power in the turret and 2800 spare watts of electrical power in the vehicle hull. These values represent the available electrical power in excess of the maximum power consumption, defined in the system and sub-system specifications for all of the turret components when operating steady state in Combat Mode with systems and subsystems fully functional (Auxiliary Power Unit and personnel heater OFF). Battery load characterization shall be defined per MIL-STD 1275D (DOD Interface Standard, Characteristics of 28V DC Electrical Systems in Military Vehicles), Paragraph 4.6 (Battery Condition). Fully functional is defined as each respective system and sub-system powered ON, and operating in its mode of highest power draw (i.e. scanning, slewing, transmitting, receiving, jamming or processing). The system and sub-system specifications shall address the power consumption at an ambient temperature of 125 degrees F with solar loading. The 125 degrees F (with solar loading) ambient temperature translates to a 140 degrees F induced environment for legacy components and to 160 degrees F induced environment for ECP 1 components.

The Contractor shall provide analysis to evaluate the higher amperage alternators compatibility with the current Power Take Off (PTO) shaft. If changes become necessary, the Contractor shall be responsible for directly working with the transmission OEM, to assure that the current transmission is minimally impacted for changes and the existing performance is not degraded. Resulting data shall be presented in the SE-IPT meetings.

C.6.3.2.4 Slip Ring Assembly (SRA) Upgrade
The Contractor shall design and integrate an upgraded Slip Ring Assembly (SRA). The upgraded SRA shall provide:

1) Electrical power transmission capability to handle the increased current from the higher amperage alternator.
2) Hydraulic fluid transmission capability to current SEPv2 requirements.
3) Pneumatic transmission capability to meet current Nuclear, Biological, Chemical (NBC)requirements.
4) Capability to support the CREW Duke V3 Integration.
5) Data transmission capability to support Vehicular Integration for Command, Control, Communications, Computers, Intelligence, Surveillance, Reconnaissance Electronic Warfare (C4ISR EW) Interoperability (VICTORY) architecture and Power Management.
6) Video transmission capability over dedicated GbE channel to support sensor integration as herein described.

The space claim for the upgraded SRA shall not impact other components, Line Replacement Units (LRUs), or Line Replaceable Modules (LRMs) in its vicinity.

C.6.3.3 Auxiliary Power Unit (APU)
The Contractor shall integrate an APU for providing electrical power to the tank systems, sub-systems and LRUs required to operate during silent watch or engine-off operations. The APU shall meet the following requirements:

1) Shall allow the vehicle to operate for 12 hours in silent watch mode as defined in the Abrams ECP1 System specification.
2) Fuel consumption shall not exceed 1.6 gallons per hour when providing a minimum of 9kW steady state resistive electric load using JP-8 per MIL- DTL-83133 at an ambient temperature of 125 degrees F.
3) Noise shall be aurally undetectable at a distance greater than 750m as defined in MIL-STD 1474D, while operating at full power in an

open terrain with hatches closed.
4) The Contractors's goal for mean time between failures (MTBF) is 1,100 hours or greater, but shall not be less than 720 hours.
5) Shall draw fuel from the vehicles existing fuel tank.
6) Shall be controlled at a crew station(s) within the vehicle and provide start, stop, and emergency stop functions.

The APU shall have an automatic fire suppression system with manual back-up capability.

C.6.3.4 Counter RCIED (Radio-Controlled Improvised Explosive Device) Electronic Warfare Device Duke v3
The Contractor shall develop an A-Kit design for integrating the CREW Duke v3, referred to as the B-Kit, in to the platform. The design shall adhere to all platform-level and B-Kit functional and environmental requirements. Exceptions must be approved by the COR in writing. The A-Kit shall include the mounting provisions and harnesses to provide power for the B-Kit.

The CREW Duke v3 consisting of the primary and secondary control units, cables, antennas, and remote control unit shall be referred to as the B-Kit and will be provided as Government Furnished Equipment (GFE). The Government will provide pertinent equipment specifications and data Interface Control Documents (ICDs) as Government Furnished Information (GFI):

CREW Duke V3: ICD SRCTec TD 10-1065, Rev 6, 27 June 2012 (Attachment B -- Appendix G), System Assembly Configuration (c). TM 11-5864-1042-10 (Attachment B -- Appendix G) will be used as reference only for the subset of system elements described therein.

The Contractor shall conduct vehicle level antenna analysis and provide design information for the Government Co-site Interference Studies and antenna pattern analysis in order to determine the optimal location for the antennas on the vehicle turret and hull. The Contractor shall deliver updated CAD Models (PRO-E) to support the Government conducted CERDEC Radio Frequency (RF) Antenna and jamming analysis and ARDEC Electromagnetic Environment Effects (E3) Hazards of Electromagnetic Radiation to Ordnance (HERO), Hazards of Electromagnetic Radiation to Fuel (HERF) and Hazards of Electromagnetic Radiation to Personnel (HERP) efforts. Data shall be provided as External Vehicle CAD Models in the following format: .stp/step, .sat, or .igs files. These models shall be delivered no later than 30 days prior to Preliminary Design Review in accordance with CDRL A022.

C.6.3.5 Line Replacement Unit (LRU) and Line Replaceable Modules (LRM)
The Contractor shall redesign and integrate the following LRUs to address Space, Weight and Power (SWaP), maintenance, and obsolescence. The redesign shall develop and integrate LRMs to the maximum extent possible.

Acronym	M1A2 SEPv2 LRU Nomenclature
ICDU	Improved Commanders Display Unit
ICEU	Improved Commanders Electronics Unit
IHMPU	Improved Hull Mission Processor Unit
ITMPU	Improved Turret Mission Processor Unit
IDID	Improved Drivers Integrated Display
IGCDP	Improved Gunners Display Panel
AIM	Analog Input Module
IFCEU	Improved Fire Control Electronic Unit

The redesigned LRUs and LRMs shall:

Reserve throughput capacity at a minimum of 40%
Reserve memory capacity of 100%.
Include High Resolution displays for High Definition sensors.

The Contractor shall manage the interface between the Abrams ECP 1 LRUs or LRMs with the overall tank system. Interface control management shall assure that the design changes do not adversely impact the compatibility of all interfaces.

C.6.3.6 VICTORY Specification 1.4
The Contractor shall integrate a vehicle network that uses a Gigabit Ethernet (GbE) databus, Transmission Control Protocol (TCP) and Internet Protocol (IP) for data transfer between computing elements within the onboard computing architecture. The Contractor shall ensure that the LRUs and LRMs that replace SEP V2 LRUs called out in C.6.3.5 are independently connected to a Gigabit Ethernet bus.

The Contractor shall apply the portions of the VICTORY 1.4 specification (Attachment B Appendix J) as defined below. The Contractor shall ensure the Vetronics System provides a single GbE interface point (a.k.a. bridge) from the platform system enclave to a classified enclave that shall provide data services in accordance with the VICTORY specification. The following VICTORY Application Interfaces shall be implemented using eXtensible Markup Language (XML) and tested for XML message format compliance:

Requirement / Spec Title - Spec Tag

Time Synchronization Service - VT50000-V1.4
Time Synchronization Service Interface - VT50001-V1.4
Position Service - VT50100-V1.4
Position Data Interface - VT50101-V1.4
Orientation Service - VT50200-V1.4
Orientation Data Interface - VT50201-V1.4
Direction of Travel Service - VT50300-V1.4
Direction of Travel Data Interface - VT50301-V1.4

The Contractor shall provide the Government with evidence of compliance as an agenda item at the SEIT meetings.

The Contractor shall participate in bi-weekly teleconferences covering each of the three VICTORY working groups and the quarterly face-to- face meetings. The Contractor shall support the VICTORY standards development process by attending these meetings and providing comments to the VICTORY standards development process.

C.6.3.7 Armor Upgrade
The Government will provide as Government Furnished Material (GFM), three complete applications of upgrade armor packages for incorporation into the prototype vehicles.

The Contractor shall remove the existing armor packages off the three prototype vehicles and replace them with the upgraded GFM armor packages. The Contractor shall ensure all applicable security measures identified in the Abrams Security Classification Guide are followed.

The Contractor shall assess the impact of the New Evolution Armor (NEA) weight on the baseline performance of the vehicle. The assessment shall be briefed at the SEIT, SFR, PDR, CDR, and SVR. Other engineering analyses or design changes will be provided for under the NEA contract.

C.6.3.8 TALIN 3000 Inertial Navigation Unit (INU) Integration
The Contractor shall integrate the TALIN 3000 INU into the vehicles and remove the POS NAV System.

C.6.3.9 Common Vehicle Architecture Description (CVAD) for the Program Executive Office Ground Combat System (PEO GCS) Common Vetronics Reference Architecture
The Contractor shall use the CVAD for PEO GCS Common Vetronics Reference Architecture Rev 1.0 (Attachment B - Appendix S) as a guideline for the development of the ECP 1 technologies.

C.7 Systems Engineering Process

C.7.1 Systems Engineering Management Plan (SEMP)
The Government-prepared Systems Engineering Plan (SEP), outlines the Governments System Engineering approaches. The Contractor shall prepare a Systems Engineering Management Plan (SEMP) detailing the Systems Engineering Processes being used to develop the system. The Government SEP is provided for guidance only (Attachment B - Appendix A). The SEMP shall be prepared and delivered in accordance with CDRL A023.

C.7.2 Systems Integration Laboratory (SIL)
The Contractor shall develop and implement a plan for the testing of vehicle subsystems and components through the use of a Contractor SIL (CSIL). This plan shall identify the compatibility, bandwidth, and complexity risks associated with adding and removing vehicle network hardware and software integration. The SIL Test Plan shall be prepared and delivered in accordance with CDRL A024. The Contractor shall procure material to update and maintain the CSIL. The Government reserves the right to review CSIL documentation prepared under this contract.

C.7.3 Trade Studies and Analysis
The Contractor shall develop and implement a cost informed trade study approach for the ECP 1 Program technologies that systematically compares and contrasts alternative design approaches and make a recommendation on how best to meet system requirements.

The Contractor shall present key design trade studies and scoring criteria to the COR for approval. The design trade study information shall be documented in a Trade Study Report in accordance with CDRL A025.

C.7.4 Design for Six Sigma (DFSS)
The Contractor shall utilize Design for Six Sigma (DFSS) tools and process for work conducted under this contract. Design for Six Sigma shall be an institutionalized documented process and the tools selected for each project shall be documented in the SEMP.

C.7.5 Design Failure Modes and Effect Analysis (DFMEA)
The Contractor shall conduct a DFMEA on all LRUs and LRMs within designated under this ECP 1 program, down to the component level,

except for COTS items for which the DFMEA shall be performed to the lowest level possible. The Contractor shall identify and evaluate potential failure modes to determine their effect on the LRU. The DFMEA shall be performed either as a hardware analysis or as a combination of a hardware analysis with functional analysis. The DFMEA data shall be delivered in accordance with CDRL A026.

C.8 Commonality

The Contractor shall participate in an every-other-week Program Management Office, Heavy Brigade Combat Team (PMO HBCT) Commonality Meeting. The Contractor shall host every-other meeting at its office. The Contractor shall participate in activities that are a direct result of actions identified during the Commonality Meeting.

Throughout the ECP 1 development effort, the Contractor shall consider and prioritize the selection of ECP 1 components with respect to commonality (hardware and software) in accordance with the following hierarchy:

Abrams Family of Vehicles Inventory
Heavy Brigade Combat Teams Inventory
PEO Ground Combat Systems Inventory
United States Army Inventory
Department of Defense Inventory

The Contractor shall address Commonality as part of all trade studies and analyses recommendations in accordance with paragraph C.7.3, Trade Studies and Analyses. The Trade Study Report (CDRL A025) must address commonality considerations.

C.9 System Architecture

The Contractor shall prepare and present to the SEIT a vehicle system architecture that includes all ECP modifications and also fully complies with the Abrams System Specification with ECP 1 revisions. Once the system architecture is established, any changes that affect the system architecture shall be presented to the SEIT. If system changes are made that impact the system architectures, those architectural changes will be presented to the SEIT. System architectures shall identify and depict all hardware and software subsystems and components (including Government Furnished Equipment (GFE) and Contractor Furnished Equipment (CFE)) and their respective interfaces.

The System Architectures shall include:

Vehicle System Architectures
Cable Interconnect (One-Wire) Diagrams
Cable Signal Interface (Two-Wire) Diagrams

The Contractor shall provide a software architecture that shows the structure or structures of the system, comprising software components, externally visible properties of those components, and the relationships between the software components. The following viewpoints shall be provided (in accordance with ANSI/IEEE 1472-2000):

Functional and logic view;
Code and module view;
Development and structural view; and
Concurrency and process/thread view;
Physical and deployment view;
User action and feedback view; and
Data view.

The Contractor shall update the existing Abrams System/Subsystem Design Description (SSDD) maintaining the current contractor format supporting the delivery of CDRL A027

C.10 Requirements Engineering

The Contractor shall modify the current Abrams System Specification (SA-SA00001D, dated 22 April 2004) and the Abrams Prime Item Product Fabrication Specification for the Tank, Combat, Full Tracked, 120MM Gun, M1A2 (SC SA100110L, dated 24 May 2011) to incorporate the necessary updates resulting from the technical and design baseline additions described in C.6.1 Vehicle Baseline and the incorporation of the technologies indentified in paragraph C.6.3 Technology Description. The updated Abrams System Specification and Abrams Prime Item Product Fabrication for the Tank, Combat, Full Tracked, 120MM Gun, M1A2 shall be submitted in accordance with CDRLs A083 and A084 respectively.

C.10.1 System Requirements Verification

The Contractor shall track verification of requirements and specifications throughout developmental and operational testing by updating the Requirements Traceability Matrix with verification strategies and data. Requirements verification tracking is limited to developmental and operational testing only, and does not include functional test and evaluation. The Contractor shall update and deliver for Government approval the Requirements Traceability Matrix with verification information in accordance with CDRL A028.

C.11 Software Design and Development
The Contractor shall design, develop, integrate, and test software or modify existing software, document and deliver system and subsystem software and component firmware for new or modified components in accordance with CDRL A027. The software for ECP 1 shall incorporate the functionality from SEP software version 5.0 which is the baseline, and the functionality required by the technologies incorporated in paragraphs C.6.3.1-C.6.3.7. All software development activities shall be an integrated part of the systems engineering effort. The Contractor shall ensure all new and modified Computer Software Configuration Items (CSCI) are modular.

C.11.1 Software Development Plan (SDP)
The Contractor shall develop a Software Development Plan (SDP) in accordance with CDRL A030. The plan shall describe the Contractors procedures, management organization, and work plan for the software development effort.

C.11.2 Software Design Description (SDD)
The Contractor shall develop and deliver a Software Design Description (SDD) that encompasses the Abrams ECP 1 top level design, and subsystem design in accordance with CDRL A031. This document shall demonstrate the flow down of system requirements to hardware or software configuration items. New or modified subsystems and components shall be easily identifiable.

C.11.3 Corrective Action System
The software program shall include a closed-loop corrective action system for problem correction prioritization. The Contractor shall report, track, analyze, and resolve all software failures through the duration of the contract. The Contractor shall maintain a database of open and closed System Trouble Reports (STRs) and shall be made available to the Software IPT. The STRs derived from internal or test problem sources shall be prioritized in a contractor established problem report database in contractor format identified by Safety, Critical, Routine, and Maintenance categories.

C.11.4 Interface Requirements and Designs
The Contractor shall develop all internal and external software interface requirements and designs. This information shall be captured and delivered in the integrated Interface Requirements Specification (IRS) in accordance with CDRL A032. The Contractor shall provide the Government access to the software design model through the Software IPT, Interface Design Description (IDD) (CDRL A033). The Contractor shall perform software integration, subsystem and system integration. The Contractor shall assure that all software modules and subsystems within the system are communicating and performing in accordance with the system requirements and design.

C.11.5 Software Test Plan (STP)
The Contractor shall, in accordance with CDRL A034, Software Test Plan (STP), develop, document, and conduct a comprehensive software test program. The STP shall describe the software test resources, test requirements, and test schedule for formal qualification testing of the Computer Software Configuration Items (CSCIs). The STP shall also describe software test cases and procedures for the formal qualification testing of one CSCI. The Contractor shall establish, maintain and provide Government access to a centralized defect database. The database shall characterize the key attributes of the defect and allow for prioritization and tracking until closure.

C.11.6 Software Metrics
The Contractor shall develop and follow a codified approach to collecting software metrics in accordance with the ISO/IEC TR 9126. The Contractor shall collect and analyze metrics that describe the following: computer resource utilization, source code size and complexity, reliability, and design stability.

C.11.7 System Level Software Test
The Contractor shall conduct Government witnessed testing of the final software at system level with COR designated representatives. The Contractor shall also provide the COR a test report in accordance with CDRL A035 to describe software test results. The Contractor shall provide the COR with 30 days notification prior to start of Government witnessed testing. Deficiencies shall be documented as a System Trouble Report (STR) in contractor format (electronic PDF) completed with resolution process in accordance with CDRL A036.

C.11.8 Software Version Description (SVD)
The Contractor shall deliver a Software Version Description describing the version of CSCI to be delivered in accordance with CDRL A037. The Contractor shall supply, prior to Government testing, an SVD Information Paper in accordance with CDRL A038.

C.11.9 Release Notes
The Contractor shall provide the Government with the software release notes for each software drop no later than three working days before the system regression testing and Government Witness Test begins in accordance with CDRL A039. The release notes should include the following: CM released software version and drop number; the contractor, subcontractor, and third party configuration items; CSCI version number; LRUs version number; description of the release; known problems and limitations with the release; base line version of the software; new functions and Change Requests (CRs); Requirements Definition Document (RDD); System Trouble Reports (STRs) fixes; enhancement issues; and downloaders version and description.

C.11.10 Source Code, Executable Code, and Application Code

The Government will have unlimited rights in Government funded work first produced, created or generated and required to be delivered under this contract in accordance with CDRL A040.

C.11.11 Interface Control Document
The Contractor shall develop, document, and deliver to the Government all interface control documents for all new LRUs and LRMs for the Abrams ECP 1 Program to define the protocol, word formats, and data types for the data packets in accordance with CDRL A041.

C.11.12 Data Packet Specification
The Contractor shall develop, document, and deliver to the Government the data packet specifications for all new remote terminal for the Abrams ECP 1 Program in accordance with CDRL A042.

C.11.13 Software Requirements Specification (SRS)
The Contractor shall develop and deliver the Software Requirements Specification (SRS) document which specifies the software requirement for all the Computer Software Configuration Items (CSCIs) of the Abrams ECP 1 program and the methods to be used to ensure that each software requirements has been met in accordance with CDRL A085. This document shall demonstrate the flow down of system requirements to software configuration items. New or modified subsystems and components shall be easily identifiable. The SRS shall be used as the basis for design and qualification testing of the CSCI.

C.12 Software Management

C.12.1 Software Development
The Contractor shall implement formalized software risk management practices, including risk tracking, review, and a mitigation program with quantitative trigger thresholds. The Contractor shall maintain an integrated schedule of the software development activities consistent with the Integrated Master Schedule (IMS). Software development activities shall be detailed down to the level that provides visibility into work unit status and meaningful measures of schedule progress.

C.12.2 Software Reliability
The Contractor shall document and execute a Software Reliability Program Plan in accordance with CDRL A043. The Contractor and its subcontractors shall implement a metrics and software measurement program. The Contractors Software Reliability Program Plan shall also include metrics to provide confidence that software is being matured to meet reliability requirements. When proposing to the SEIT any technical or programmatic changes in the program planning and execution, the Contractor shall present the metric data supporting the proposed change.

C.13 Information Assurance (IA)
The Contractor shall establish or leverage administrative, technical, and physical safeguards to protect all Government data, to ensure the confidentiality, integrity, and availability of Government data. The Contractor shall use the Abrams M1A2 SEP v2 Information Assurance safeguards and security controls. The Contractor shall support accreditation of the system, by providing the IA related documentation, analyses, test, evaluation and assessments in accordance with CDRL A044.

The Contractor shall comply with IA requirements in accordance with AR 25-1, Information Assurance and support the new IA documentation needed for the DoD IA Certification and Accreditation Process (DIACAP) as outlined in DODI 8510.01. This shall require updates to the following IA SEPV2 documentation artifacts:

1) Systems Security Plan (SSP)
2) Security Test and Evaluation (ST&E)
3) Cross Domain Appendix (CDA)
4) Cross Domain Validation and Approval Request (CDVAR)
5) Unit SOPs and technical bulletin(s) [Security procedures]
6) Continuity of Operations Plan (COOP)
7) SW Development Plan (see paragraph C.9.1)
8) Configuration Management Plan (CMP)
9) Configuration Control Board Charter
10) Backup Strategy
11) Disaster Recovery Plan (DRP)
12) Incidence Response Plan
13) Evidence of Best Business Practices (BBPs) and Security Technical Implementation Guides (STIGs)
14) Concept of Operations (CONOPS)
15) Data Flow Diagram
16) Detailed Architecture Diagram
17) Hardware and Software List (include vendors, versions)
18) Ports, Protocols and Services List

The Contractor shall ensure that all IA and IA enabled products be National Security Telecommunications and Information Systems Security Policy Number 11 (NSTISSP-11) compliant, and the products are validated by accredited labs under National Security Agency (NSA), the National IA Partnership (NIAP) Common Criteria Evaluation and Validation Scheme or National Institute of Standards and Technology (NIST) Federal Information Processing Standards (FIPS) Cryptographic Module Validation Program (CMVP) to include FIPS Pub197, Advanced Encryption Standard, FIPS; FIPS Pub 140-2, Security Requirements for Cryptographic Modules and FIPS Pub 198-1, The Keyed-Hash Message Authentication Code (HMAC); IETF RFC 2560, X.509 Internet Public Key Infrastructure.

Reference documentation:

1) AR 25-2, Information Assurance
2) NISP SP 800-37, Rev 1, Guide for applying the Risk Management Framework to Federal Information Systems: A Security Life Cycle Approach
3) NIST SP 800-53 Rev 3, Recommended Security Controls for Federal Information Systems and Organizations
4) Department of Defense (DOD) through it DoD IA Certification and Accreditation Process (DIACAP) DODI 8510.01
5) DODD 8500.01E IA
6) DODI 8500.2 IA Implementation
7) NISP SP 800-37, Rev 1, Guide for applying the Risk Management Framework to Federal Information Systems: A Security Life Cycle approach
8) NIST SP 800-53 Rev 3, Recommended Security Controls for Federal Information Systems and Organizations
9) (CJCSM) 6510.011A, Chairman of the Joint Chiefs of Staff Manual
10) 6212.01E, Interoperability and Supportability of Information Technology and National Security System
11) National Industrial Security Program Operating Manual (NISPOM)
12) DoDI 8551.1, Ports, Protocols and Services Management (PPSM)
13) DoD 5220.22-M; Best Business Practices (BBPs)
14) Security Technical Implementation Guides
15) Department of Defense Federal Information Security Management Act (FISMA) (IA milestones through system lifecycle)
16) DoDD 8570.01-M, Information Assurance Workforce Improvement Program

C.14 Modeling and Simulation

As a part of its design process, the Contractor shall plan and execute iterative Modeling and Simulation (M&S) in order to optimize the Abrams ECP 1 design concept and assess feasibility. The M&S shall identify risks and impact of design concepts on system performance in key attribute areas to include Mobility, Thermal, Structure, Signature Management, Lethality, Survivability (Vulnerability and Criticality), Transportability, and Reliability, Availability and Maintainability (RAM). The Contractor shall allow Government Subject Matter Experts access to observe and discuss the M&S process for the duration of the contract, in order to ensure an understanding of the tools, processes, constraints, and assumptions used during Contractor and subcontracted M&S efforts. All M&S outputs, interim and final analysis results, and input data used to create the models shall be accessible to the Government and presented to the Government subject matter experts at designated IPT meetings, technical reviews, and PMRs.

The Contractor shall provide an M&S Plan in accordance with CDRL A045 that details the schedule and execution of the M&S related to the Abrams ECP 1 Program.

The Contractor shall provide the Government M&S data in support of live fire testing in accordance with CDRL A046.

C.15 Reserved

C.16 Metrics and Analysis

C.16.1 Technical Performance Measures

The Contractor shall recommend, subject to COR approval, the technical performance parameters and the mechanism for continuing verification of projected versus actual achievement of technical performance in accordance with the Systems Engineering Plan.

C.16.2 Electrical Load Analysis

The Contractor shall provide the results of an electrical load analysis for all electrical systems that have been modified at Preliminary and Critical Design Reviews.

C.16.3 Capacity and Margins

The Contractor shall monitor and track end-item capacities and margins to reflect changes as a result of obsolescence or new capabilities. The Contractor shall identify unacceptable capacity and margin projections and recommend a resolution plan to the SEIT.

C.16.4 Weight and Balance

The Contractor shall track the weight and the Center of Gravity (CG) of the entire system, as well as, the hull and turret independently with a detailed breakdown of each component. The Contractor shall submit and update this information in the form of an Abrams Vehicle

Weight Report in accordance with CDRL A047. The Contractor shall work to decrease the overall combat weight of the vehicle and turret unbalance in a cost effective way. Weight change initiatives shall be approved by the COR prior to being implemented. The Contractor shall present at each Systems Engineering IPT meeting projected impacts to the vehicles weight and center of gravity due to new and modified systems and subsystems.

C.16.5 Obsolescence
The Contractor shall have sole responsibility for identifying and subsequent replacement or redesign of a part or system because parts or subsystems are at risk for obsolescence or no longer available as it relates to the Abrams ECP 1 effort.

C.17 Manpower Personnel Integration (MANPRINT) PROGRAM
The Contractor shall use the MANPRINT discipline to ensure that the interdependent considerations of Human Factors Engineering; Manpower, Personnel and Training; System Safety; Health Hazard Assessment and Soldier Survivability are addressed and integrated into the ECP 1 designs.

The Contractor shall present at design and program reviews the results of MANPRINT consideration efforts. These presentations shall include:

The qualitative and quantitative efforts used to address those resources required to support, operate, maintain, troubleshoot and repair the Abrams ECP 1 system.

Evidence that critical MANPRINT related issues identified during all testing, verification activities, and User Juries, have been resolved.

Critical operator and maintainer tasks.

Recommended design changes or improvements to resolve MANPRINT issues.

C.18 Electromagnetic Environmental Efforts (E3)
All electrical and electronic subsystems and components developed, selected or revised for the Abrams ECP 1 program by the Contractor shall comply with MIL-STD-461F. The Contractor shall develop and deliver the Electromagnetic Interference Test Procedures (EMITP) and Electromagnetic Interference Test Report (EMITR) for each electrical and electronic subsystem or component developed, selected, or revised for the ECP 1 Program in accordance with CDRLs A048 and A049.

The Contractor shall review and evaluate the electromagnetic test procedures and results of all GFE and GFM selected for Abrams ECP 1 to ensure electromagnetic compatibility at the system level. The results of this evaluation shall be documented in accordance with CDRL A050.

The ECP 1 hardware shall be developed in accordance with MIL-STD 461F.

The ECP 1 level bonds and grounds inspection procedure shall be developed and included in the E3 Verification Procedures. The bonds and grounds inspection procedure shall be used to verify that a system is compliant with the zero hours and zero miles bonds and grounds requirements.

C.19 Chemical, Biological, Radiological and Nuclear Survivability (CBRN)
New or modified components shall be designed in accordance with Appendix B of the Environmental Conditions for the Heavy Brigade Combat Team Tracked Vehicle Systems.

C.20 Nuclear Survivability
The ECP 1 changes that affect Mission Essential Functions (MEF) of the vehicle shall be hardened to withstand the effects of air blast, thermal radiation, and initial nuclear radiation. The nuclear survivability hardening criteria for mission essential equipment mounted on the inside and outside of the vehicle shall be as specified in the Environmental Conditions for the Heavy Brigade Combat Team Tracked Vehicle Systems. The MEF pertaining to a battlefield nuclear event are outlined in Attachment B - Appendix K. The Contractor is not responsible for nuclear radiation verification testing at the LRU/SRU/LRM or higher HWCI level, but is required to support pre and post test functionality check out.

The Contractor shall conduct monthly dedicated E3 and Nuclear Survivability working meetings through CDR and quarterly meetings thereafter with PM HBCT Engineering to establish requirements, and provide status of design compliance of the nuclear survivability and E3 requirements.

C.21 Interface Control Documents (ICDs)
For all new or modified configuration items, the Contractor shall develop and provide Interface Control Documents (ICDs) that describe the inputs and outputs of a single subsystem, the interfaces between two subsystems, and the complete interface protocol from the lowest

physical elements to the highest logical levels in accordance with CDRL A041. The purpose of the ICD is to communicate all possible inputs to and all potential outputs from a subsystem for the user of the subsystem. Internal interfaces of the vehicle shall be documented in the Systems and Subsystems Software Design Document (SSDD). The Contractor shall obtain interface document acceptance by all product sources involved in the interface.

C.22 Configuration Management

C.22.1 Configuration Management Process
The Contractor shall implement and maintain a configuration management process in accordance with the Configuration Management Plan (Attachment B - Appendix L or current version as appropriate) which shall govern all aspects, to include software and firmware of the Abrams ECP 1 effort.

C.22.2 Source Control Technical Data
Source Control Drawings (SCDs) shall conform to the following:

In order to assure life cycle competition for Non-Developmental Items (NDIs), use of SCDs shall be minimized. When it becomes apparent to the Contractor that a Source Control drawing is in the best interest of the Government, a recommendation shall be made to the COR including the results of a market survey which led to the recommended selection. No SCD shall be prepared by the Contractor, nor shall the Contractor assume that the Government will accept the source control recommendation, unless specific written approval is provided by the Contracting Officers Representative. A copy of the Non-Standard Parts Approval Request (DD Form 2052) shall be submitted with justification.

C.22.3 Standardization
All parts proposed for addition to the Program Parts Selection List (PPSL) or items submitted for Engineering Change Proposals (ECPs) shall be screened by the Contractor and approved by the COR prior to addition to the PPSL. For parts in Federal Supply Classes (FSCs) which require Military Parts Control Advisory Group (MPCAG) review, the parts approval request may be submitted by faxed DD Form 2052 or email. A list of parts with other FSCs shall be made available for review by the COR for the purpose of selective screening. Unless a request is provided to the COR by the Contractor for exception and approval, recommendations (DD Form 2052) made by the MPCAG is considered final.

C.22.4 Configuration Services
The Contractor shall provide electronic copies of current drawings, Drawing Lists, Generation Breakdown List (GBLs), Gerber files, Artwork Masters, CAD Models, Technical Data Packages (TDP), Engineering Change Proposals (ECP), as built documentation and BOMs and all other updates to the PCI data created under this contract, excluding Op sheets (however the Government may review the Op sheets), to the COR. These electronic copies shall only be submitted to the COR in Government approved file formats and extensions in accordance with the Configuration Management Plan.

C.23 Technical Data
The Contractor shall prepare and deliver an ECP detailing the result of hardware and software design changes made under this contract, in accordance with this section (C.23) and CDRL A080. The ECPs shall be submitted to the COR 180 calendar days after completion of Contractor Qualification Testing. The ECP will then be forwarded to the Government Configuration Control Board (CCB) for approval. Thereafter any changes to the ECP baseline will be provided to the COR for submission to the Government CCB for approval. All changes must be delivered not less than two months prior to the end of the contract.

The Contractor shall prepare and deliver reports, models, drawings, specifications, technical manuals, Engineering Change Proposals (ECPs) and other technical data related to the Abrams ECP 1 program. The Government will review and approve the ECPs and provide approval notification to the contractor. The Contractor shall use MIL-STD-31000 and the attached TDP Option Selection Worksheet (Attachment B - Appendix M) as a guide in developing product drawings, Technical Data Packages.

The Contractor shall insure that the TDP documentation contains quality control information and updates. These updates shall address process control(s), product control(s) and/or test(s) necessary to achieve a quality product. The Contractor shall define the required process control(s), product control(s) and test(s) on engineering drawings.

C.24 Life Cycle Data Management

C.24.1 Data Management Strategy/Technical Data Rights Strategy
DoD Directive 5230.24 shall be used as a guide for data classification. The Contractor shall specify items for which other than Unlimited Rights are provided to the Government in accordance with DFARS 252.227-7017 or DFARS252.227-7019, whichever is applicable. Except for the items specified in the Data Rights Assertions, data utilized and delivered under this contract shall contain no contractor or vendor proprietary or copyright markings.

C.24.2 Data Management Plan
The Contractor shall prepare and deliver a Data Management Plan (DMP) in accordance with Attachment B - Appendix N and CDRL A051. The

DMP shall contain a master list of managed data, data content and format descriptions, data requirements lists for all suppliers and vendors, privacy requirements, security requirements and procedures. The Contractor shall provide the location or mechanism of data retrieval, reproduction and distribution, as well as, a listing of program data to be collected and schedule for its collection.

C.24.3 Engineering Data, Models, and Drawings

All technical data delivered under this contract shall be adequate for the Government to conduct competitive acquisitions. The Contractor shall prepare and deliver engineering data, models and drawings to analyze, fabricate, test and support new or modified hardware and software products for this contract. This data shall include special tooling and software (e.g. firmware programming files and Gerber data), interface data and special test equipment data. The final drawing package shall not contain attached engineering orders and shall account for all form, fit, and function requirements. Changes developed under this contract shall be incorporated into the drawing package. The Contractor shall ensure that applicable requirements for engineering data are flowed down to the subcontractors. This data is part of the ECP package specified in paragraph C.23 and delivered in accordance with CDRL A080.

Drawings, models, or other TDP documentation will not be procured or fabricated unless it is under formal configuration management control, per the Government-approved Configuration Management Plan (Attachment B - Appendix L).

The Contractor shall contact the Government Data Manager through the SEIT within 60 calendar days of contract award to identify the documents required to be placed in the Government Integrated Data Environment (IDE). The Contractor shall provide the primary Contractor Point of Contact (POC) for each document. Upon Government approval, the Contractor shall obtain access to the identified Government IDE. The IDE shall consist of Government and Contractor storage locations.

C.25 Environmental Compliance and Hazardous Substance

C.25.1 Environmental Compliance

The Contractor shall comply with all Federal, State, and local environmental laws, regulations, and policies.

The Environmental Management Team (EMT) is a multi-disciplinary group chartered by PM Heavy Brigade Combat Team (HBCT) dedicated to addressing environmental issues and supporting the PM HBCT environmental program. This team will include subject matter experts from Government and Industry. The EMT shall set goals and environmental compliance, thresholds, priorities for hazardous materials elimination, and monitor Contractor compliance in meeting reduction goals. The EMT shall work with the PM office to establish environmental compliance goals within program schedules and budgets. The Contractor shall provide support to the EMT, to include attending meetings, completing assigned actions items, providing information related to the development of program environmental documentation. The EMT meets on a semi-annual basis in order to adequately address and resolve current hazards associated with the vehicle system. There is a requirement for CONUS travel for the semi-annual meetings.

C.25.2 Hazardous Materials

C.25.2.1 Hazardous Material Restrictions

Asbestos, beryllium, beryllium alloys, cadmium, cadmium alloys, Class I and Class II Ozone Depleting Substances, hexavalent chromium, lead, leaded alloys, mercury, radioactive materials and other Group 1 Agents classified as carcinogenic to humans by the International Agency for Research on Cancer (IARC) Monographs, shall not be present in or on any ECP 1 delivered materials, required for the operation and sustainment of the ECP 1 unique items, or used in final system manufacture and assembly processes for the ECP 1 integration efforts.

C.25.2.2 Exceptions to the Hazardous Materials Requirements

Waivers from the hazardous materials requirements shall not be permissible except where a suitable alternative does not exist. The Contractor shall obtain Government approval via a waiver request prior to delivering any ECP 1 unique item. Waiver requests shall include detailed technical justification for the use of the prohibited hazardous material. The Government will make the final determination on whether sufficient justification has been provided to support approval of any waiver requests. The Government will consider waivers in these situations on a case by case basis. If a waiver is requested for radioactive material, the following information shall be included in the waiver request:

1) Listing of the radioactive material and their quantities.
2) Subsystem location of the radioactive material.
3) Purpose of the radioactive material.
4) Provide the Nuclear Regulatory License, if required.

No waiver request is required for the following:

1) Cadmium on electrical connectors and back shells used to mate with cadmium electrical connectors on Government Furnished Equipment (GFE)
2) Chemical Agent Resistant coating (CARC) primers and topcoats
3) Lead-acid batteries
4) Lead solder
5) Steel containing up to 0.35% lead by weight
6) Aluminum containing up to 0.4% lead by weight
7) Copper and Brass alloys containing up to 4% lead by weight

8) Beryllium and Beryllium alloys used in electrical components
9) Nickel and Nickel alloys used in electrical components
10) Mercury containing components compliant with European Union (EU) Directive 2002/95/EC (RoHS)

Trace amount of identified prohibited materials contained in base materials or alloys are to be reported in the Subcontract Material Report and the Hazardous Materials Management Report (HMMR), but do not require a waiver. For the purposes of this contract, trace amounts are defined as <0.1% for carcinogens and <1% for all other materials.

C.25.2.3 Lead (Pb) Free Control Plan
A lead (Pb) free control plan that describes policies, procedures, manufacturing processes, and monitoring in regards to all (Pb) Free electronic components that are, or have the potential to be utilized, shall be provided to, and approved by the COR. The aforementioned lead (Pb) free control plan must make extensive use of GEIA-STD-0005-1 and GEIA-STD-0005-2 to assure product performance, reliability, and safety. The lead (Pb) free control plan shall be submitted in accordance with CDRL A053.

C.25.2.4 Hazardous Materials Management Report (HMMR)
The Contractor shall establish, implement, and maintain a HMMR using National Aerospace Standard 411, Hazardous Materials Management Program as a guide. The Contractor shall prepare a Hazardous Material Management Report (HMMR) in accordance with CDRL A052 which shall identify all hazardous materials required for system production and sustainment, including the parts that require them. The report shall also include a listing of prioritized hazardous materials for minimization or elimination and identify those hazardous materials and processes for which non-hazardous substitute materials and technologies may be available for implementation. This report shall be prepared in accordance with National Aerospace Standard 411, Section 4.4.1. Current status, changes, or issues with the HMMR shall be discussed as a part of each technical review and program management review. This report shall provide the basis for monitoring the reduction in hazardous materials used in the system. The HMMR shall be updated semi-annually in order to report reduction in hazmat use in accordance with DI-MISC-81397).

C.25.3 Corrosion Prevention and Control

C.25.3.1 Corrosion Prevention Advisory Team (CPAT)
The Contractor shall attend the Government CPAT meetings on a semi-annual basis. The Contractor shall present and discuss Abrams ECP 1 corrosion issues. The contractor shall complete action items assigned by the COR within the scope of this program.

C.25.3.2 Corrosion Prevention and Control Plan (CPCP)
The Contractor shall develop and maintain an Abrams ECP 1 CPCP in accordance with CDRL A081.

C.26 System Safety Program
The Contractors system safety program shall focus on the identification, assessment, mitigation, and continuous tracking, control, and documentation of environmental, safety and health mishap risks encountered in the development, test, acquisition, use and disposal of the Abrams Tank weapon systems and subsystems. The system safety program is responsible for the implementation and monitoring of engineering and management principles, criteria, and techniques to achieve acceptable mishap risk, within the constraints of operational effectiveness, time, and cost, throughout all phases of the system life cycle. A safe design is a prerequisite for safe operations, with the goal being to produce an inherently safe product that shall have the minimum safety-imposed operational restrictions in accordance with MIL-STD-882E. The Contractor shall establish and conduct a system safety program in accordance with the requirements of MIL-STD-882E. The Contractor shall prepare and deliver a System Safety Program Plan (SSPP) in accordance with CDRL A054.

C.26.1 Hazard Notification
The Contractor shall establish an incident alerting, notification, investigation, and reporting process, to include notification of the COR for all incidents.

C.26.2 Hazard Tracking and Hazard Log
The Contractor shall prepare a Hazard Tracking System (HTS) in accordance with MIL-STD-882E, Task 106 (Hazard Tracking System). The HTS shall include the findings MIL-STD-882E from the System Hazard Analysis (Task 205) and Environmental Hazard Analysis (Task 210). The Contractor shall document and track all hazards from identification until the hazard is eliminated or the associated risk is reduced to a level acceptable to the COR. The HTS shall include all hazards identified through testing and other analyses in accordance with Severity Categories and Probability Levels provided in MIL-STD-882E, Section 4.3. The HTS shall be delivered to the Government in accordance with CDRL A055.

All hazards shall receive final disposition by the COR. Closed out Hazards shall remain documented in the Hazard Log.

C.26.3 Safety Assessment Report (SAR)

The Contractor shall prepare a Safety Assessment Report (SAR) in accordance with CDRL A056 that identifies all potential and actual Safety and Health Hazards associated with the Abrams Tank Systems and Subsystems. The SAR shall include a description and evaluation of each hazard and the actions identified for mitigation of the associated risks. Hazard risks shall be evaluated by severity and probability of occurrence before and after mitigation in accordance with MIL-STAD-882E.

C.26.4 Occupational Health Hazard Assessment (OHHA)
The Contractor shall perform and document an OHHA to identify health hazards and recommend engineering controls, equipment, and protective procedures, to reduce the associated acceptable risk. The Contractor shall provide an OHHA for each vehicle system and design modification prior to test activities. This assessment shall be included in the Health Hazard Assessment Report (HHAR) in accordance with CDRL A057.

Issues to be addressed within the report shall include:

- Noise
- Toxic gases
- Carbon Monoxide
- Ammonia
- Oxides of nitrogen and sulfur
- Toxic chemicals
- Ionizing and non-ionizing radiation
- Heat and cold (to include heat stress)
- Shock and Whole Body Vibration to crew members
- Address the chemicals identified in the Material Safety Data Sheets to be provided in accordance SAE-AMS2825

The hazards identified in the OHHA shall be maintained in a vehicle hazard tracking database and this information shall be reported at design reviews. The data for this report shall be collected from the prototype tanks.
C.26.5 Software Engineering
The Contractor shall design software controlled or monitored functions to minimize initiation of hazardous events or mishaps.

C.26.6 Critical Safety Program
The Critical Safety Program described herein is applicable to new items designed under this contract and to non-development items. It is only applicable for those items for which drawings shall be delivered to the COR.

C.26.6.1 Critical Safety Program Definitions

C.26.6.1.1 Critical Safety Items (CSI): A part, assembly, installation, or production system with one or more critical characteristics that, if not conforming to the design data or quality requirements, would result in a probable occurrence of an unsafe condition. Unsafe conditions include conditions which would cause loss or damage to the end item or major component or loss of control or serious injury to personnel. Unsafe conditions relate to hazard severity categories IA-D, II A-C and III A-B of the risk acceptance level definitions IAW MIL-STD-882E.

C.26.6.1.2 Critical Safety Characteristics (CSC): Features (i.e. tolerance, finish, material composition, manufacturing, assembly, or inspection process) of product, material, or process, which if nonconforming or missing would cause the failure or malfunction of the critical safety item.

C.26.6.2 Identification of Critical Safety Items
The Contractor shall clearly identify each CSI and assembly process as such on the engineering top drawing, part drawing, or assembly drawing. The Contractor shall also clearly identify the CSC(s) for each CSI as such on the engineering parts, engineering top drawings, part drawings, assembly drawings, or process documentation. The Contractor shall ensure that all designated or identified CSCs shall have an associated control method. The control method shall be either a Statistical Process Control (SPC) with a Process Capability Index (Cpk) greater than or equal to 1.66, or 100% inspection. The Contractor shall annotate the control method in the notes for all designated or identified CSCs. The specific method for marking drawings shall be as delineated in MIL-STD-31000 and ASME Y14.100.

C.26.6.3 Data Sources
Identification of CSIs shall be based on the following data sources:

- Use of engineering analysis and judgment
- Failure Modes and Effects, Criticality Analysis (FMECA) (MIL-STD-1629)
- Safety Assessment and Safety Hazard Analysis (MIL-STD-882E)
- Development Testing and Operational Testing results
- RAM engineering assessments
- Previous experience using like items or designs
- Logistics support analysis (LSA) data
- Component qualification test results

Contractor shall validate the CSI requirements expressed herein to ensure that all critical safety aspects of the design are accurately

depicted on deliverable drawings, and parts or materials operate well below fatigue limits or stress levels. The Contractor shall ensure that the Government can verify these requirements without the use of destructive inspection equipment. The Contractors validation shall be based on engineering analysis of the CSI characteristics and shall consider design changes, and deterioration through time from use, fatigue life, and operating conditions.

C.26.6.4 Critical Safety Items Master List
A master list of CSIs and associated critical characteristics, including nomenclatures and Part Numbers shall be prepared and documented by the Contractor and furnished to the procuring activity in accordance with CDRL A058. The Contractor shall maintain and update the CSI list throughout the life of the contract. The Contractor shall also reference the CSIs on the vehicle class and division drawing. This list shall be dynamic in nature with changes taking place as experience and knowledge are obtained and design changes are incorporated into the system.

C.27 Government Furnished Material (GFM)

C.27.1 Status Reporting
The Contractor shall utilize an Inventory Control Plan and process that accounts for GFM in accordance with FAR 52.245-1. The plan shall provide for monthly GFM inventory counts at all locations (storage and consumption points) to prevent loss or misplacement of material. The Contractor shall report the GFM status in accordance with CDRL A059. The Contractor GFM count information should list materials that have been used, materials on hand, materials on order, and material shortages. The Contractor shall identify and report to the Administrative Contracting Officer excess GFM. Once the Administrative Contracting Officer is notified, the Government has 120 days to provide disposition instructions.

The Contractor Inventory Control Plan shall include provisions to properly identify inventory.
This plan shall also include details for implementing the requirements of the IUID process for LRU level parts and parts with a dollar value equal to or greater than $5,000.00 (USD).
The nine GFM prototype vehicles and inbound technologies listed in Attachment C.
The Inventory Control Plan shall be discussed during IPT meetings.

C.27.2 Property Tracking
All GFM received by the Contractor shall be inspected upon receipt and the inspection data shall be included in the GFM Status Report (CDRL A059). Deficient or defective GFM shall be reported to the COR within five business days of inspection in accordance with CDRL A060. Deficient or defective GFM shall be replaced by the Government. A schedule for replacement shall be created once the defective material notification is received by the COR, and provided to the Contractor within five business days of receipt of notification. The Contractor shall provide an impact assessment within five business days of receipt of the schedule.

C.28 Prototypes

C.28.1 The Contractor shall produce nine fully configured prototype Abrams ECP 1 vehicles. The application of baseline items, addressed in Section C.6.1, is discussed below.

The Government will deliver nine Condition Code A M1A2 SEPv2 vehicles in accordance with ERR GDMY3958 dated June 09, 2011, to the contractor as Government Furnished Material.

The Contractor shall procure and install the hardware generated by Post ERR ECPs that have been approve and are listed in Attachment B - Appendix C. The Contractor shall also procure and install the integration hardware for the VEM and DDU. The DDU will be provided as GFM as indicated in Attachment C. A contract modification will be issued to incorporate newly approved ECPs.

The Contractor shall remove the nine non-Ammunition Data Link breechblock assemblies (PN 12529515) from the M256 cannons in each prototype vehicle. The Contractor shall ship these nine breechblock assemblies to Watervliet Arsenal to be modified into Ammunition Data Link breechblock assemblies (PN BL-50070). The Contractor shall re-install each of the nine Ammunition Data Link breechblock assemblies into the M256 cannon from which it was removed.

The Contractor shall supply and install the weight kits, designed under this contract on all nine prototypes during initial prototype fabrication.

The Contractor shall verify the Hardware (HW) and Software (SW) are the same on all prototypes prior to start of Government test. If HW, with the exception of the improved armor, and SW change during the execution of Government Test, the Contractor shall update all vehicles prior to the start of the next Government test.

Seven prototypes will be allocated for Government testing and two will be allocated for contractor use.

The Government will provide three complete vehicles sets of improved armor as GFM.

In the event that the Government is unable to provide the GFM armor in sufficient time for the contractor to incorporate into the vehicle prototypes being used to support Pre-Production Testing, the Contractor shall develop a surrogate method of up-weighting the vehicle prototypes to simulate the weight impacts of the GFM armor. This approach will not provide an acceptable surrogate for ballistic testing purposes, and that it is undertaken as a means of mitigating testing risk due to the possible lack of GFM armor.

The Contractor shall remove the existing armor packages and all weight kits off three prototype vehicles and replace them with the improved GFM armor packages in time for the Live Fire Test and Evaluation. The Contractor shall ensure all applicable security measures identified in the Security Classification Guide (dated 03 March 2011) are followed.

C.29 Quality Engineering and Testing

C.29.1 Quality Engineering Responsibilities
The Contractor shall ensure that Quality Engineering personnel are involved in audit and design reviews, verification and qualification planning, conducting verification and qualification, and technical data finalization, to ensure the objectives of its overall quality programs are achieved and continuously improved upon. Quality Engineering personnel shall participate in determining the type and amount of verification and qualification necessary to ensure all requirements are satisfied and verified.

C.29.2 Hardware Qualification
The Contractor shall conduct qualification testing on all hardware designed or modified under the ECP 1. The quantity of hardware or components to be tested, as well as, the specific qualification tests to be performed, shall be determined jointly with the COR.
The Contractor shall maintain a document that contains qualification test status for all items being qualified under this ECP 1. The Contractor shall re-qualify hardware for which there are design changes after the initial qualification in accordance with CDRL A061.

C.29.2.1 Hardware Qualification Test Plans
The Contractor shall develop hardware qualification test plans for all hardware qualification tests designated under this ECP. The COR will approve the qualification test plans in accordance with CDRL A062.

C.29.2.2 Hardware Qualification Tests
The Contractor shall conduct hardware qualification tests in accordance with the applicable specifications and test plans as agreed to by the COR.

C.29.2.3 Qualification Test Reports
The Contractor shall submit Qualification Test Reports to the COR for review and approval after completion of the final test on each piece of hardware or component. These test reports shall be submitted to the Government in accordance with CDRL A063.
C.29.3 Highly Accelerated Life Tests (HALT)
The Government requires a HALT effort. The Contractor shall recommend the hardware within this ECP 1 which merits a HALT at PDR for approval by the COR. The Contractor shall provide the Government with an analysis for the component or hardware for which a HALT is merited.

C.29.3.1 Hardware HALT Test Plans
The Contractor shall develop Hardware HALT test plans for all hardware or components subject to HALT. The Contractor shall provide final versions of the aforementioned HALT test plan to the COR in accordance with CDRL A064.

C.29.3.2 Hardware HALT Test
The Contractor shall conduct hardware HALT testing in accordance with the specifications and HALT test plans as agreed to by the COR.

C.29.3.3 Hardware HALT Reports
The Contractor shall submit LRU HALT test reports to the COR for review and approval after completion of the final HALT test on each component or hardware in accordance with CDRL A065.

C.30 Reliability and Maintainability (R/M) System Assessments

C.30.1 R/M Program
The Contractor shall maintain an R/M program to assure required vehicle reliability and maintainability performance is being monitored, evaluated and achieved throughout the vehicle's life cycle in accordance with GEIA-STD-0009 (Reliability Program Standard for Systems Design, Development and Manufacturing).

C.30.1.1 R/M Program Plan
The Contractor shall develop, implement, and maintain in its format a comprehensive R/M Program Plan. The plan shall establish procedures to satisfy the ECP 1 supportability and sustainment standards. The system design shall be monitored throughout the entire period of performance to identify, assess, and implement failure analysis and corrective actions and to correct all incidents which

would adversely impact R/M. The Contractor shall develop an R/M analysis and predictions to ensure compliance with the Abrams System Specification. The plan shall encompass all aspects of R/M with respect to design selection of components, predictions, and testing. The Contractor shall maintain in its format and make available to the COR all R/M data on a vendor or subcontractor supplied item and shall inform the COR of all parts or components which will degrade system R/M requirements. The R/M program plan shall include the tasks outlined in paragraphs C.2.6.2 and C.30.2.1. The Contractor shall submit their R/M program plan in accordance with CDRL A066.

C.30.1.2 R/M Reports
The Contractor shall develop and maintain an R/M Report in its format. The report shall provide data to support the Contractors claim that it meets or exceeds the R/M requirements. The Contractor shall also identify how best commercial engineering and DFSS approaches are being incorporated early in the system design process to achieve the requirements. The Contractor shall submit their R/M reports in accordance with CDRL A002.

C.30.1.3 Procedures and Controls
The Contractor shall establish and maintain procedures and controls, which ensure products obtained from vendors and subcontractors shall meet R/M requirements. The Contractor shall establish, implement and maintain documented procedures, which detect and preclude the use of substandard or counterfeit parts in the production process and impose similar requirements on subcontractors. In addition, the Contractor shall provide the COR within five working days of special R/M review meetings scheduled with subcontractors so that Government representatives can attend at their discretion.

C.30.1.4 Reliability Predictions
The Contractor shall develop and maintain a reliability prediction report in its format in accordance with CDRL A066. The report shall provide detailed reliability predictions based on a defined configuration and associated models. The predictions shall be allocated from the system level down to the lowest indenture level and updated each time significant design or mission profile changes significantly impact the Abrams ECP 1 Program or its subsystems.

C.30.1.5 R/M Modeling and Analysis
The Contractor shall identify all mission critical ECP 1 components. Mission critical components are those items whose failures: (1) can cause a Critical Mission Failure (CMF), (2) can cause a System Failure (SF), (3) affect the operational availability, or (4) cause high repair or replacement costs. For the identified mission critical ECP components, the Contractor shall model and analyze them to ensure sufficient high reliability to meet the R/M requirements. For the select mission critical ECP 1 components, the Contractor shall provide the following information in accordance with CDRL A066:

Whether the component failure would result in a CMF or a SF.

Analysis method used on mission critical ECP 1 components. These analysis methods may include: Finite Element Analysis, Fatigue Analysis, Margin Analysis for Environment, Thermal Analysis, Dynamic Analysis, Computational Fluid Dynamic Analysis, Electrical, Controls. Testing may be used in place or along with the chosen analysis method(s) for the component.

A characterization of the operational environment of the component (local loads, stresses, vibration, shock, thermal, displacement, or electrical) that impact the reliability of the component.

Analysis results of the mission critical components.

If testing is the method selected for the component reliability optimization, the Contractor shall submit the component test plans and analysis of the test results of the mission critical component.

Predictions for time, cycles, or hours-to-failure for each critical component based on engineering analysis.

Design improvement recommendations.

Performance changes over time and a recommended approach for replacement before failure. This approach shall include a method of detection and prognostics to monitor the component wear or life.

C.30.2 Test Incident Reports (TIRs)
The Contractor shall update and maintain a system for analysis of TIRs generated during Government tests. The contractor shall access all TIRs directly through Vision Digital Library System (VDLS). The system shall be capable of tracking the status of TIRs to include necessary distribution, failure analysis, corrective action, and management reports. The Contractor shall also be responsible to distribute TIRs down to suppliers and subcontractors to insure failure analysis and corrective action reports include its input.

C.30.2.1 Failure Analysis and Corrective Action Report (FACAR)
The Contractor shall submit FACARs in response to TIRs in accordance with CDRL A067.

C.31 Test and Evaluation (T&E)

C.31.1 General
The Government will complete vehicle level testing in accordance with the Abrams ECP 1 Test Schedule (Attachment D) at all the applicable United States Government (USG) test sites to include Aberdeen Proving Ground (APG), Yuma Proving Ground (YPG), and White Sands Missile Range (WSMR). The Contractor shall provide operator training for USG test personnel at each test site before testing begins. The USG test site personnel shall have control over all vehicle assets while testing at USG test sites.

The Contractor shall participate in all T&E IPT meetings, TRRs, and After Action Review (ARR) meetings. The Contractor shall participate in the development of the Test and Evaluation Master Plan (TEMP).

C.31.2 Contractor Prove-out Testing

C.31.2.1 Test and Evaluation Program Plan (TEPP)
The Contractor shall provide a Test and Evaluation Program Plan (TEPP) for the seven prototypes in accordance with CDRL A068. The TEPP shall detail out all the testing during the Contractor vehicle system prove-out phase prior to start of Government Test. The TEPP shall encompass all runs, data type, timing and cost. The Government will have the final approval of the TEPP.

C.31.2.2 Prove-out Test
Seven prototype tanks shall be allocated for Government testing and two additional prototype tanks shall be allocated for contractor use.

The Contractor shall conduct a vehicle system prove-out for the seven prototypes prior to start of Government Production Prove-Out Test (PPT). The Contractor shall be given the option of using Government test sites at no cost to the Contractor for system level testing of each prototype test asset.

The Contractor shall deliver verification data, including test, demonstration, analysis, reports and inspection results to the Government. The Test Reports shall be delivered in accordance with CDRL A069.

Upon completion of the Contractor Prove-out Test, a Final Inspection Record (FIR) shall be delivered as described in paragraph C.31.8. The Contractor shall correct all defects identified in the FIR prior to acceptance by the COR to enter into Government test.

C.31.3 Contractor Support of Government Test
The Contractor shall provide personnel to conduct vehicle maintenance and repairs throughout the test phase at the required test locations. The Contractor Field Engineering Representatives (FERs) shall be available on site during test.

C.31.4 Production Prove-out Test (PPT)
The Contractor shall provide onsite FERs at each Government test site during PPT. Seven prototype vehicles shall be tested as outlined in the test schedule.

C.31.5 Production Qualification Test (PQT)
The Contractor shall provide onsite FERs at each Government test site during PQT. Eleven production tanks, which will be supplied by the Government, shall be used for PQT. Six of the tanks will be allocated for the RAM test and five for Follow-on Test & Evaluation (FOT&E).

C.31.6 Live Fire Test and Evaluation (LFT&E)
The Contractor shall reconfigure three tanks from PPT with the new armor package for the Live Fire Test. The Contractor shall provide onsite FERs and equipment to repair test vehicles after each ballistic event.

C.31.7 Follow-on Operation Test & Evaluation (FOT&E)
The Contractor shall provide onsite FERs for the Government FOT&E event. The FOT&E is scheduled to take place during the PQT time frame and shall consist of five production vehicles (out of the eleven production vehicles referenced in C.31.5).

C.31.8 Final Inspection Record (FIR)
The Contractor shall develop and provide for COR approval a validated vehicle end item FIR representing the ECP 1. The FIR shall be delivered in accordance with CDRL A070. The FIR shall be required during Production Prove-out Test on the prototype test tanks. The Contractor shall update the FIR as needed for each ECP application.

The Final Inspection shall be conducted:

Prior to the start of Government PPT and PQT
Conclusion of Government PPT and PQT
Upon completion of the armor kit installation on three PPT vehicles scheduled for Live Fire Testing

The Contractor shall notify the COR 30 days prior to conducting FIR activities, regardless of the location or facility to allow for Government participation and witnessing of FIR execution.

The Contractor shall execute a Final Inspection per the FIR and correct all noted deficiencies prior to vehicle delivery to the Government.

C.31.9 Vehicle Transportation
The Contractor is responsible for the preparation and transport of nine prototype and eleven production (as described in paragraph C.31.5) vehicles throughout this contract effort.

C.32 Integrated Logistic Support (ILS)

C.32.1 Program The Contractor shall plan, manage, and execute an ILS Program for the Abrams ECP 1 program.

C.32.2 Program Objectives
The Contractor shall, using the existing M1A2 SEP v2 logistic support package as a baseline, conduct a Logistics Support Analysis program to translate the design of the Abrams ECP 1 into:

A supportability influenced Abrams ECP 1 design that maximizes the availability, effectiveness and capability of the system at the lowest Life Cycle Cost (LCC).

Validated draft logistic support package products for the Abrams ECP 1 program to support Government testing and logistics demonstration.

An assessment of the feasibility of applying Abrams ECP 1 capabilities in the field.

C.32.3 ILS Program Management
The Contractor shall establish and maintain the management processes and controls to execute the Abrams ECP 1 ILS program.

The Contractor shall present its plan for managing and executing the ILS program at a SIPT meeting within 30 calendar days of contract award. The plan shall describe the Contractors organization, lines of communication, schedule of activities, with associated resources, and management controls. This plan shall be presented during the initial SIPT meetings for evaluation and mutual agreement by the parties.

C.32.4 Supportability Strategy
The Contractor shall execute the ILS program using the Government Abrams ECP 1 Life Cycle Support Plan as a guide (Attachment B - Appendix O).

C.32.5 Logistics Supportability Analysis (LSA) and Logistics Management Information (LMI)
The Contractor shall perform Supportability Analysis (SA) of the ECP 1 design to develop and validate LSA and LMI data for the ECP 1 program.

C.32.5.1 Logistics Management Information (LMI)
The Contractor shall conduct the LMI and LSA Program in accordance with GEIA-HDBK-0007 and GEIA-STD-0007. The Contractor shall collect and deliver LMI and LSA data to reflect the latest configuration in accordance with CDRL A071. The LMI and LSA Program shall address field and sustainment levels of maintenance.

C.32.5.2 Level of Repair Analysis (LORA)
The Contractor shall perform and deliver Level of Repair Analysis to the SRU level for the ECP 1 unique items based on the Army two-level maintenance policies in accordance with CDRL A072, with the exception of GFM. The LORA shall be run for both Field and Sustainment level repairable components.

C.32.5.3 Level of Repair Analysis (LORA) Modeling
The Contractor shall conduct LORA modeling using COMPASS, PALAMAN or equivalent modeling. The Contractor shall utilize model analysis to determine retrofit or modification recommendations, and repair or discard considerations in support of design activities.

C.32.6 Core Logistics Analysis (CLA) and Source of Repair Analysis (SORA)
The Contractor shall support the execution of a Core Logistics Analysis (CLA) and Source of Repair Analysis (SORA) by providing to the Government necessary sustainment level maintenance technical data required to complete the CLA and SORA and document analysis and finding for a Core Logistics Analysis and Core Depot Assessment in accordance with CDRL A073.

C.32.7 Performance Based Logistics (PBL) Business Case Analysis (BCA)
The Contractor shall provide data and input to the Government in the development of a PBL Feasibility (Type I) Business Case Analysis in accordance with the Department of Army PBL BCA Policy Memorandum (Attachment B - Appendix P). The SIPT will formulate a Performance Based Logistics Strategy for the Abrams ECP 1 program. The Contractor shall provide access to all records and data as necessary to prepare the BCA. The BCA development and data transfer will be conducted through the SIPT.

C.32.8 Testability

Built-In Test (BIT) and Built-In Test Equipment (BITE) shall be designed into the redesigned LRUs to provide fault detection and isolation to the LRU and LRM (e.g. the circuit card and component level). The BIT and BITE results shall be conveyed to the crew system failures and significant degradation in the systems capability to perform mission critical functions. The Platform BIT and BITE shall detect 95% mission critical failure occurrences of electronic LRUs and LRMs and associated field replaceable interconnected LRUs and LRMs. The Platform capability shall identify and isolate 90% (T) or 99% (O) of detected mission critical failure occurrences of electronic LRUs and LRMs (e.g. the circuit card and component level) and associated field replaceable interconnects to the failed LRU and LRM using platform background or initiated testing.

Power-On Built-In Test (BIT), continuous BIT, and initiated BIT shall identify for the crew, system failures and significant degradation in the systems capability to perform mission critical functions. The Contractor shall insure that all Build-In Test (BIT) within the confines of the platform is provided to the SIPT for use by the Government.

C.32.9 Vehicle Health Management System (VHMS)

The Contractor shall integrate VHMS capabilities to the modified VEM and SW5.0 requirements baseline provided in Attachment B, Appendix Q.

The Contractor shall integrate hardware and software to meet requirements VHMS-GCS-1785 and VHMS-GCS-2271 from the System Specification for Heavy Brigade Combat Team (HBCT) Vehicle Health Management System (VHMS) Ground Combat System (GCS) Segment Requirements Specification; C1017-01-0024; Revision F.

The Contractor shall integrate hardware and software to meet requirements VHMS-GCS-4977 and VHMS-GCS-0013 from the HBCT VHMS Ground Combat System (GCS) Segment Requirements Specification; C1017-01-0024; Revision F for ECP 1 LRUs and LRM Circuit Card Assemblies listed below. The Contractor shall ensure the data collected for requirement VHMS-GCS-13 is stored in non-volatile Random Access Memory (RAM) on the LRU or LRM for interrogation by the VHMS platform configuration management software.

a. Common Remote Switching Module (CRSM)
b. Enhanced Hull Power Distribution Module (eHPDU)
c. Mission Control Unit (MCU) LRMs
d. Turret Control Unit (TCU) LRMs
e. Hull Control Unit (HCU) LRMs
f. Commanders Display Unit (CDU)
g. Drivers Crewstation (Common High Resolution Display (CHD) and Drivers Control Panel (DCP))
h. Gunners Crewstation (CHD and Gunner Control Panel (GCP))

The Contractor shall integrate hardware and software to collect and store the following parameters on the Recording Simulation Unit (RSU) at the required sampling rates.

Type	Existing 1553B DECU Parameters	1553 DP	Transmission Rate on 1553
Analog*	Vehicle Speedometer	DP 0600 Word 3	10 Hz
Time Series*	Tachometer Output Shaft	DP 2501 Word 5	10 Hz
Analog*	Intake Air Pressure 2401	DP 2401 Word 2	10 Hz
Time Series*	NH Speed	DP 2501 Word 3	10 Hz
Time Series*	T1 Turbine Air Inlet Temperature	DP 2501 Word 6	10 Hz
Time Series*	DECU Starter Pilot Relay	DP 2501 Word 2	10 Hz
Time Series*	Fuel Cutoff	DP 2501 Word 2	10 Hz
Time Series*	Ignition Exciter	DP 2501 Word 2	10 Hz
Time Series*	NPT Meter	DP 3006 Word 9	1 Hz
Time Series*	NH Test	DP 3006 Word 9	1 Hz
Discrete**	T7 Gas Temperature		Flag
Discrete**	Power Level Angle (PLA) DC		Go/NoGo
Discrete**	Power Turbine Stators (PTS) Prop		Go/NoGo
Discrete**	Inlet Guide Vanes (IGV) Prop		Go/NoGo

*analog and time series data shall be captured at specified rates
** discrete parameters shall be captured as counters when flagged or NoGo occurs

When integrating the VHMS capabilities, the Contractor shall use the following documents as reference:

1) HBCT VHMS GCS Segment Requirements Specification; C1017-01-0024; Revision F
2) HBCT VHMS GCS Interface Requirements Specification; C1017-01-0333; Revision A

3) HBCT VHMS GCS User Interface Design Description; C1017-01-0184; Revision A
4) HBCT VHMS GCS System View SV-2, System Communication Description; C1017-01-0195, Revision A
5) HBCT VHMS GCS System View SV-4, Functionality Description; C1017-01-0065, Revision D
6) HBCT VHMS GCS Operational View OV-7, Logical Data Model; C1017-01-0300

C.32.10 System Support Package List (SSPCL)
The Contractor shall prepare and deliver an SSPCL that reflects the ECP 1 support items necessary to sustain the continuity of Government Testing in accordance with CDRL A074.

C.32.11 Test Support Package (TSP)
The Contractor shall deliver an ECP 1 TSP, consisting of the list of parts in the COR approved SSPCL, to each site 60 calendar days prior to the start of testing or a training event. The Contractor shall be responsible for all maintenance, replenishment and control of the on-site ECP 1 TSP during all testing and training events conducted under this contract. Should testing or training event be interrupted because a particular support item is unavailable, to the extent the part is available within the TSP, the Contractor shall provide the item within 24 hours of being notified about it. In the event the TSP is deficient, the Contractor shall remedy the deficiency within 48 hours.

C.32.12 Field Service Representative (FSR)
The Contractor shall provide on-site ECP 1 trained FSR(s) for field level maintenance and depot level maintenance commencing two weeks prior to and during training and test events. The FSR shall be able to field diagnose and return unserviceable ECP 1 assets into serviceable condition at the Line Replaceable Unit (LRU) level of assembly (field level or maintenance).

C.32.13 Maintenance Planning and Supportability Analysis
The Contractor shall conduct Maintenance Planning and Supportability Analyses, in order to develop logistics products based on the Armys two-level maintenance policies in accordance with AR 750-1 and AR 700-127.

C.32.14 Supply Support Lists
The Contractor shall establish and maintain support item lists that identify new ECP 1 specific support items, and at what level it is utilized or authorized for use. The Contractor shall maintain the documentation and present the statistics at SIPT meetings. These lists shall include:

Authorized Stockage List (ASL).
Basic Issue items (BII)
Components of the End Item (COEI)
Additional Authorized items List (AAL)

C.32.15 Technical Manual (TM) Data
The Contractor shall develop a change package to the SEPv2 field level equipment publications listed below to include a Maintenance Allocation Chart (MAC) and Repair Parts Special Tool List (RPSTL) to reflect the ECP 1 system design for new or changed tasks. The Contractor shall deliver Preliminary Draft Equipment Publications (PDEP), draft Interactive Electronic Technical Manual (IETMs) and paper operator TMs as part of the TSP for PPT and data collector training to each test site. The contractor shall validate the technical manual change package and provide Draft Equipment Publications (DEP) to the Government 16 months after start of PPT. The Government reserves the right to witness any and or all of the Contractors validation. The Contractor shall ensure that all products delivered match the configuration of the vehicle entering PPT.

C.32.15.1 Publications
TM 9-2350-388-13+P
TM 9-2350-388-24-1
TM 9-2350-388-24-2

C.32.15.2 Publication Management
The Contractor shall maintain a publication history file for the period of this contract which shall be available to the SIPT. The file shall contain a record of all changes to each publication. Contractor is authorized to use a digital image instead of a line drawing where deemed practical, taking into account the purpose and suitability of the illustration in the publication.

C.32.16 Logistics Demonstration
The Contractor shall provide the technical analyses for a logistics demonstration at the FOT& E site. The Contractor shall provide all ECP1 unique parts, tools, and training necessary to conduct the Logistics Demonstration. The objectives of the Logistics Demonstration shall be to validate the supportability characteristics of the ECP 1 program. The Contractor shall conduct a Logistics Demonstration readiness review 90 days prior to the scheduled event. The Logistics Demonstration shall be performed in accordance with the Logistics Demonstration Plan.

C.32.16.1 Logistics Demonstration Plan
The Contractor shall develop and submit a plan to the COR to validate the adequacy of the maintenance planning and resources required to

conduct the Logistics Demonstration for the ECP 1 program in accordance with CDRL A075.

C.32.16.2 Logistics Demonstration Results
The Contractor shall prepare and deliver a report that documents the results of the Logistics Demonstration (to include evaluation of operations and maintenance procedures, support items, manpower and skill requirements, maintenance allocation, and maintenance times). The Contractor shall update all logistics products deliverable under this contract based on the results of the Logistics Demonstration and technical manual validations in accordance with CDRL A075.

C.32.17 MWO Study
The Contractor shall conduct a study to determine the feasibility of field application (below Deport) of ECP 1 capabilities. The Contractor shall brief the initial results and recommendations of the study to the SIPT 30 days prior to CDR, and deliver a final report 60 days post CDR in accordance with CDRL A076. Each capability shall be evaluated separately, but the recommendations can include recommendations for grouping or applying MWOs jointly.

C.32.18 Item Unique Identification (IUID) Markings
The Contractor shall plan for and implement IUID markings on ECP 1 unique items. The Contractor shall prepare and deliver an IUID candidate list of all ECP 1 unique components in accordance with CDRL A077. The Contractor shall develop the list in accordance with MIL-STD 130 and DoD Guide to Uniquely Identifying Items (Assuring Valuation, Accountability and Control of Government Property, version 2.0 dated 01 October 2008) and MIL-STD-130N (dated 15 June 2007).

C.32.19 Special Tools and Test Equipment
Maximum use of common tools, support equipment, and Test Measurement Diagnostic Equipment (TDME) organic to user is required. All new special tools or test equipment requirements shall be briefed to the SIPT upon identification. The Contractor shall provide ECP 1 unique special tools or test equipment for all testing, training and logistics demonstration per the approved System Support Package Component List.

C.32.20 Automated Test Equipment (ATE)
The Contractor shall maximize the use of embedded diagnostics for on-system troubleshooting. Performance of troubleshooting that cannot be addressed through embedded diagnostics; the Contractor shall maximize the use of IETMs operated on the Portable Multifunction Display (PMD) and/or the Maintenance Support Device (MSD).

C.32.21 Training Programs
The Contractor shall conduct training at the USG test sites designed to provide instructions and orientations necessary to increase knowledge, skills, and techniques to the degree required to perform scheduled tasks during government testing and logistics demonstration to individuals qualified in their specialties. A training program shall be developed at both the operator and maintainer levels of support. The training materials shall be validated prior to conducting training. The operational and maintainer training shall be updated based on test results and incorporated for future training events.

C.32.21.l Training
The Contractor shall perform analysis of ECP 1 tasks which are determined to require formal training prior to PPT (paragraph C.31.4), PQT (paragraph C.31.5), FOT&E (paragraph C.31.7) and Logistics Demonstration (paragraph C.32.16). The Contractor shall brief a recommended task list to the SIPT in accordance with the approved IMS from which the Governments representatives on the SIPT will select tasks for the training course development.

C.32.21.1.1 Operator Training
Operator training shall be provided to familiarize necessary personnel with the required skills and knowledge required to execute the Abrams ECP 1 Government test efforts. The Contractor shall provide operator level training in accordance with CDRL A078. Operator training shall be conducted prior to PPT, PQT, and FOT&E. The PPT and PQT training shall be conducted at APG and YPG. The FOT&E training shall be conducted at the USG test site location specified in Attachment D.

C.32.21.1.2 Maintainer Training
Prior to Logistics Demonstration, the Contractor shall provide maintainer level training in accordance with CDRL A086 at the site specified in Attachment D. Training shall be provided to appropriate personnel responsible for the conduct of the Logistics Demonstration. The training shall familiarize personnel with the required skills and knowledge necessary to execute the Logistics Demonstration events.

C.32.21.2 Training Materials
The Contractor shall develop and deliver the training course and curriculum necessary, at both operator and maintainer levels, to teach the tasks the Government selected for training.

C.32.21.2.1 Operator Training Materials
The Contractor shall provide all course and curriculum training materials required prior to PPT, PQT, and FOT&E in accordance with CDRL A078. Operator training materials shall be updated based on PPT test outcomes and any changes shall be incorporated for future training events.

C.32.21.2.2 Maintainer Training Materials

The Contractor shall provide all course and curriculum training materials required prior to Government Logistics Demonstration at the location identified in Attachment D and in accordance with CDRL A086. The training materials shall contain the most current information as a result of PPT test outcomes.

C.32.22 Training Devices

The Contractor shall provide technical services for Training Device programs. The Contractor shall propose changes to all Interface Control Documents (ICDs) related to Training Devices. The Contractor shall submit an impact statement in conjunction with ECPs when there is an effect on Training Device Programs.

C.32.23 Displaced Material

The Contractor shall develop and deliver a Displaced Materials report that identifies all items with a value exceeding $500 displaced during the prototype vehicle build effort in accordance with CDRL A079. In turn, the COR shall provide the Contractor disposition instructions for each item in the report within 90 days. The Contractor shall then package and ship those items that the COR has determined will be returned to the Army supply system or used to satisfy program requirements, the remainder of the items shall be disposition IAW DOD 4160.21-M.

*** END OF NARRATIVE C0001 ***

Name of Offeror or Contractor: GENERAL DYNAMICS LAND SYSTEMS INC.

SECTION G - CONTRACT ADMINISTRATION DATA

LINE ITEM	PRON/ AMS CD/ MIPR/ GFEBS ATA	OBLG STAT	JO NO/ ACCT ASSIGN	ACRN	PRIOR AMOUNT	INCREASE/ DECREASE	CUMULATIVE AMOUNT
0001AE	4736M21847	2	A.0008737.1.1.5.8	AD	$ 0.00	$ 1,861,027.00	$ 1,861,027.00
					NET CHANGE	$ 1,861,027.00	

ACRN	ACCOUNTING CLASSIFICATION	INCREASE/ DECREASE
AD	021 201320142040 A5XGJ 273735330RU01 3109 L035049723 A.0008737.1.1.5.8 021001	$ 1,861,027.00
	NET CHANGE	$ 1,861,027.00

	PRIOR AMOUNT OF AWARD	INCREASE/DECREASE AMOUNT	CUMULATIVE OBLIG AMT
NET CHANGE FOR AWARD:	$ 152,324,000.00	$ 1,861,027.00	$ 154,185,027.00

LINE ITEM	ACRN	EDI/SFIS ACCOUNTING CLASSIFICATION
0001AE	AD	021 201320142040 A5XGJ 273735330RU01 3109 L035049723 A.0008737.1.1.5.8 021001

SECTION J - LIST OF ATTACHMENTS

List of Addenda	Title	Date	Number of Pages	Transmitted By
Attachment 0002	ATTACHMENT B INDEX OF GOVERNMENT FURNISHED INFORMATION	04-SEP-2013	001	

Attachment B

Government Furnished Information (GFI) Index

NOTE: The GFI under Attachment B will be provided to the Contractor under separate cover.

Appendix	Description
A	System Engineering Plan
B	Program Management Cost Reporting Plan
C	Post ERR ECP List
D	Environmental Conditions for the Heavy Brigade Combat Team Tracked Vehicle system
E	MIL-STD-464C, Tailored for Heavy Brigade Combat Team Vehicle System
F	Joint Tactical Radio System (JTRS) System Development and Demonstration Phase, HMS HW Dual MP Tray ICD, Revision XB, Document No. 69-P53941R, 24 May 2013
G	CREW/Duke V3, TM 11-5865-1042-10, Operators Manual for CREW-2 Countermeasures Set AN/VLQ-12(V)3 Duke V3 (NSN 5865-01-567-8646) (EIC 1YB) SRCTec TD 10-1065, P001 Drawing & Interface Control Document, Rev 6, 27 June 2012
H	Power Management Study Final Report, 2011 Abrams Power Improvements Project, dated 14 December 2011, General Dynamics Land Systems
I	Purchase Description, Battery Monitoring Systems
J	Vehicular Integration for C4ISR/EW Interoperability (VICTORY) Standard Specifications, Version 1.4, November 13, 2012 Vehiclular Integration for C4ISR/EW Interoperability (VICTORY) Standard Specifications Appendices, Version 1.4, November 13, 2012
K	Nuclear Hardness for the combat platforms within the HBCT
L	Configuration Management Plan
M	TDP Option Selection Worksheet
N	Memorandum, SAAL-PA, Subject: Data Management Strategy Guidebook and Worksheet Memorandum, SAAL-PA, Army Acquisition Executive, 09 September 2010 Army Guide for the Preparation of a Program Product Data Management Strategy (DMS) and Data Management Worksheets
O	Life Cycle Support Plan
P	Memorandum, SAAL-ZL, Subject: Performance-Based Logistics (PBL Business Case Analysis (BCA) Policy, 18 August 2005
Q	Abrams SEP v2 VEM CDR Briefing Package, 25 July 2012 GCS Specification Scope Baseline for VEM/5.0 CDR, 25 July 2012 Heavy Brigade Combat Team (HBCT) Vehicle Health Management System (VHMS) Ground Combat System (GCS) DoDAF SV-4, System Functionality Description C1017-01-0065, 29 November 2010 Heavy Brigade Combat Team (HBCT) Vehicle Health Management System (VHMS) Ground Combat Systems (GCS) DoDAF SV-2, System Communication Description C1017-01-0195, Rev A, 17 May 2012 Heavy Brigade Combat Team (HBCT) Vehicle Health Management System (VHMS) Ground Combat Systems (GCS) DoDAF OV-7, Logistical Data Model C1017-01-0300, 23 November 2010 Modified VEM and SW 5.0 Requirements Baseline *Removed fourteen digital logbook related requirements PERFORMANCE SPECIFICATION, System Specification for Heavy Brigade Combat Team (HBCT), Vehicle Health Management System (VHMS), Ground Combat System Segment, C1017-01-0024, Rev F, 12 September 2012
R	Ammunition Data Link Integration (ADL-I) SSR/SFR Briefing Package, 20 July 2012

S Common Vehicle Architecture Description (CVAD) for the Program Executive Office Ground Combat System (PEO GCS) Common Vetronics Reference Architecture, Rev 1.0