ATTACHMENT 1

GPS III
EVOLVED EXPENDABLE LAUNCH VEHICLE (EELV)
COMPETITIVE LAUNCH SERVICES
PERFORMANCE WORK STATEMENT (PWS)

FA8811-16-R-0006

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Department of the Air Force
Space and Missile Systems Center
Launch Systems Enterprise Directorate
Los Angeles Air Force Base, California

1 EVOLVED EXPENDABLE LAUNCH VEHICLE LAUNCH SERVICES

1.1 DESCRIPTION AND SCOPE OF THE LAUNCH SERVICES

This Performance Work Statement (PWS) defines the launch services the Contractor will perform for Air Force and National Reconnaissance Office (NRO) missions in order to provide a Launch Vehicle (LV) and deliver a Payload (PL) into its intended orbit managed by Air Force Space Command, Space and Missile Systems Center (AFSPC/SMC). This contract is for the procurement of GPS III missions only; therefore, requirements with specific NRO-only references are not applicable. NRO-only references appear in grey text.

The Contractor shall perform all launch service tasks necessary to deliver payloads to defined orbital parameters in compliance with mission requirements as described in Section 3. The launch service shall support missions to all orbital parameters, consistent with vehicle configuration capabilities and Range Safety restrictions. The Contractor shall provide launch services, which are in compliance with all Range Safety requirements. The Contractor shall make all arrangements with the responsible authorities for the required Range Safety authorization and support for vehicle processing; integrated payload/vehicle processing, launch; and launch site maintenance and modifications.

The requirements in Section 3 of this PWS is divided into functional areas: 3.1 Program Management, 3.2 Systems Engineering, 3.3 Launch Vehicle Production, 3.4 Mission Integration, 3.5 Launch Operations, 3.6 Support to Government Space Flight Worthiness, 3.7 Quick Reaction and Anomaly Resolution, and 3.8 Mission-Unique Launch Vehicle Services.

The PWS tasks for each launch service effort described in this PWS may be grouped chronologically: 1) establish of the launch vehicle configuration, 2) qualify the flight configuration, 3) produce the flight launch vehicle, and 4) conduct the launch campaign.

The chronological flow of the launch service first begins with 1) the Contractor establishing the launch vehicle configuration in accordance with the systems engineering functions and tasks of section 3.2, culminating in submittal of CDRL A009 with the proposed configuration changes against the certified/approved launch vehicle in accordance with paragraph 3.2.4. Second, 2) analysis and qualification is conducted for the proposed launch vehicle configuration while performing the systems engineering functions and tasks of section 3.2. Third, 3) production of the flight vehicle is accomplished by performing tasks of section 3.3. Finally, 4) the launch campaign is conducted with the performance of section 3.4, Mission Integration, and section 3.5, Launch Operations.

During post award contract execution, the contractor may request, in writing, Government approval to allow relevant activities, documentation, and information developed under other contract(s)/agreement(s) with the Government for NSS launch services missions, to be used to satisfy requirements of this PWS.

1.2 PERFORMANCE WORK STATEMENT TERMINOLOGY

A glossary of definitions for terms used in and applicable to this PWS is provided in Appendix A. An Acronyms and Abbreviations list is provided in Appendix B.

1.2.1 Government

The term “Government” refers to Department of Defense (DoD) personnel, including military and Government civilians.

1.2.2 United States Government Team

The term "United States Government [USG] Team" refers to the Air Force SMC/LE program office and AFPEO/SP office personnel, but also includes the Aerospace Federally Funded Research and Development Center (FFRDC), SMC/LE Systems Engineering and Integration (SE&I) Contractors, SMC/LE Systems Engineering and Technical Assistance (SETA) support Contractors, SMC/LE Advisory & Assistance Services, the National Reconnaissance Office (NRO)/Office of Space Launch (OSL), NRO/OSL SETA support Contractors, NRO/OSL Independent Verification and Validation (IV&V) support Contractors, the SMC Independent Readiness Review Team (IRRT), Defense Security Service (DSS), Defense Information Systems Agency (DISA), Defense Contract Management Agency (DCMA), Defense Contract Audit Agency (DCAA), 30th Space Wing (30 SW), 45th Space Wing (45 SW), and other organizations as designated by SMC/LE Procuring Contracting Officer (PCO). Appropriate Non-Disclosure Agreements with USG Team Members and the Contractor shall be in place per SMC/LR--H002 ENABLING CLAUSE FOR PRIME AND SUPPORT CONTRACTOR RELATIONSHIPS (JUL 2014). Estimates of the number of USG Team individuals associated with specific requirements in this PWS are listed in Appendix E.

1.2.3 Space Vehicle Team

1.2.3.1 For United States Air Force (USAF) missions, the term "SV Team" refers to the SV Directorate/Program Office and Space Vehicle Contractor (SVC) personnel, but also includes the Aerospace FFRDC, the SV's SE&I Contractor and SETA support Contractors, and the SVC's designated Launch System Integration Contractor (LSIC) (if applicable).

1.2.3.2 For NRO missions, the term "SV Team" refers to the SV System Program Office and SVC. The interface with the SV Team is the NRO/OSL and the LSIC.

1.2.4 Electronic Data Access

The term "(Electronic Data Access)" refers to the ability of the USG Team to remotely access the data via the Contractor's electronic data repository host systems for the purpose of reviewing, uploading, or downloading specific, identified program-related data on Contractor host systems. The Contractor shall be responsible for providing access to the data, administering user accounts, and ensuring the integrity of the data. The Contractor shall provide server/folder location of data and confirm appropriate permissions have been provided. Data identified in this PWS shall be provided via electronic access unless otherwise specified in the Contract Data Requirements List (CDRL) descriptions. All data accessed is considered delivered to the Government for the purposes of Defense Federal Acquisition Regulation Supplement 252.227-7015.

1.3 DOCUMENTATION DE-CONFLICTION

If any conflict or inconsistency exists between the signed mission Interface Control Document, the Standard Interface Specification, or this Performance Work Statement, the mission Interface Control Document shall be given precedence.

2 APPLICABLE DOCUMENTS

2.1 COMPLIANCE DOCUMENTS

The Contractor shall comply with the compliance documents listed in Appendix C.

2.2 REFERENCE DOCUMENTS

The reference documents that are applicable to this PWS are listed in Appendix D.

3 SPACE LAUNCH SERVICE

The Government requires the services of an integrated Launch System to meet National Security Space (NSS) launch needs. Space Launch Services for NSS missions include LV production and transportation, mission integration, launch operations, support to independent Government mission assurance, base and range support, mission commodities, all associated program management and systems engineering functions and tasks, and any required special studies as defined in PWS Section 3.7.

The Contractor shall provide Space Launch Services for NSS missions in accordance with the performance requirements stated in the Evolved Expendable Launch Vehicle (EELV) System Performance Requirements Document (SPRD), EELV Standard Interface Specification (SIS), Mission Requirements Annex (MRA) (for USAF only), Interface Requirements Document (IRD) (for NRO only), and mission Interface Control Document (ICD). The Contractor shall control, document, and provide the USG Team continuous access and insight into its processes and assessments of progress and performance of all Space Launch Service requirements. The Contractor shall control, document, and provide the USG Team continuous access to the Contractor's command media and support the USG's Independent Mission Assurance activities.

3.1 PROGRAM MANAGEMENT FUNCTIONS AND TASKS

The Contractor shall identify a lead Program Manager and perform all program management functions and tasks necessary to deliver launch services and to satisfy the mission requirements for the mission consistent with operational quality, safety, security, and environmental standards. The program management function of this contract shall provide insight to the Government for all technical and programmatic activities performed under this contract.

The following compliance documents are applicable to program management execution: DoD 5000.04-M-1
Military Standard (MIL-STD)-882E (T)
MIL-STD 1528A (see CDRL B005)
Range Commander's Council (RCC) 324-11 (for Global Positioning System [GPS] Metric Tracking)
DoD 5220.22-M,
EELV Operations Security (OPSEC) Plan,
EELV Security Classification Guide,
EELV Program Protection Plan (PPP)
DoD Instruction (DoDI) 8581.01 Enclosure 3, paragraph a.4.e.
NRO Launch (NROL) Information Protection Guide (IPG) (for NRO missions)
Air Force Space Command Manual (AFSPCMAN) 91-710 (T)
Committee on National Security Systems Directive (CNSSD)-505 (see CDRL B005)
Committee on National Security Systems Instruction (CNSSI)-1200 (see CDRL B005)
Committee on National Security Systems Policy (CNSSP)-12, and

CNSSP-22
The Contractor shall provide tailoring to or Contractor's command media which fulfills MIL-STD-1528A for Government approval in accordance with CDRL B005.

The following reference documents are applicable to program management execution:
Air Force Instruction (AFI) 10-245,
AFI 10-701,
AFI 10-1202,
AFI 20-114,
Air Force Space Command Instruction (AFSPCI) 10-1208,
13-1213,
AFI 31-101, AFI 31-101_Air Force Space Command Supplement (AFSPCSUP),
AFI 91-204_AFSPCSUP_I, CNSSI-1253,
MIL-STD-881C Appendix J,
MIL-STD-1367A,
MIL-STD-1791A,
MIL-STD-2073-1E(1),
National Aerospace Standard (NAS) 411,
DoDI 4140.67,
DoDI 5000.02,
DoDI 5200.39,
DoDI 5200.44,
DoDI 8500.01, and
DoDI 8510.01

3.1.1 Launch System Data
The Contractor shall provide and maintain the USG Team access to all Launch System Data supporting this contract residing on the Contractor's systems throughout the contract period of performance. The Contractor shall communicate with the USG Team any updates to Launch System data as soon as possible but no later than 24 hours, or one business day, after the updates. Launch system data includes access to fleet data. Fleet surveillance is essential to the Space Flight Worthiness Certification process which requires identification of hazards, assessments of risks, mitigation measures and acceptance of residual risks. Fleet and mission specific launch system data are elements affecting the risk baseline accepted by the USG for National Security Space missions. The Contractor shall notify the Government of any network outages or system upgrades that could interrupt access to the systems. The Contractor shall cooperate with the USG Team to develop a plan to implement this requirement. (Electronic Data Access)

3.1.2 Launch System Electronic Data Access Training
The Contractor shall provide the USG Team Launch System Electronic Data Access computer-based training. Such training shall include, but is not limited to: Work Authorizing Documents (WAD) access and feedback, anomaly/non-conformance system, launch console data system, specification and engineering file management system, and Contractor employee online training database. (Electronic Data Access)

3.1.3 Data Accession List
The Contractor shall maintain a list of data supporting this contract on a Data Accession List (DAL). (CDRL A001)

3.1.4 Program Management Data Reporting

The Contractor shall collect and report program data to SMC/LE by providing the following:

A. Cost Data Summary Report (CDRL A002)
B. Functional Cost-Hour Report (CDRL A003)
C. Contractor Business Data Report (CDRL A004)
D. Contractor Work Breakdown Structure (CDRL A005)
E. Integrated Program Management Report – Integrated Master Schedule (IMS) (CDRL A006)

3.1.4.1 The Contractor shall report all Contractor labor hours (including subcontractor labor hours) required for performance of services provided under this contract via the secure data collection site (i.e., Enterprise-wide Contractor Manpower Reporting Application [ECMRA]). The Contractor is required to completely fill in all required data fields using the following Web address: http://www.ecmra.mil. Reporting inputs will be for the labor executed during the period of performance during each Government fiscal year (FY), which runs from October 1 through September 30. While inputs may be reported any time during the FY, all data shall be reported no later than (NLT) October 31 of each calendar year. Contractors may direct questions to the ECMRA help desk.

3.1.5 Program Management Reviews

The Contractor shall schedule and conduct monthly Program Management Reviews (PMR) to: report development and production status, ensure schedules support program objectives, review action items, review program schedules, and discuss any issues. The intent of the PMR is to provide a forum for open dialog between the USG Team and the Contractor. The Contractor shall provide the USG Team the PMR briefing slides no later than 3 calendar days prior to the review or as agreed to by the parties. SMC/LE and the Contractor will agree to the PMR agenda no later than 14 calendar days prior to the PMR or as agreed to by the parties. The PMR agenda shall include a status of the following topics at a minimum: Programmatics, Business Operations, Production Operations, Risk Management, Subsystem(s) Status, Launch Operations, and Wrap Up/Action Items. PMRs will be planned for 2 hours but last no more than 1 business day. Locations may rotate between Contractor and Government facilities. The USG team shall be invited to major subcontractor PMRs or equivalent reviews. (Electronic Data Access)

3.1.6 Launch Manifesting Process

The Contractor shall participate in the Government's led launch scheduling and manifesting process to include the following reviews and meetings: a semi-annual Current Launch Schedule Review Board (CLSRB), a semi-annual Government Integrated Meeting (GIM), a monthly Senior Management Review (SMR), weekly launch manifest status teleconferences, and a Contractor-led monthly manifest review. The Contractor should assume a meeting length of 4 hours each. (Ref. AFSPCI 13-1213)

3.1.6.1 The Contractor shall develop and provide the USG Team Launch Schedule Option Assessments as part of the launch manifesting process. (Electronic Data Access)

3.1.6.2 The Contractor shall provide the USG Team a Launch Slot Recommendation (LSR) and Launch Date Recommendation (LDR) within the assigned launch period for each launch mission in accordance with contract clause SMC--H006. (CDRL B001)

3.1.7 System Safety Program

The Contractor shall establish, implement, and maintain a System Safety Program in accordance with MIL-STD-882E (tailored consistent with SMC-T-004). The Contractor shall provide a System Safety Program Plan (SSPP) and Safety Assessment Report (SAR) in accordance with MIL-STD-882E (tailored consistent with SMC-T-004). (Electronic Data Access) (CDRLs B002 and B003)

3.1.8 Range Safety

The Contractor shall coordinate the tailoring of AFSPCMAN 91-710 for all missions under this contract with SMC/LE and Range Safety prior to formal submittal. The Contractor shall coordinate relief requests (e.g., Equivalent Level of Safety (ELS), or Waivers) for all missions under this contract with SMC/LE and Range Safety prior to formal submittal. (Electronic Data Access)

3.1.8.1 The launch system shall utilize GPS as one of the two mandatory Range Safety tracking data sources. The launch system's on-board GPS shall comply with the requirements documented in the approved RCC 324-11. The Contractor shall coordinate RCC 324-11 tailoring requests, equivalent level of safety certifications, and non-compliance waiver relief requests for all missions under this contract with SMC/LE and Range Safety prior to formal submittal.

3.1.8.2 The launch system's Autonomous Flight Safety System (AFSS) or flight safety system using a secure command system employing National Security Agency approved cryptography in accordance with DoDI 8581.01 Enclosure 3, paragraph a.4.e. shall comply with the requirements documented in the approved RCC 319-10 (T). The Contractor shall coordinate RCC 319-10 (T) tailoring requests, equivalent level of safety certifications, and non-compliance waiver relief requests for all missions under this contract with SMC/LE and Range Safety prior to formal submittal.

3.1.9 Safety Training

The Contractor shall provide any Contractor-required safety training to USG Team and SV Team (for NRO missions) personnel for Contractor facilities used in performance of this contract to ensure USG Team access to those facilities.

3.1.10 Launch System Familiarization Course

The Contractor shall provide the USG Team an instructor-led Launch System Familiarization (FAM) Course as needed, up to three times a calendar year to provide training to the Government team supporting NSS missions with the launch service provider: twice at the SMC/LE's facility, and once at the launch base for this mission.

The FAM Course shall be conducted in two parts: a one-day overview for non-technical personnel and a two-day in-depth engineering system familiarization. The level of detail covered by the FAM course training materials shall be provided by the Contractor in the initial CDRL submittal and approved by the Government for the final CDRL submittal prior to conducting the FAM course. At a minimum, the FAM Course shall include familiarization on the following: LV configurations, propulsion systems, avionics systems, structures systems, manufacturing facility, manufacturing processes, launch site facilities, facility systems and capabilities, launch site critical ground mechanical, structural, and fluid/gas systems, launch site/ground command, control, and communications, power systems, flight controls, guidance, navigation, ground and airborne ordnance systems, ground electrical systems, control/telemetry, launch process flow, Contractor organizational structure, flight safety systems, launch commit sequence, performance capabilities, personnel roles and responsibilities, and types of Contractor engineering and launch documentation. (CDRL A007).

3.1.11 Program Protection

The Contractor shall develop, provide, implement, and maintain, a Program Protection Implementation Plan (PPIP) in accordance with the EELV PPP and DoDI 8582.01. (CDRL A008)

3.1.11.1 The Contractor shall provide support to the USG Team in annual EELV Program Protection Surveys (PPS) at all Contractor facilities in accordance with the EELV PPP.

3.1.11.2 The Contractor shall attend and support the quarterly EELV System Security Working Group (SSWG) and one security-related meeting per month in accordance with the EELV PPP (e.g., Information Technology [IT] Security Breach or Unauthorized Information Distribution resolutions).

3.1.11.3 The Contractor shall provide support to the USG Team in the development of the EELV PPP Contractor-specific Annex. The Contractor's support to the USG Team in the development of the EELV PPP shall include providing the LV-specific and supporting Ground system architecture specific information necessary to document, identify, assess, and mitigate security related vulnerabilities and risks.

3.1.11.4 The Contractor shall protect Information Systems (IS) processing classified data in accordance with DoD 5220.22-M, and applicable supplements.

3.1.11.5 The Contractor shall obtain and/or maintain International Organization for Standardization/International Electrotechnical Commission (ISO/IEC) 27000/02 (T) certification.

3.1.12 Operations Security

The Contractor shall develop, implement and maintain an Operations Security (OPSEC) program in accordance with contract Attachment 2, DoD Contract Security Classification Specification (DD254). (Ref. AFI 10-701 and the EELV OPSEC Plan)

3.1.13 Anti-Terrorism

The Contractor shall implement and maintain an Anti-terrorism (AT) program for activities at Cape Canaveral Air Force Station (CCAFS), Kennedy Space Center (KSC), and Vandenberg Air Force Base (VAFB). (Ref. AFI 10-245) The Contractor shall ensure SMC/LE approval prior to taking any action regarding anti-terrorism requirements requested by the 30 SW Operations Security Office (30 SW/CCH) or 45 SW/Anti-Terrorism Office (ATO) that change or add any additional anti-terrorism requirements to this PWS paragraph and subparagraphs.

3.1.13.1 Meeting Support: The Contractor shall identify site security leads to support one meeting per year.

3.1.13.2 Program Reviews: The Contractor shall perform an in-house Annual Review of its Anti-Terrorism program, which shall be documented in accordance with the host Wing ATO checklist.

3.1.13.3 Training: The Contractor shall perform annual training utilizing SMC/LE Anti-Terrorism training materials as a guideline. The Contractor shall create a Corporate Annual Training Letter stating that all site personnel have completed their individual Anti-Terrorism training.

3.1.13.4 Force Protection Condition (FPCON) Checklists: The Contractor shall utilize site specific FPCON checklists provided by SMC/LE at each launch site.

3.1.13.5 Random Anti-Terrorism Measures (RAMs): The Contractor shall perform prescribed RAMs or alternate RAMs that are preapproved by SMC/LE (up to 5 per month). Completed RAMs shall be documented in a format prescribed by SMC/LE and reported quarterly to the Host Wing ATO.

3.1.13.6 Mission Essential Personnel: The Contractor shall create and maintain a "Mission Essential Personnel" list and an "Emergency Essential Personnel" list for higher FPCON levels (Charlie and Delta) and other emergency situations at each launch site. The Contractor shall provide these lists to the appropriate launch site personnel in advance of any emergency situation and in the event of any changes

3.1.14 Environmental Requirements

The Contractor shall comply with environmental requirements in accordance with AFSPCMAN 91-710 as applicable and all relevant and applicable Federal, State, and local environmental laws, regulations, and executive orders, and base regulations as documented in the appropriate license, lease, Commercial Space Operations Support Agreements (CSOSA), and CSOSA annexes.

3.1.14.1 The Contractor shall provide to the USG Team each environmental impact analysis document, environmental report, and applicable meeting notices related to or that impact the approved/certified EELV launch system. This includes associated correspondence sent to or received from environmental regulatory agencies and the host Wing, but does not include informal telephone and e-mail communication. (Electronic Data Access)

3.1.14.2 The Contractor shall include SMC/LE in the coordination process with the host Wing and the environmental regulatory agencies relating to the application, development, or modification of permits or required environmental compliance plans, environmental cleanup actions, or other major efforts subject to environmental laws and regulations. The Contractor shall provide information to the on-site USG Team environmental representatives, during the coordination process, to ensure that the USG Team is aware of the risks and alternatives that are evaluated or accepted during this process. (Electronic Data Access)

3.1.14.3 The Contractor shall provide data needed to allow SMC/LE to conduct the Environmental Impact Analysis Process in accordance with National Environmental Policy Act and Executive Order (E.O.) 12114, Environmental Effects Abroad of Major Federal Actions, dated 4 January 1979.

3.1.15 Hazardous Materials

The Contractor shall develop, provide, maintain and comply with a hazardous materials management plan in accordance with AFSPCMAN 91-710 and Task 108 of MIL-STD 882-E. (CDRL B004) (Ref. NAS 411)

3.1.16 Incident and Discrepancy Reporting

The Contractor shall maintain an incident and discrepancy reporting system. The Contractor shall notify the USG Team, via Contractor-identified internal reporting systems, of incidents and discrepancies.

3.1.16.1 The Contractor shall notify the USG Team of incidents and discrepancies related to this mission during the execution of this contract that involve: (1) loss of life or severe personal injury as defined per Occupational Safety and Health Administration reporting requirements; (2) damage to any flight hardware or Critical Ground Support Equipment (GSE); or (3) damage to Critical GSE occurring during vehicle build, test, transportation, processing, or facility readiness operations. The notification shall be provided as soon as operationally possible, but no later than 48 hours (post-emergency response and safety hazard securing) and in accordance with already-established Contractor reporting procedures. The Contractor shall provide the status of ongoing investigations, Contractor incident root cause data, and determination and associated corrective actions. (Electronic Data Access)

3.1.16.2 The Contractor shall notify the onsite USG Team as soon as operationally possible (post emergency response) of hazardous materials and waste releases that require coordination with Governmental regulatory agencies.

3.1.16.3 The Contractor shall report within 48 hours of an event's occurrence any incidents and any discrepancies that may be or are a major non-conformance or lead to any of the following: (a) actual or potential delay to the ship date of flight hardware, (b) out-of-position (OOP) work transferred to the launch site, (c) changes to the IMS, (d) waivers or exceptions to test or verification requirements, or (e) impact a scheduled launch date. The Contractor shall provide the status of ongoing investigations, Contractor incident root cause data, and determination and associated corrective actions. For all other minor incidents and discrepancies, notification shall be no later than 14 calendar

days of an event's occurrence and status reporting will be determined by SMC/LE on a case-by-case basis.

3.1.17 Public Affairs Activities

The Contractor shall support Public Affairs activities by coordinating with SMC/LE and SMC/PA. The Contractor shall coordinate press statements, press releases, or any related public affairs items with SMC/PA prior to release to the general public.

For NRO missions, the Contractor shall support Public Affairs activities to include Launch External Affairs Forum (LEAF) coordination. The Contractor shall submit all launch memorabilia; press statements, press releases, or any related public affairs items to the NRO LEAF for approval prior to production or release to the general public.

3.1.18 Program Milestone Reviews

The Contractor shall conduct and provide USG Team participation in the Program Milestone Reviews as defined in Appendix H. These reviews may be combined with Contractor reviews with USG approval.

3.2 SYSTEMS ENGINEERING FUNCTIONS AND TASKS

In order to ensure the successful completion of this mission and associated tasks required for mission success, the Contractor shall perform systems engineering functions and tasks necessary to deliver launch services consistent with operational safety, suitability, and effectiveness (OSS&E) and Environmental Safety and Occupational Health guidance on EELV systems. In order to ensure the Government can accomplish its mission assurance functions and tasks the Contractor shall maintain and provide the USG Team insight into the systems engineering processes supporting the launch service. In order to facilitate smooth and unimpeded communication between the USG Team and the Contractor the Contractor shall identify a technical Point of Contact (POC) (vehicle Chief Engineer or equivalent) to work with the USG counterpart to manage the activities in this section.

The following **compliance documents** are applicable to systems engineering execution:
American Institute of Aeronautics and Astronautics (AIAA) S-080-1998- Standard for Space Systems,- Metallic Pressure Vessels, Pressurized Structures, and Pressure Components,
AIAA S-081A-2006- Space Systems- Composite Overwrapped Pressure Vessels,
AIAA S-110-2005- Standard for Space Systems- Structures, structural Components, and Structural Assemblies,
AIAA S-113-2005- Criteria for Explosive Systems and Devices on Space and Launch Vehicles,
AIAA S-114-2005- Moving Mechanical Assemblies for Space and Launch Vehicles,
AIAA S-120-2006- Mass Properties Control for Space Systems,
MIL-STD-461F-Department of Defense Interface Standard: Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment,
MIL-STD-882E (T)- Department of Defense Standard Practice: System Safety,
MIL-STD-1542B- Military Standard: Electromagnetic Compatibility Requirements for Space Systems,
SAE AS9100C- Quality Management Systems- Requirements for Aviation, Space and Defense Organizations,
SMC Standard (SMC-S)-001- AFSPC Standard: Systems Engineering Requirements and Products,
SMC-S-002- AFSPC Space and Missile Systems Center Standard: Configuration Management,

SMC-S-003 (T)- Quality Space and Launch Requirements Addendum to AS9100C,
SMC-S-005- AFSPC Space and Missile Systems Center Standard: Space Systems- Flight Pressurized Systems,
SMC-S-006- AFSPC Space and Missile Systems Center Standard: Solid Rocket Motor Case Design and Test,
SMC-S-008- AFSPC Space and Missile Systems Center Standard: Electromagnetic Compatibility Requirements for Space Equipment & Systems,
SMC-S-011- AFSPC Space and Missile Systems Center Standard: Parts, Materials, and Processes (PMP) Control Program for Launch Vehicles,
SMC-S-013- AFSPC Space and Missile Systems Center Standard: Reliability Program for Space Systems,
SMC-S-016- AFSPC Space and Missile Systems Center Standard: Test Requirements for Launch, Upper-stage, and Space Vehicles,
SMC-S-018- AFSPC Space and Missile Systems Center Standard: Lithium-Ion Battery for Spacecraft Applications,
SMC-S-020- AFSPC Space and Missile Systems Center Standard: Technical Requirements for Wiring Harness, Space Vehicle,
SMC-S-021- AFSPC Space and Missile Systems Center Standard: Technical Reviews and Audits for Systems, Equipment, & Computer Software, and
ISO 17666 (CDRL B005)- Space Systems- Risk Management.

The following **reference documents** are applicable to systems engineering execution:
JANNAF-GL-2012-01-R0- Test and Evaluation Guidelines for Liquid Rocket,
SMC-S-004- AFSPC Space and Missile Systems Center Standard: Independent Structural Loads Analysis,
SMC-S-012- AFSPC Space and Missile Systems Center Standard: Software Development for Space Systems,
SMC-S-019- AFSPC Space and Missile Systems Center Standard: Program and Subcontractor Management,
ISO 17666- Space Systems- Risk Management,
SMC/LE Risk Management Plan (RMP),
Technical Operating Report (TOR)-2005(8583)-4019- Risk Management Plan Guide for Space Acquisition Programs,
SMC Guide (SMC-G)-1202- Space Flight Worthiness Criteria (SFWC),
SMC-G-1203- Independent Readiness Review Team (IRRT),
SMC-G-1204- SMC Space Launch Readiness Review,
EELV Systems Engineering Plan (SEP),
SAE AS9003- Inspection and Test Quality System,
SAE AS9120- Quality Management Systems: Aerospace Requirements for Stockist Distributors, and
National Aerospace and Defense Contractors Accreditation Program [Nadcap] AC7004
SMC/LE TIRP - SMC/LE Technical Issue Resolution Process

3.2.1 Technical Interchange Meetings

The Contractor shall invite the USG Team to Technical Interchange Meetings (TIM) or any Contractor-equivalent boards and make available any meeting documentation materials. (Electronic Data Access)

3.2.2 Contractor Engineering Database

The Contractor shall provide the USG Team access to the Contractor's non-conformance, drawings, configuration control, risk, hazard tracking system, production,

launch operations and other similar engineering databases necessary to support space flight worthiness (SFW) certification by the USG Team. (Electronic Data Access)

3.2.3 Systems Engineering Boards and Processes

The Contractor shall conduct and support USG Team participation in Launch System: Risk Management Boards (RMB); Engineering Review Boards (ERB); Anomaly Review Boards (ARB); Technical Review Boards (TRB); Corrective Action Boards (CAB); Change Control Boards (CCB) for technical issues; Material Review Boards (MRB); Failure Review Boards (FRB); Parts, Materials, and Processes (PMP) Control Boards; Systems Safety Groups; Preliminary Design Review (PDR); Critical Design Review (CDR); Functional and Physical Configuration Audits (FCA/PCA), System Verification Review (SVR); Production Readiness Review (PRR); Test Readiness Review (TRR); Shipping Readiness Reviews; or Contractor equivalent boards and/or Contractor-equivalent processes. For recurring review boards, the Contractor shall provide electronic invitations to the USG Team no later than 10 calendar days in advance of the board. For all other review boards the Contractor shall provide electronic invitations to the USG Team as soon as possible after the board is scheduled. The Contractor shall provide the USG Team entrance and exit criteria for System Engineering boards, as required by their command media. The Contractor shall provide virtual participation capability for System Engineering boards. (Electronic Data Access)

3.2.4 Launch Vehicle Configuration Change Reporting

The Contractor shall provide the USG Team proposed configuration changes to be implemented on the USG certified/approved launch vehicle configuration. The Contractor shall provide the USG certified/approved launch vehicle configuration. (Ref. EELV SEP) Class 1 and 2 changes will be assessed by the USG team however Class 1 changes shall be communicated in accordance with SMC-S-001- AFSPC Space and Missile Systems Center Standard: Systems Engineering Requirements and Products, SMC-S-002- AFSPC Space and Missile Systems Center Standard: Configuration Management, SMC-S-021- AFSPC Space and Missile Systems Center Standard: Technical Reviews and Audits for Systems, Equipment, & Computer Software and paragraph 3.2.4.1.1. The Contractor shall support participation by the USG Team in system engineering boards and qualification tests/analysis per paragraph 3.2.3. (Electronic Data Access)

A Class 1A change for the purpose of this document is defined as a change that affects the SPRD, SIS, ICD, or substantial changes as specified in Table 1. Class 1A changes require USG approval.

A Class 1B change for the purpose of this document is defined as a change that drives assessments across multiple technical disciplines/systems, any redesign that has been assessed by the Contractor or USG Team as driving any qualification, a form/fit/function change or any changes to flight critical items listed in the Flight Critical Items List. The Government Product Line Chief Engineer will work with the Contractor Product Line Chief Engineer (or equivalent) to mutually establish the appropriate level of reporting for Class 1B

changes (a subset of the items listed for Class 1A in paragraph 3.2.4.1.1) after contract award.

A Class 2 change is defined as any change which does not meet the definition of a Class 1 change as described herein.

Table 1. Substantial Change Definition

Factor	Increase ^	Decrease ^	Communicate Changes*	Approval Deadlines**	Implementation Deadlines***
Maximum thrust (each engine)	+3%	-1.5%	NLT L-15 months	NLT L-12 months	NLT L-6 months
Specific impulse (each engine)	+1%	-0.5%	NLT L-15 months	NLT L-12 months	NLT L-6 months
Total impulse (each stage)	+1%	-0.5%	NLT L-15 months	NLT L-12 months	NLT L-6 months
Length of vehicle	+1%	-1%	NLT L-15 months	NLT L-12 months	NLT L-6 months
Propellant Tank Diameter (each stage)	+1%	-1%	NLT L-15 months	NLT L-12 months	NLT L-6 months
Structural safety factor	--	-5%	NLT L-15 months	NLT L-12 months	NLT L-6 months
Design Fatigue Life Margins	--	-10%	NLT L-15 months	NLT L-12 months	NLT L-6 months
^ Increase/Decrease from design specification assessed as part of baseline certification configuration					
*Communicate changes means the Contractor notifies their intent to include change on NSS mission					
** Approval is USG approval or disapproval to the Contractor for the incorporation of the change or USG approved schedule provided					
*** Implementation means engineering drawings complete, hardware produced and incorporated and all qualification/acceptance testing complete unless mutually agreed by both parties for a later date					

3.2.4.1 The Contractor shall communicate with the USG Team NLT L-15 months or otherwise indicated in Table 1, prior to executing any actions to implement a Class 1 change to the USG certified/approved launch vehicle configuration. The contractor shall provide the initial technical rationale for the Class 1A change as available, or upon change identification to the Contractor's Change Control Board, or equivalent, whichever is earlier. The Contractor shall provide the final technical rationale and obtain SMC/LE approval after final design of any Class 1A change NLT L-12 months, prior to incorporation of the proposed configuration change to the USG certified/approved launch system configuration. The Contractor shall implement all Class 1 changes NLT 6 months or otherwise indicated in Table 1 unless mutually agreed upon by both the Contractor and USG for a later date. (Electronic Data Access)

3.2.4.1.1 For Class 1A changes, the technical rationale (Change Assessment package) shall include: Design Evolution Narrative, Design Requirements and Interfaces, Design Environments, As-built Design, Software Design, Supporting Design Analyses, Principles of Operation, Limited Operating Life Items Tracked, Summary of Required Manufacturing Processes, Summary of Logistics, Summary of FMEA and Reliability Assessment, Summary of Identified Risks, Acceptance/Qualification Test Plan/Procedures, Test-Like-You-Fly Exceptions and Deviations, Qualification Rationale, Qualification Test Results, List of Test Nonconformances,

Summary of Flight Data, and Configuration Differences Between Unit Under Test (UUT) and Qualification Unit (For example UUT includes Flight and Proto Qualification Units), unless mutually agreed by both parties to be non-applicable.

3.2.4.2 The Contractor shall communicate with the USG Team of any proposed Class 2 configuration change to the USG certified/approved launch vehicle configuration and the initial technical rationale as available for the change as soon as possible but no later than 10 calendar days after identifying the change. Any Class 2 change after L-60 requires Government Product Line Chief Engineer approval. The Contractor shall provide the final technical rationale NLT 30 days prior to coordinating the Government Hardware Reviews as defined in section 3.6.5. (Electronic Data Access)

3.2.4.3 The Contractor shall communicate changes to the launch system's interface with Engineering Launch Support System (ELSS) or a change to the Operational Surveillance Requirements as defined in Section 3.5.1.14 as soon as possible but no later than 14 days prior to testing operations or launch. The Contractor shall obtain SMC/LE approval after final design of changes to the launch system interface with ELSS or a change to the Operational Surveillance Requirements prior to implementation no later than 7 days prior to testing operations or launch. (Electronic Data Access)

3.2.5 Non-Recurring Engineering and Processes

3.2.5.1 The Contractor shall provide the USG Team access to the launch system design, systems analyses and methodologies, component qualification data in accordance with SMC-S-016- AFSPC Space and Missile Systems Center Standard: Test Requirements for Launch, Upper-stage, and Space Vehicles and performance capabilities for the contracted LV configuration to support the USG's SFW certification process. The Contractor shall document (an electronic interoffice memorandum is acceptable) and notify the USG Team when delivery occurs identifying the location of the data no later than 60 days after contract award (or the agreed upon timeline approved by USG Team) and upon implementing subsequent changes in the data. The Non-Recurring Engineering and Process data shall contain information referenced in Appendix F, or Contractor equivalent, as applicable to the Contractor's USG certified/approved launch vehicle configuration for changes to the certification baseline. (Electronic Data Access).

3.2.5.2 The Contractor shall make available all applicable data for command media, processes, planning, and documentation as requested by SMC/LE to include, but not limited to, command media, processes, planning, and documentation associated with design, fabrication, transportation, and operations of the launch system, to include updates during the period of performance. Any relevant activities and information developed under another contract or agreement with the USG can be used to satisfy this requirement. (Electronic Data Access)

3.2.5.3 The Contractor shall enable technical interchange with their subject matter experts (SME) to support the USG Team's model development, Independent

Validation and Verification (IV&V) software, and other independent analyses that are used to establish a baseline for recurring IV&V. The Air Force's New Entrant Certification Guide (NECG) illustrates the framework for this requirement. (Electronic Data Access) (CDRL B010)

3.2.6 Launch System Testing (component, unit, subsystem, system, launch site)
The Contractor shall develop the Launch Vehicle Test and Verification Plan NLT 90 days after contract award (CDRL A010). The test program in conjunction with other verification activities shall be designed to demonstrate compliance to system level performance and environmental specifications and system interface requirements and contractual compliance requirements. The document shall summarize all component/unit, subsystem, and system level testing, including the test margin, and number of thermal cycles as applicable. The test program shall be designed to ensure qualification and workmanship defects are adequately screened prior to launch. Waivers to the plan shall be submitted for government approval no later than 30 days prior to execution for the case of when the contractor determine an exception is warranted or 5 days following when contractor violated requirement through test execution. The Contractor shall provide test plan verification evidence electronically. (Electronic Data Access)

3.2.7 Launch System Parameters
The Contractor shall make available in a configuration controlled system to the USG Team launch countdown parameters; operational redline limits; and the data, rationale, source, and justification for selecting or changing the specific limits on parameters that affected continued processing from initiation of launch countdown until completion of the launch countdown. (NSS missions and non-NSS missions) (Electronic Data Access)

3.2.7.1 For NSS missions, the Contractor shall provide the baseline for items listed in 3.2.6 from the USG certified/approved launch vehicle configuration at launch minus six (L-6) months. From L-6 until launch, the Contractor shall maintain the baseline and push-notify the USG Team of any changes to this electronic baseline along with the information requested in paragraph 3.2.6. (Electronic Data Access)

3.2.8 Post-Flight Data Review
The Contractor shall perform post-flight data reduction, anomaly resolution, lessons learned determinations, and observation disposition. The Contractor shall provide the USG Team corrective action plans for anomalies. (Electronic Data Access)

3.2.8.1 The Contractor shall conduct a Quick-Look Assessment meeting at the launch site within 2 hours after SV separation that includes USG Team personnel and covers system and sub-system performance. For long coast missions, the Contractor shall conduct the Quick-Look Assessment meeting within 2 hours of transfer orbit insertion. System and sub-system performance shall address initial observations and any anomalies recorded during the minus/plus count.

3.2.8.2 The Contractor shall provide an initial and final Post-Flight Assessment Report. (CDRL B006)

3.2.8.3 The Contractor shall conduct a Post-Flight Review, which summarizes the Post-Flight Assessment Report, for the USG Team no later than 45 calendar days following Contractor's receipt of LV telemetry data.

3.2.9 Aging and Surveillance Program

The Contractor shall maintain and provide to the USG Team an aging and surveillance program to ensure that the LV meets all Contractor specifications and flight safety standards. (Electronic Data Access)

3.2.10 Performance Capabilities Guide

The Contractor shall provide and maintain a Performance Capabilities Guide. (CDRL B007)

3.2.11 Quality Management

The Contractor shall comply with SMC-S-003 (T)- Quality Space and Launch Requirements Addendum to AS9100C. The Contractor shall perform quality management in accordance with the following:

3.2.11.1 The Contractor shall attain AS 9100C certification from a Certification Body recognized by the International Aerospace Quality Group (IAQG), and maintain the certification throughout the duration of the contract. The AS9100C certification shall cover all Contractor sites, including subsidiaries and partners, performing LV manufacturing, management, integration, testing, and launch.

3.2.11.2 The Contractor shall be responsible for satisfying AS9100C as implemented by SMC-S-003 (T) for supplier management and purchased materials and parts from a supplier. Other potential standards that may be applicable include AS9003, AS9120, or Nadcap AC7004E, as appropriate to the supplier. Evidence of supplier quality management system approval shall be based on accredited third-party certification or Contractor second-party audit. The requirements in this paragraph are subject to tailoring in accordance with CDRL B005.

3.2.11.3 The Contractor shall provide a current audit plan and schedule for internal and external quality audits and invite the USG Team to observe these audits. USG Teams for multiple contracts and/or efforts will coordinate to identify one Observer per Auditor. The Contractor shall provide the USG Team with access to audit reports (e.g., findings, observations, opportunities for improvement, and corrective action requests) and implementation status of corrective actions resulting from these internal and external quality audits. (Electronic Data Access)

3.2.11.4 The Contractor shall provide the USG Team quality metrics for processes comprising the Contractor's quality management system. Consistent with the requirements in AS9100C, these metrics shall address monitoring and measurement of processes and product including hardware non-conformances, internal escapements, external and supplier escapements, supplier quality ratings, and corrective action effectiveness. (Electronic Data Access)

3.2.11.5 The Contractor shall allow the USG Team participation in Contractor's meetings with its suppliers (e.g., Quality Councils, Supplier Corrective Action Request [SCAR] reviews, management reviews, supplier conferences, and other forums) relating to delivery performance and product quality.

3.2.12 Support to LSIC and SVC Meetings and Reviews

For NRO Missions, the Contractor shall support SV Design Reviews and other significant SV milestone meetings at the request of the LSIC and/or SVC.

3.3 LAUNCH VEHICLE PRODUCTION

In order to ensure the successful launch of healthy satellites into their intended orbit the Contractor shall perform all tasks necessary to provide a Launch System, as defined in the SPRD, capable of placing PLs into their mission orbits in accordance with the performance and accuracy requirements stated in the SPRD and SIS, and further defined in the mission ICD and the Mission Requirements Annex (for USAF missions), and Interface Requirements Document (IRD) (for NRO missions).

3.3.1 Launch Vehicle Hardware and Software

3.3.1.1 The Contractor shall manufacture, test, assemble, and transport the LV to the appropriate launch site for each required launch. The Contractor shall document and provide evidence of Contractor specification compliance for all LV hardware and software. (Electronic Data Access)

3.3.1.2 The Contractor shall provide acceptance rationale for the LV at the appropriate assembly milestones in accordance with the Contractor's command media, providing evidence that the LV meets the performance requirements for a specified PL launch. (Electronic Data Access)

3.3.1.3 The Contractor shall ensure all environmental considerations (e.g., temperature, humidity, shock, and vibration) required by the specific LV hardware and transportation modes, are monitored and recorded before, during, and after the transportation. The Contractor shall report discrepancies to the USG Team in accordance with PWS paragraph 3.1.16.

3.3.1.4 The Contractor shall provide office accommodations in the engineering, primary production, testing, and launch facilities/sites for a small resident USG Team designated by SMC/LE. Accommodations shall include access to telephones, copy machines, conference room, high-speed network connectivity to support electronic access to Contractor data systems, and Internet access.

3.3.1.4.1 SMC/LE's designated on-site representatives shall be granted physical access and non-escort privileges to all areas of the Contractor's facility where work is being performed under this contract once all required safety/security training has been completed. The Contractor shall grant "admit" and "escort" privileges within Government program office areas, for a limited set of Government and FFRDC personnel who have had proper

"admit/escort" briefings, to facilitate visits by other Government representatives. The Contractor shall ensure that SMC/LE-designated representatives have access to the program's manufacturing areas, verification and test activities, and program schedules and data.

3.3.2 Mission-Unique Requirements

The Contractor shall perform all mission-unique activities and meet the specific requirements as defined in the Mission Requirements Annex (for USAF missions), IRD (for NRO missions), and further defined and finalized in the mission ICD.

3.4 MISSION INTEGRATION

In order to ensure the successful integration of the Space Vehicle with the Launch Vehicle the Contractor shall provide all services necessary to integrate the PL(s) with the LV in accordance with System Performance Requirements Document Rev. A; System Interface Specification Rev. B; and the mission specific Interface Control Document. The Contractor shall be responsible for managing the mission integration of the payload, flight, and ground systems with the launch vehicle and its associated GSE. The Contractor shall provide and maintain a Mission Integration Schedule which typically begins at Launch minus 24 (L−24) months and ends after conclusion of the Government Post-Flight Review at approximately Launch plus 60 calendar days (L+60). The following reference documents are applicable to execution of mission integration services: SMC/LE Generic Government Baseline Launch Rehearsal Plan (for USAF missions), OSL Baseline Launch Rehearsal Plan (BLRP) (for NRO missions) and Baseline Day of Launch (DoL) Plan (for NRO missions). (Electronic Data Access)

3.4.1 Principal Mission Manager Interface

For each mission, the Contractor shall identify a single principal mission manager interface POC for SMC/LE and the SV Team for USAF missions and for OSL and LSIC for NRO missions.

3.4.2 Mission Integration Activities

The Contractor shall provide a descriptive document: Mission Integration Management Plan (MIMP), which defines the standard process flow and specific timelines needed for first time and reflight spacecraft integration with the LV. (CDRL B008) The MIMP should be consistent with the Mission Integration Schedule and include the following activities:

3.4.2.1 Mission Integration Working Groups and Reviews

3.4.2.1.1 For each USAF mission, the Contractor shall conduct mission integration working groups and reviews in accordance with the table below.

Working Groups / Meetings	Nominal Timeline / Location	Frequency
Day of Launch (DOL) Working Group	L-12 months to ILC per 4-party agreement	Two
Government Mission Director (GMD) via teleconference	L-8 weeks to ILC	Weekly

Ground Operations Working Group (GOWG)	L-12 months to ILC Held at launch site per 4-party agreement	Two
Ground Operations Readiness Review (GORR)	Immediately prior to hardware arrival (LV and SV) Held at launch site	Two
Mission Kickoff Review	ATP + 1 month	One
Mission Integration Status Review (MISR)	L-2 years to ILC	Quarterly
Mission Integration Working Group (MIWG)	L-2 years to L-6 months	Biweekly
	L-6 months to ILC	Weekly
Management Working Groups (MWG)	L-2 years to ILC	Quarterly

3.4.2.1.2 For each NRO mission, the Contractor shall conduct a Mission-Kickoff Review NLT ATP + 1 month, mission integration teleconferences every 2 weeks up until L-6 months and then every week until launch, quarterly MWG held at the Contractor facility, weekly GMD Status Reviews, via teleconference, from L-12 weeks until launch, eight GOWG meetings held at the launch site, three DOLWG meetings, one AOWG NLT L-1 month held at the launch site, and one GORR also held at the launch site.

3.4.2.2 The Contractor shall conduct quarterly Mission Integration Status Reviews that include status on all active missions under this contract and NRO integration effort(s). Reviews shall include the mission summary overviews, which provide status on contractual actions, technical risks and issues, LV multi-mission schedule, recent accomplishments, upcoming events, and other related issues. For a single mission contract, the MWG and MISR may be combined.

3.4.2.3 The Contractor shall include USG Team participation in Other Contractor Mission Readiness Reviews as defined in Section 4.0 of CDRL B008 (MIMP). For regularly scheduled reviews, the Contractor shall notify the USG Team no later than 14 calendar days in advance of the review. For last-minute reviews the Contractor shall notify the USG Team as soon as possible after the review is scheduled. (Electronic Data Access)

3.4.3 Space Vehicle Integration Information

3.4.3.1 For USAF missions, the Contractor shall provide the SV Team the appropriate LV and integration information necessary to satisfy Mission Requirements Annex and ICD requirements, supporting successful mission integration of the PL with the LV and successful launch of the PL into the designated orbit. The Contractor shall provide the USG Team information exchanged between the Contractor and the SV Team. (Electronic Data Access)

3.4.3.2 For NRO missions, the Contractor shall provide the OSL and LSIC the appropriate LV and integration information necessary to satisfy the ICD

requirements, supporting successful mission integration of the PL with the LV and successful launch of the PL into the designated orbit. The Contractor shall provide OSL information exchanged between the Contractor and the LSIC. (Electronic Data Access)

3.4.4 Interface Control Document

3.4.4.1 For USAF missions, the Contractor shall generate and maintain a mission ICD for each mission that correlates to Mission Requirements Annex. (CDRL B009) If any conflict or inconsistency exists between the signed mission ICD, the SIS, or this PWS, the ICD shall be given precedence.

3.4.4.2 For NRO missions, the Contractor shall generate and maintain a mission ICD that correlates to IRD requirements. (CDRL B009) If any conflict or inconsistency exists between the signed mission ICD, the SIS, or this PWS, the ICD shall be given precedence. The Contractor shall ensure that all LV hardware and software, including mission-unique hardware and software modifications, and the mission design complies with the ICD. The Contractor shall also provide systems engineering oversight to trace system requirements and provide continuous visibility into engineering efforts and their impact to the system.

3.4.5 Mission Design and Analyses

The Contractor shall perform mission design and analyses to ensure that the requirements of the mission ICD are met. The Contractor shall optimize the mission-specific design consistent with the mission-specific requirements and constraints as specified in the mission ICD. The Contractor shall reserve performance for SMC/LE management composed of 2% of LV capability plus payload equivalent mass of 75 pounds-mass (lbm) for mission assurance equipment/add-on instrumentation. (CDRL B010)

3.4.6 Orbital Debris Mitigation

The Contractor shall provide mitigation in accordance with the SPRD and use SMCI 62-110, *Space Debris Mitigation Management*, 24 July 2014 as guidance. (CDRL B010) (Electronic Data Access)

3.4.7 Integrated (Space Vehicle/Launch Vehicle) Operations Planning

3.4.7.1 For USAF missions, in coordination with SMC/LE, the Contractor shall plan for and execute launch site integrated operations and provide the USG Team an integrated operations schedule no later than 14 calendar days prior to the first day of integrated operations. The Contractor shall maintain the integrated operations schedule and provide updates for daily scheduling meetings. Integrated Operations start when SV and LV hardware are being actively transported in a common work area such as the Payload Processing Facility (PPF) through launch. The Launch Vehicle Contractor (LVC) shall initiate daily meetings with the SV and USG Teams throughout integrated operations. All Integrated Operations procedures shall be coordinated with SMC/LE. (Electronic Data Access)

3.4.7.2 For NRO missions, in coordination with OSL, the Contractor shall plan for and execute launch site integrated operations and provide OSL an integrated operations schedule NLT 14 calendar days prior to the first day of integrated operations. The Contractor shall maintain the integrated operations schedule and provide updates for daily scheduling meetings. Integrated Operations start when SV and LV hardware are being actively transported in a common work area such as the PPF through launch. The LVC shall initiate daily meetings with the LSIC and OSL throughout integrated operations. All Integrated Operations procedures shall be coordinated with OSL. The Contractor shall identify all relevant launch site facility constraints and requirements and resolve any incompatibilities that will impact SV or LV system design and operations for the mission. The Contractor shall also support LSIC planning to define launch base facility compatibility with planned mission support hardware movement and installation. (Electronic Data Access)

3.4.8 Launch Rehearsal Support

The Contractor shall perform launch rehearsals with the USG Team, SV Team, and NRO Operations Squadron (NOPS) using the SMC/LE Generic Government Baseline Launch Rehearsal Plan for USAF missions or the OSL BLEP for NRO missions as guidance.

3.4.8.1 The Contractor shall participate in rehearsal planning efforts, including the development and rehearsing of anomalies in coordination with the government/contractor, Rehearsal Working Groups (RWG), Rehearsal Anomaly Team (RAT).

3.4.8.1.1 For the RAT, the Contractor shall provide Launch Vehicle Program Rehearsal Lead (LVC SIM) to be the lead for all Contractor rehearsal activity and a Mission RAT member (LV SIM), a technical SME, to be responsible for coordinating the development of integrated LV/SV anomalies.

3.4.8.1.2 The Contractor shall support the RAT Kick-off meeting and weekly RAT meetings leading up to the rehearsals starting at L-6 months.

3.4.8.2 The Contractor shall develop with the RAT all documentation required for rehearsal to include white cards, profile letter, rehearsal script, rehearsal timeline, and integrated mission script and mission-specific DoL support.

3.4.8.3 For NRO mission rehearsals, the Contractor shall develop and provide simulated telemetry tapes containing simulated plus count launch vehicle telemetry and data to exercise plus count data displays.

3.4.8.4 The Contractor shall perform three integrated launch rehearsals for each mission. The first two rehearsals will be referred to as Integrated Crew Exercise (ICE) 1 and ICE 2; the third rehearsal will be a Mission Dress Rehearsal (MDR) using the SMC/LE Generic Government Baseline Launch Rehearsal Plan for guidance. In addition, for NRO missions, the Contractor shall perform a table-top exercise. The Contractor shall configure facilities for rehearsals such that connectivity between facilities shall represent that of DoL.

3.4.8.5 For NRO missions, the Contractor shall support Unclassified and Classified Academic sessions, to include development of the briefing materials, prior to each rehearsal and Unclassified and Classified Hotwashes following each rehearsal.

3.4.8.6 For USAF missions, the Contractor shall conduct Academic sessions, to include development of the briefing materials, prior to each rehearsal and Hotwashes following each rehearsal.

3.4.8.7 For NRO missions, the Contractor shall support three-dimensional (3D) computer simulation for demonstration and rehearsals.

3.4.8.8 During rehearsals, the Contractor shall provide key DoL personnel as required to simulate an authentic DoL scenario.

3.4.8.9 The Contractor shall make available the equivalent documentation that will be used for conducting rehearsals and launch, to include LV countdown procedures, Launch Console Handbooks (LCH), and rehearsal anomaly documentation as defined in the SMC/LE Generic Government Baseline Launch Rehearsal Plan for USAF missions and the OSL BLEP for NRO missions no later than 5 calendar days prior to rehearsals and launch. (Electronic Data Access in printable format)

3.4.9 Third Integrated Crew Exercise (ICE 3)
SMC/LE or NRO OSL may require a third ICE (ICE 3) for a particular mission (IAW contract clause SMC-H-005).

3.4.10 Mission Interface Control Document Requirements Verification
The Contractor shall verify that the LV requirements documented in the mission ICD are met and facilitate USG Team (for USAF missions) or OSL and LSIC (for NRO missions) participation in requirements verification. The Contractor shall provide a Verification Planning Matrix (VPM) and Verification Evidence Records (VER). (CDRLs B011 and B012)

3.4.11 Flight Hardware Interface Checks
The Contractor shall perform tests to verify the compatibility of the physical and electrical interfaces and clearances between the LV and SV. The testing shall verify that all physical and electrical interfaces meet mission ICD requirements. The Contractor shall perform electrical and mechanical fit checks of the adapter harness to the standard electrical interface panel for each SV. The Contractor shall accomplish the interface tests no later than L−12 months subject to the availability of facilities and SV hardware. In the event of unavailability of facilities or SV hardware, the time-phasing of this test shall be coordinated among the LVC, SV Team, and the USG Team for USAF missions or the LVC, LSIC and OSL for NRO missions. (CDRL A011)

3.4.12 Ground Hardware Interface Checks
The Contractor shall support SV GSE interface fit checks with the Launch System NLT L−12 months. The time-phasing of this test shall be coordinated among the LVC, SV Team, and the USG Team for USAF missions or the LVC, LSIC, and OSL for NRO missions.

3.4.13 Launch Safety Collision Avoidance and Radio Frequency Power Impingement Data
The Contractor shall perform analysis and provide data in support of the USG Team's Collision Avoidance (COLA) and Radio Frequency Power Impingement (RFPI) analyses. (CDRL B013 and B014)

3.4.14 Launch Range Coordination
For each mission, the Contractor shall capture mission unique hardware, processing, and hazards, including SV inputs, in the Missile System Prelaunch Safety Package (MSPSP) (either as an update to the MSPSP or as a mission unique MSPSP) and submit to Range Safety IAW AFSPCMAN 91-710. The Contractor shall also coordinate SV integrated operations and launch requirements (e.g., Radio Frequency [RF] emitter control, telemetry support, etc.) with the Launch Range via the Universal Documentation System (UDS) and other base support documentation. The Contractor shall coordinate approval of all related operation requests received from the Launch Range with the USG Team and SV Team for USAF missions. (Electronic Data Access)

3.4.15 Mission-Unique Tests
For NRO missions, the Contractor shall conduct, support, and coordinate test requirements as defined below:
(1) Fit check shall include a fit check of LSIC payload adapter (PLA) to LV electrical and mechanical interfaces. Includes LV factory support of required hardware checkout.
(2) Spacecraft Mechanical/Electrical Trailblazer shall include validation of LV encapsulation activity in PPF, validation of LV and SV hardware PPF space requirements, cleaning, buildup, use, movement, storage, etc. during the operational flow in PPF fit check/demonstration of PLA mate to LV hardware in PPF, and fit check/validation of LV/SV electrical and mechanical interfaces in the PPF. It shall also include fit check/demonstration of LSIC GSE, mechanical, and electrical interfaces at launch pad.
(3) 3D visualization support (LV flight and GSE hardware models)

3.5 LAUNCH OPERATIONS

In order to ensure the successful launch of healthy satellites into their intended orbit the Contractor shall process and launch missions and deploy PL(s) into their intended orbit as defined in individual Mission Requirements Annex (for USAF missions) and mission ICDs. The Contractor shall maintain and provide the USG Team insight into activities covered in the Launch Operations section of the PWS. All launches shall occur from CCAFS, VAFB, or Kennedy Space Center (KSC). The following **compliance documents** are applicable to execution of launch site operations and support services:
AFSPCMAN 91-710- Range Safety User Requirements- Launch Vehicles, Payloads, and Ground Support Systems Requirements,
SAE AS9100- Quality Management Systems- Requirements for Aviation, Space and Defense Organizations,
RCC 324-11- Global Positioning and Inertial measurements Range Safety Tracking Systems' Commonality Standard,
and RCC 501-08- Range Commander's Council Universal Documentation System.

The following **reference documents** are applicable to execution of launch site operations and support services:
AFI 91-202_Air Force Space Command Supplement (AFSPCSUP)_I,
AFI 91-217- Safety Program (Space/Systems Safety),

Air Force Space Command Instruction (AFSPCI), 10-1208,
Air Force Manual (AFMAN) 91-222_AFSPCSUP_I- Space Safety Investigations and Report,
American Society for Testing and Materials (ASTM) E1548,
VAFB Comprehensive Emergency Management Plan (CEMP) 10-2,
45 SW Comprehensive Emergency Management Plan (CEMP) 10-2,
30 SW Instruction (30SWI) 90-202,
30 SW Operating Plan (SWOP),
45 SW Operating Plan 91-204 Volume 2,
EELV ELSS System Requirements Document (SRD),
30 SWI 91-101- 30th Space Wing Operating Plan, Investigation of Launch and Launch Processing Mishaps,
respective 30 SW and 45 SW CSOSA- Commercial Space Operations Support Agreement Annexes,
and AFI 31-101-Integrated Defense and AFI_AFSPCS_SUP 31-101- Integrated Defense Air Force Space Command Supplement

3.5.1 Launch Site Operations and Support Services
The Contractor shall provide launch site operations and support services necessary to support scheduled NSS launches.

3.5.1.1 The Contractor shall modify, update, control, and maintain the launch operations procedures, out-of-position (OOP) procedures, and any other launch site-related procedures. The Contractor shall provide a process for comment adjudication and/or incorporation. Except for OOP procedures, the Contractor shall provide the USG Team these procedures no later than 5 calendar days prior to their use. OOP procedures shall be provided to the USG Team as soon as possible. The Contractor shall produce procedures in accordance with SMC-S-016 paragraph 4.8.2. For paperless systems, the Contractor shall provide real-time access to the procedures as they are being performed. (Electronic Data Access)

3.5.1.2 The Contractor shall provide the USG Team access to all Work Authorizing Documents associated with Launch Operations. The Contractor shall provide the appropriate 30th or 45th Launch Group a list of WADs planned to be used for a mission no later than 30 calendar days prior to LV arrival at the applicable launch site. (Electronic Data Access) (CDRL B015)

3.5.1.3 The Contractor shall provide the USG Team a master Launch Operation schedule no later than 30 days prior to initial flight hardware arrival at the launch site, and provide updates when the master schedule changes. (Electronic Data Access)

3.5.1.4 The Contractor shall provide the USG Team unescorted physical access to daily launch site operations.

3.5.1.4.1 The Contractor shall pre-coordinate launch site processing activities with the appropriate 30th or 45th Launch Group prior to launch site processing tasks being executed. SMC/LE, 45th Launch Group, and 30th Launch Group will pre-coordinate a list of Work Authorizing Documents to observe from the list provided in PWS paragraph 3.5.1.2. The Contractor shall allow the USG Team access to observe

Work Authorizing Documents planned after the submission of CDRL B015 to include OOP work scheduled or unscheduled. SMC/LE, 45th and 30th Launch Groups will provide a list of the names of all USG Team members who may observe Contractor's processes and provide updates, as applicable.

3.5.1.4.2 The Contractor shall maintain and provide the USG Team a daily schedule that forecasts all operations no later than 7 calendar days in advance and provides updates to operations less than 7 days out. Daily status includes work directed by Work Authorizing Documents and non-conformance process in addition to major maintenance activities associated with the launch site and LV. The Contractor shall invite the USG Team to all launch integration and scheduling meetings. (Electronic Data Access)

3.5.1.5 The Contractor shall provide the disaster preparedness plan no later than 30 calendar days prior to first LV hardware delivery at the launch site, and maintain on an annual basis after that. The plan shall address contingency safing and storage of LV and, if mated, PL. (Electronic Data Access)

3.5.1.6 The Contractor shall conduct and support USG Team participation in Contractor readiness reviews prior to major operational events (e.g., LV transport to the launch pad; PL encapsulation, mate, and transport; and LV propellant loading operations). The Contractor shall notify the USG Team no later than 5 calendar days in advance of each readiness review. The Contractor shall convey to SMC/LE any request to waive the 5-calendar-day notification requirement.

3.5.1.7 The Contractor shall support USG Team readiness reviews, which include:

- Mission Readiness Review (MRR) - scheduled 2 weeks prior to the scheduled SV operation
- Flight Readiness Review (FRR) –held at L-7 to 14 days
- Launch Readiness Review (LRR) - held at L-2 to 3 days
- Up to three SV milestone reviews for USAF missions or up to five NRO milestone reviews for NRO missions.

Support to USG Team readiness reviews includes attendance, presentation of requested information, and providing answers to questions posed during reviews or as follow-up questions related to material presented. For the milestone reviews, the LVC shall attest to the review Chairman whether the Launch System is ready to proceed with continued processing, assess the margin to the planned schedule, and discuss issues and risks as appropriate. For the Government's FRR and LRR, the Contractor shall attest to the review Chairman whether the Launch System is ready to proceed with launch. The Contractor shall also attest to the integrated mission readiness to OSL at the GORR, the Mission Certification Review, the MRR, and the Consent to Launch Review for NRO missions.

3.5.1.8 The Contractor shall be responsible for all transportation of the LV and its components (e.g., Stage1, Stage 2, Interstage, Fairings and Solid Rocket Motors

(if applicable)) subsequent from the point of arrival at Air Force Station or Base to include offloading at the launch site.

3.5.1.8.1 The Contractor shall invite the USG Team to all LV transportation planning meetings.

3.5.1.8.2 The Contractor shall support USG Team participation in transport activities by including USG Team in convoy with support vehicles and in real-time discussions during transports involving issues potentially impacting LV components.

3.5.1.8.3 The Contractor shall conduct a pre-route survey prior to moving flight hardware and shall advise the USG Team of this process.

3.5.1.8.4 The Contractor shall ensure that all required environmental considerations (e.g., temperature, shock, humidity, and vibration control) are monitored and recorded before, during, and after the transportation and handling of the LV or its components. The Contractor shall report discrepancies to the USG Team in accordance with PWS paragraph 3.1.16. (Electronic Data Access)

3.5.1.9 The Contractor shall vertically encapsulate the PL. The Contractor shall vertically transport the Encapsulated Assembly (EA) to the LV. For missions which the MRA allows, the Contractor shall vertically or horizontally mate the EA to the LV. If the Contractor chooses to integrate the EA horizontally then the contractor shall agree to work to closure all Government identified issues/risks associated with integrating the EA horizontally. If the Contractor is vertically integrating the EA during integrated LV-PL operations, the LVC shall maintain the PL in the vertical position (defined by SIS Rev B, 4.7) at all times. "Vertical" is defined as the PL or LV axis corresponding to the EELV Standard Interface positive X-axis (Ref. SIS Rev B 3.1.1.1), being aligned opposite to the local gravity vector to within 5 degrees.

3.5.1.9.1 The Contractor shall execute their proposed processing operation for an EELV class mission via pathfinder or launch operations no later than L-12 months. (CDRL B016)

3.5.1.9.2 The Contractor shall encapsulate the PL in the mission-specified PPF (per MRA, IRD or ICD). The Contractor shall provide the GSE necessary to encapsulate the PL in the payload fairing (PLF), excluding SV specific hoisting equipment, and transport the EA from the PPF to the launch complex. The Contractor shall provide necessary hardware (e.g., diving boards, ladders, access stands, and lighting) to access the PL via all PLF doors, at the PPF and at the launch complex.

3.5.1.9.3 The Contractor shall ensure that all LV equipment and procedures related to PL encapsulation and EA transport are compatible with the designated PPF. The Contractor shall survey the route and transport the EA to the launch pad over the pre-surveyed route.

3.5.1.9.4 The Contractor shall maintain, monitor, and record EA environments as defined in the mission ICD or the IRD (for NRO missions) or the Mission Requirements Annex (for USAF missions).

3.5.1.9.5 At the launch complex, the Contractor shall provide environmental protection, to include weather, contamination, and RF mitigation, for the PL and personnel during access to the PL. The Contractor shall provide the SVC provisions to install and use "drag-on" equipment at the launch complex for the PL as specified in the IRD, Mission Requirements Annex or mission ICD. For NRO missions, the Contractor shall provide provisions for the installation and operation of Government-provided RF Detection/Collection System (RFDCS) and On-Line Lightning Measurement System (OLMS) hardware in close proximity to the EA while mated to the LV, as specified in the IRD or mission ICD.

3.5.1.9.6 The Contractor shall perform verification testing and operations procedures, as mutually agreed upon with the SVC, for post-mate to the Adapter; post-encapsulation; pre-mate readiness and post-mate to LV; and pre-launch on-pad.

3.5.1.9.7 The Contractor shall conduct Contingency Operations as follows: (a) once the EA is mated to the LV, the Contractor shall coordinate with the SVC, any deviation from planned procedures and timelines. An outcome of this coordination may result in the EA being de-mated and transported to the PPF by the Contractor; and (b) in the event of an on-pad abort, the Contractor shall re-establish pre-launch on-pad access capabilities as required by the SVC, taking into account post-abort safing procedures.

3.5.1.10 The Contractor shall support daily SV processing coordination meetings from start of integrated operations at the launch site through launch.

3.5.1.11 The Contractor shall support testing of SV-unique communication links as specified in the mission ICD.

3.5.1.12 The Contractor shall perform pathfinder and/or interface testing in advance of launch site processing to ensure there is low "launch on time" risk. The Contractor shall perform final system level integrated test to verify the compatibility of the physical and electrical interfaces and clearances between the LV, SV, and range as defined in the mission ICD.

3.5.1.13 The Contractor shall perform integrated launch system tests (e.g., Wet Dress Rehearsal [WDR], or static fire), or provide technical rationale why test is not required. USG will approve technical rationale no later than L-12 months. The test shall ensure all interfaces between launch vehicle and ground systems, and all critical launch vehicle subsystems which would drive a launch delay if discovered day of launch are functionally verified. Full functional verification and cryogenic conditions are not required so long as the launch delay risk has been mitigated by an adequate system level test.

Integrated launch system tests shall not be conducted with the encapsulated assembly integrated on to the LV.

3.5.1.14 Operational Surveillance Requirements

The Contractor shall support Government surveillance and analysis of the EELV Contractor processes and launch operations from launch base testing and operations to post-flight/test analysis. This is in support of the Government mission assurance plan as outlined in AFSPCI 10-1208 Spacelift Operations. The USG Team will monitor Contractor-performed launch base testing by viewing test and launch operations data, monitoring voice communications, viewing Closed Circuit TV (CCTV) video, or by witnessing the test. Launch operations include readiness activities such as launch rehearsals. Government mission assurance activities will be implemented with a "see and hear what the Contractor sees and hears" philosophy such that the USG Team can perform its mission assurance role with the same information being used by the Contractor.

For all missions, the Contractor shall provide real-time telemetry data, audio/video feeds, in the format defined below for launch operations, to the on-site Government technical team and off-site designated Government telemetry acquisition system during testing operations.

3.5.1.14.1 Operational Voice Requirements

The Contractor shall provide the onsite Government technical team and offsite designated Government telemetry acquisition system full-duplex communication capability on all Contractor Voice Nets during launch base processing through the end of the mission. Restriction to full duplex capability shall be determined on an operation to operation basis.

3.5.1.14.1.1 The Contractor shall provide a direct full duplex communication interface at a SMC/LE designated demarcation point capable of supporting at least 48-channel capacity, for Government communication distribution.

3.5.1.14.1.2 The operational voice requirements shall be met for all Contractor launches in support of Government mission assurance crossover assessments.

3.5.1.14.2 Video Requirements

The Contractor shall provide the onsite Government technical team and offsite designated Government telemetry acquisition system with full video access to all launch Contractor video feeds, at a SMC/LE designated demarcation point, during launch base processing through end of mission. The operational video requirements shall be met for all Contractor launches in support of Government mission assurance crossover assessments.

3.5.1.14.3 Data and Timing Requirements

For all missions, the Contractor shall provide real-time telemetry data, correlated time of day, and countdown timing to the onsite Government technical team and offsite designated Government telemetry acquisition system during launch base processing and countdown operations through end of mission. For NSS missions, real time telemetry coverage and collection is required for mission critical events (i.e. Powered flight and separation events). The Contractor may use multiple space based or ground stations to meet the real time requirement. For non-NSS missions, the Contractor shall provide telemetry data, correlated time of day, and countdown timing to the onsite Government technical team and offsite designated Government telemetry acquisition system during launch base processing and countdown operations through end of mission in support of Government mission assurance crossover assessment. Real-time telemetry data, correlated time of day and countdown timing shall be provided by the Contractor to a SMC/LE designated demarcation point.

3.5.1.14.3.1 For NSS missions, the Contractor shall transmit real-time LV and GSE Pulse Code Modulation (PCM) or native format data during launch base processing, countdown operations, and throughout the duration of flight to end of mission. For non-NSS missions, the Contractor shall transmit LV and GSE PCM or native format data during launch base processing, countdown operations, and throughout the duration of flight to end of mission, as available.

3.5.1.14.3.2 For all missions, the Contractor shall provide 30 Contractor workstations (both hardware and software) at the launch site with the capability to view, analyze, data review, and print the same Contractor system displays, within 1 second of when the display was generated, as the Contractor. "Same displays" means the same information; changes in command states, alarm limit changes, and the responses to alarms should be available and up to date. Contractor workstations shall have a data archive capability sufficient to store processed data associated with the current vehicle (for each vehicle type) as it moves through its launch flow.

3.5.1.14.3.3 For NSS missions, the Contractor shall provide routine response, system administration, training and technical support, and on-call response for the Contractor workstations during rehearsal, system-level tests, integrated operations, and on DoL. For non-NSS missions, the Contractor shall provide routine response, system administration, training, and technical support.

3.5.1.14.3.4 For all Contractor launches, the Contractor shall transmit Inter-Range Instrumentation Group – Time Code Format B (IRIG-B) and countdown timing data to the designated Government telemetry acquisition system.

3.5.1.14.3.5 For NSS missions, the Contractor shall record ground system, LV system, video, and voice data for playback. For non-NSS missions, the Contractor shall provide ground system, LV system, video, and voice data for playback, as available. (CDRL B017)

3.5.1.14.4 Contractor Facility Requirements

3.5.1.14.4.1 At the launch site, the Contractor shall provide six consoles containing Operational Voice Workstations and an EELV's Contractor telemetry processing system. Seating shall be in the same room and co-located with Contractor counterparts for the following roles: Government Mission Director (GMD), Deputy Government Mission Director (DGMD), Aerospace General Office (AGO) General Manager, Launch Vehicle Lead (LV-1), and two SV positions. For NRO missions, an Aerospace Chief Engineer (AERO CE) will also be required.

3.5.1.14.4.2 At the launch site, the Contractor shall provide six additional consoles containing Operational Voice Workstations and an EELV's Contractor telemetry processing system. Seating is desired to be co-located with Contractor counterparts for the following roles: AGO Program Manager, AGO Program Director, AGO Chief Engineer, Air Force Launch Director, Deputy Air Force Launch Director, and Air Force Advisor. If the Contractor uses restricted systems, such as foreign suppliers, the Contractor shall provide eight additional consoles containing Operational Voice Workstations and an EELV's Contractor telemetry processing system per subsystem.

3.5.1.14.4.3 At the Contractor design engineering facility, the Contractor shall provide two consoles containing Operational Voice Workstations and an EELV's Contractor telemetry processing system.

3.5.1.14.4.4 The user consoles shall contain an Operational Voice Workstation for Contractor and Government voice nets with a headset jack, headset, and a Contractor telemetry data display workstation.

3.5.1.14.4.5 The Contractor shall provide user training to the USG Team on the Contractor's console systems.

3.5.1.14.4.6 The Contractor shall provide the USG Team access to all of the Contractor's engineering, primary production, testing, and launch facilities and sites.

3.5.1.14.5 The Contractor shall include in its normal, daily scheduled activities, the planned preventative maintenance and upgrades to maintain the processing and display capabilities of the Contractor's telemetry, data processing, and monitoring systems provided to the USG Team in a non-contractor facility. These systems and data shall be the same as used by the Contractor in monitoring their operations.

The Contractor shall develop and execute the procedures that integrate the Government Launch Operations Team into all aspects of integrated launch system tests (e.g., mechanical pathfinders, Wet Dress Rehearsal (WDR), or static fire), and launch countdown (e.g., T−0 times, anomaly resolution, resource conflicts, reporting of vehicle capability with respect to winds aloft, Range Safety and Mission Assurance COLAs).

3.5.1.14.6 The Contractor shall perform the operation in close coordination with the Government Launch Operations Team, which culminates in an operational readiness statement to the GMD. The GMD will make the final "Ready/Not Ready" determination to proceed with LV propellant tanking and movement of the LV or facility around the LV in support of launch of the integrated LV/SV stack for NSS missions. The GMD will also make the final "Go/No-Go" for the operation determination of the integrated LV/SV stack for NSS missions. Any decision by the GMD to override the LVC's "Go/No-Go" for the operation may be subject to FAR 52.233-1 "Disputes."

The Contractor shall coordinate any planned attempts to recover/land the primary propulsive stage(s) with the USG Team Any plans to recover/land the primary propulsive stage(s) shall only be executed on a "do-no-harm" basis as it pertains to mission success, and shall not in any way infringe upon the propellant margin or Flight Performance Reserve for the mission. Any circumstances which may preclude the attempted recovery/landing of the primary propulsive stage(s) shall not be considered as a factor in the final "Go/No-Go" decision made by the GMD.

3.5.1.14.6.1 The Contractor shall provide status prior to, and obtain approval from GMD to proceed, for all critical operations during launch countdown, including (as appropriate to the Launch System):

i. Propellant loading and unloading
ii. Static engine firing (non-DoL)
iii. Enter Terminal Count
iv. Final Go/No-Go for launch
v. Recycle operations for the next launch attempt in an event of a scrub or abort

3.5.1.14.7 The Contractor launch countdown procedure shall comply with block-out periods in the launch window due to Government-determined and GMD-accepted COLA restrictions specified at L-2 hours.

3.5.1.14.8 In the case of an anomaly or out-of-family (OOF) condition encountered during the count, a real-time anomaly investigation shall be conducted and coordinated with the USG DoLTeam for concurrence.

3.5.1.14.9 The Contractor shall provide a dedicated voice network and dedicated individual to transmit real-time information such as balloon terminations, file formats and naming conventions for specific runs and steering profile names, etc. between the USG winds team and the Contractor winds team. The Contractor shall provide real-time controls and loads results from each wind balloon run during the DoL count. If the Contractor vehicle requires a flight software steering load, the load shall be provided to the USG winds team in real time during the DoL count.

3.5.1.14.10 In the event the GMD calls a "No-Go," the terminal count sequence shall be discontinued and the Contractor shall recycle for the next opportunity.

3.5.1.15 The Contractor shall provide the USG Team upper stage orbital vector and attitude data at the time of PL separation no later than 20 minutes after the Contractor's receipt of LV telemetry data or as specified in the mission ICD. (Electronic Data Access)

3.5.1.16 In the event of a launch mishap, the Contractor shall conduct a launch mishap investigation, including engineering analysis that is adequate to determine the cause of the launch mishap event and the corrective action necessary to prevent future launch mishap reoccurrences. The Contractor shall coordinate the investigation with the USG Team. (Electronic Data Access)

3.5.1.16.1 In the event of a launch mishap for launch services procured outside this contract, the Contractor shall support USG Team participation in the investigation and shall present cause and corrective action data for those components relevant to current and future EELV launch services.

3.5.1.16.2 The Contractor shall generate and provide the USG Team a Mission Contingency Plan for each EELV launch at least 14 days prior to launch using 30SWI 91-101, Section 2.10.1.7, 30 SW

Operating Plan and 45 SW Operating Plan 91-204, Volume 2, and 30 SW and 45 SW CSOSA Annexes as guides. (Electronic Data Access)

3.5.1.16.3 In the event of a mishap, the Contractor shall support the USG Team in ensuring the safety and the protection of Launch Site resources.

3.5.1.16.4 In the event of a mission failure, the Contractor shall impound and place under positive control all flight and processing data that are accessible directly or through agreements with other agencies and subcontractors.

3.5.1.16.5 The Contractor shall provide the USG Team all the data and reports applicable to the Contractor's launch mishap investigation and corrective action determination, including any revisions or updates of the information upon completion of the launch mishap investigation. (Electronic Data Access)

3.5.1.16.6 The Contractor and its subcontractors shall support USG Team independent mishap investigation(s). Support for these independent mishap investigations will be executed as separate contract actions in accordance with PWS paragraph 3.7, Quick Reaction and Anomaly Resolution, unless the parties agree otherwise.

3.5.1.17 For NRO missions, the Contractor shall provide additional security support at the launch site during the launch campaign as defined by the NRO security protection guide and the mission-unique security plan.

3.5.2 Launch Infrastructure

The Contractor shall provide fully mission capable launch infrastructure in order to ensure flight hardware integrity and meet the mission processing schedule and contracted launch date.

3.5.2.1 The Contractor shall invite the USG Team to Contractor-led facility and infrastructure meetings and working groups.

3.5.2.2 The Contractor shall provide the USG Team with a DoL Readiness Assessment, status of any corrective actions, repairs required to return or maintain the launch complex operational readiness since the prior mission, first use items, special attention items, and mission-unique items for all Critical GSE after the FRR and no later than 72 hours prior to the LER. (Electronic Data Access)

3.5.2.3 The Contractor shall provide the USG Team access to Launch Infrastructure documentation. (Electronic Data Access)

3.5.2.4 The Contractor shall provide the USG Team launch complex Critical GSE performance anomaly findings no later than 4 calendar days following a launch. (Electronic Data Access)

3.5.2.5 The Contractor shall provide the USG Team access to a quick-look post launch damage assessment for any corrective actions or repairs required to return the launch complex back to full mission capability no later than 14 calendar days following a launch. (Electronic Data Access)

3.5.3 Base and Range Support

The Contractor shall interface with the appropriate launch site representatives to acquire all necessary base range operations and base support services for NSS launches.

3.5.4 Mission Commodities

The Contractor shall provide required launch commodities (e.g., propellants, liquids, and gases) to support all phases of LV processing and launch for NSS missions. The Contractor shall provide commodities to the SVC as required by the mission ICD. The Contractor shall provide to the USG Team sampling services reports for all mission commodities in accordance with the mission ICD. (Electronic Data Access)

3.6 SUPPORT TO GOVERNMENT SPACE FLIGHT WORTHINESS

The Contractor shall support the Government's Independent Mission Assurance process for SFW Certification and readiness of the LV, subsystems, components, and mission design. SFW criteria are outlined in:
AFI 63-101/20-101,
SMC-G-1201 through SMC-G-1204,
and the SMC/LE EELV Mission Assurance Plan.
Additional verification activities may be added to address mission-specific needs or identified risks. SFW and Mission Assurance responsibilities are outlined in AFSPCI 10-1208 Chapter 2 and the SMC/LE EELV Mission Assurance Plan (MAP). The Contractor shall submit a Government-approved Non-Recurring Engineering (NRE) Work Closure plan (CDRL B020). The Contractor shall identify a technical POC (vehicle chief engineer or equivalent) to work with the USG counterpart to manage the activities in this section.

3.6.1 Contractor Support to Government Space Flight Worthiness Meetings

The Contractor shall support the Independent Government Mission Assurance data requests by providing requested data, responses to questions from the USG Team, and insight into technical rationale and understanding of any differences that result from the independent assessments. The Contractor shall support Government Discipline Area Working Groups via teleconference. There are sixteen working groups that meet on a periodic basis in accordance with the table below. These working group meetings may be combined with Government approval. The Contractor shall start coordinating with USG Team on all deliverables in CDRL B010 no later than 60 days prior to each deadline at the working group meetings. For each working group, the Contractor shall provide a Responsible Engineer (RE) from the appropriate discipline(s). (CDRL B010)

Working Groups	Nominal Timeline	Frequency
Avionics Systems	L-2 years to L-1 year	Monthly
	L-1 year to ILC	Weekly
Batteries	L-2 years to L-1 year	Monthly
	L-1 year to ILC	Weekly
Contamination	L-2 years to ILC	Monthly
Day of Launch Winds	L-2 years to L-1 year	Every 3 months
	L-1 year to L-3 months	Monthly
	L-3 months to ILC	Biweekly
Dynamic Environments	L-2 years to ILC	Monthly
Engines	L-2 years to L-1 year	Monthly
	L-1 year to ILC	Weekly
Flight Controls	L-2 years to L-1 year	Every 3 months
	L-1 year to L-6 months	Monthly
	L-6 months to ILC	Biweekly
Flight Mechanics	L-2 years to L-1 year	Every 3 months
	L-1 year to L-6 months	Monthly
	L-6 months to ILC	Biweekly
Flight Operations	L-2 years to L-1 year	Every 3 months
	L-1 Year to ILC	Monthly
Flight Software	L-2 years to L-1 year	Monthly
	L-1 year to ILC	Weekly
Ground Systems Software	L-2 years to L-1 year	Monthly
	L-1 year to ILC	Weekly
Guidance Avionics Hardware	L-2 years to L-1 year	Monthly
	L-1 year to ILC	Weekly
Launch Operations	L-2 years to ILC	Monthly
Loads	L-1 year to ILC	Biweekly
Power/Control Avionics Hardware	L-2 years to L-1 year	Monthly
	L-1 year to ILC	Weekly
Propulsion Systems	L-2 years to L-1 year	Monthly
	L-1 year to ILC	Weekly
Ordnance	L-2 years to L-1 year	Monthly
	L-1 year to ILC	Weekly
Structures	L-2 years to L-1 year	Every 3 months
	L-1 year to L-6 months	Monthly
	L-6 months to ILC	Biweekly
Telemetry	L-2 years to ILC	Quarterly
Thermal/Aero/Fluids	L-2 year to ILC	Monthly

3.6.2 USG Team Participation in Contractor Production and Engineering Forums

3.6.2.1 The Contractor shall conduct a weekly chief engineers meeting with the USG product line chief engineer to discuss customer concerns and emergent technical changes and issues identified by the Contractor. The Contractor shall provide the USG product line chief engineer access to technical meetings to discuss or resolve key issues.

3.6.2.2 The Contractor shall invite the USG Team to Contractor product team regularly scheduled and ad hoc meetings related to the certified/approved launch system configuration and potential changes or risks to the certified/approved launch system configuration. Product team meetings provide Government insight into Contractor unplanned work and planned recurring and non-recurring activity associated with a hardware element or analysis area.

3.6.2.3 The Contractor shall notify the USG Team of production process related changes. The Contractor shall support USG Team participation in engineering and production reviews associated with significant production process changes, including the readiness reviews to implement those changes. All production process related documentation changes, including associated command media changes and production process re-verification plan, shall be posted and made available to the USG Team. (Electronic Data Access)

3.6.2.4 The Contractor shall support USG Team participation in anomaly investigation meetings associated with test failures or significant non-conformances.

3.6.2.5 The Contractor shall post and make available to the USG Team failure analysis reports, crossover assessments, and corrective actions (Electronic Data Access).

3.6.2.6 The Contractor shall support USG Team participation in Launch Site Status meetings associated with engineering disciplines and emergent technical issues and concerns for the launch system at the launch site.

3.6.2.7 The Contractor's Launch System REs shall conduct the walk-down of the vehicle and Critical GSE prior to vehicle flight closeout. The Contractor shall notify the USG Team no later than 14 calendar days in advance of the walk-down. The Contractor shall provide the USG Team the walk-down checklists prior to the walk-down. The Contractor shall provide completed checklists and findings immediately to the USG Team and summarize the findings in the Contractor's readiness reviews. The Contractor shall support a final review of issues and non-conformances encountered between vehicle shipment to the launch site and final close-outs. (Electronic Data Access)

3.6.2.8 The Offeror shall document and disposition Test-Like-You-Fly exceptions in a format consistent with the Offeror's command media.

3.6.3 Contractor Support to SMC/LE Issue Closure

3.6.3.1 The Contractor shall support SMC/LE's issue resolution process using the SMC/LE Technical Issue Resolution Process (TIRP) as guidance.

3.6.3.2 For issues identified through the conduct of PWS Section 3.2, the Contractor shall support the USG issue resolution process. The Contractor shall support additional USG Team fact finding through access to engineering counterparts, working groups, data access, or established Request For Information (RFI) processes.

3.6.3.3 Elevated risk (i.e., risks with probability above 3 in 1,000), significant first flight items, items outside of qualification, flight anomalies, significant test failures, or significant OOF data shall be brought to the attention of the USG Team.

3.6.3.4 The Contractor shall allow the USG Team to observe and participate in the engineering investigations associated with issues and elevated risks.

3.6.3.5 For significant risks (i.e., between 1 in 100 and 3 in 100), outside of qualification, or where a quantitative risk assessment cannot be performed and qualitative risk assessment results in a "Low-Medium" risk position per the TIRP, the Contractor shall develop a mitigation plan to reduce the risk to "Low" per the TIRP for implementation if directed by the USG team at no additional cost to the USG.

3.6.3.6 For risks with probability above 3 in 100, or items where a quantitative risk assessment cannot be performed and qualitative risk assessment results in a Medium Risk position per the TIRP, the USG Team will not recommend launch to the launch certification authority, and the Contractor shall support the USG Team issue resolution process and conduct mitigation activity to reduce the risk. The Contractor shall develop and implement a USG approved mitigation plan to reduce the risk to "Low" per the TIRP at no additional cost to the USG.

3.6.4 Launch Vehicle As-Built Configuration List (CDRL A009)

The Contractor shall provide the USG Team, for each mission, information that specifies software revisions, drawing numbers, next higher assembly part number, revision letters, and serial numbers for all SMC/LE-identified flight-critical hardware. The Contractor shall provide the USG Team with revisions for the first flight, qualification, and certification articles. The Contractor shall update the information as changes are made. (Electronic Data Access)

The Contractor shall provide the USG Team with a list of all flight hardware component/system removed and replaced during the launch vehicle production and testing flow no later than 7 days prior to WDR or equivalent, no later than 7 days prior to FRR, and immediately for any flight hardware component/system removed and replaced afterwards.

3.6.5 Government Hardware Review

The Contractor shall provide an As-Built Configuration List (ABCL) (CDRL A009) and a Flight Critical Hardware List (CDRL B018). Following contract award, the Government Product Line Chief Engineer will develop the Pedigree Review Matrix (PRM) from these lists. The PRM defines the items to be reviewed and the level of review required. The Contractor shall comply with Appendix G in support of on-site Government Hardware Reviews. It is the intent of the Government to conduct hardware reviews in conjunction with the Contractor's processes when possible, and as soon as practicable otherwise. The Contractor shall provide all data and complete all RFI/RIDs NLT 60 days prior to ILC with the exception of the launch site hardware review. The government hardware acceptance process is broken down into three categories of review.

3.6.5.1 Category 1 - Government Pedigree Review: The purpose of the Government Pedigree Review is to enable the Government to develop an informed flightworthiness assessment of each item/assembly under review. It consists of a detailed data review of all the engineering drawings, supporting build/work instructions, test data, quality records, and non-conformances/dispositions associated with the item being reviewed. The Pedigree Review is also designed to inform the Government of any and all changes to the current item's configuration as it compares to the configuration of the item that underwent qualification – this includes all engineering changes (Class 1 and Class 2) as well as all deviations and waivers from the approved item drawings/specifications. It is the Government's desire that all the aforementioned data be managed electronically by the Contractor and available to the Government team remotely in order to minimize travel and disruption of daily activities at the Contractor's facility. Data shall be updated and available continuously, with the complete set of data available for review within 1 week of the hardware selloff.

For some first flight, complex, difficult to produce, and single point failure hardware or complex system test programs, (specifically engines, motors, integrated assemblies, and payload fairing assemblies) Pedigree Reviews shall be conducted at the manufacturer's facility (CDRL B019). The Pedigree Review can be held concurrently with the Contractor's internal Hardware Acceptance Reviews (HARs) (reference SMC-S-003 (T) section 7.5) provided all the required data is available and this merged review has been approved by Government Product Line Chief Engineer. Timing of the on-site Pedigree or Joint Pedigree/HAR shall be as soon as possible after the item has completed all build and test and is ready for delivery or storage. Notification of a review shall be provided to the Government no less than 4 weeks prior to the desired review date.

Category 1 items in the PRM usually include completed structural assemblies, clamp band or separable assemblies, feedlines with bellows or gimbal joints, tanks/bottles/domes, valves, ordnance or mechanical devices, welded or composite structure, batteries, guidance and control avionics, all engines, motors, integrated assemblies, and payload fairing assemblies. Category 1 reviews nominally use 2 sets of eyes for reviewing each build record or quality document and a total Government team of up to 20 people

3.6.5.2 Category 2 – Acceptance Data Package Review: The Acceptance Data Package (ADP) review is a detailed data review where the Government team has access to high level assembly data, inspection and test data, departures from engineering baselines (engineering change proposals, waivers and deviations), non-conformance data (to include Material Review Board dispositions), and test anomalies. All ADP review data shall be managed through the contractor's electronic database and available to the government team remotely and concurrently within 1 week of the hardware selloff. The contractor shall provide 5 day notification of data availability.

Category 2 items in the PRM usually include orifices, frames, skins panels, pyro valves, high production rate ordnance, mechanical disconnects and hold down systems, ducts, simple valves, and avionics not noted in Category 1.

3.6.5.3 Category 3 – Real Time Final Assembly & Launch Site Test Review: Final verification of the integrated system is a real time process with minimal schedule margin. All data acquired during this process including telemetry, non-conformances, procedures and quality records shall be available real time. All this data shall be managed through an electronic database and available to the government team remotely. For items not available electronically due to media limitations, an on-site review is acceptable upon government approval.

3.6.5.4 Government Issue Resolution for Hardware Reviews

Request for Information (RFI) – This is generally a clarification request or a request for a data product such as a supporting analysis, quality document or drawing. RFIs shall be answered within 2 weeks for the request and are no additional charge to the government.

Review Item Discrepancies (RID) – This is a finding where the government team determines the contractor has a discrepancy requiring mitigation. The contractor shall correct the discrepancy at no additional charge to the government within 30 days of the RID being issued.

The RID/RFI process shall be managed by the contractor through an electronic database accessible by the government team.

3.6.5.5 Government On-site Visits

The government hardware review team shall have the option to visit contractors and sub-contractors for cases where category 1 – 3 reviews are made fully electronic and are conducted remotely. This visit can be concurrent with contractor's internal HARs at the discretion of the government. Teams shall consist of approximately 20 visitors and visits will occur over approximately 2 days (4 days for concurrent HARs) and may include special topics such as quality reviews, technical interchange discussions, or program reviews. Topics shall be agreed upon by the government and contractor program manager.

3.6.5.6 Hardware Assignment

The Contractor shall minimize schedule risk associated with findings in government hardware reviews by assigning hardware slated for government missions early in the production cycle. In cases where a flight critical hardware item is procured in lots, is assigned upon usage or no advance notification prior to use is feasible, Category 1-3 data is required for the entire lot or hardware range and shall be made available in the same time frame as noted under the category description.

3.6.6 Launch Vehicle Production Cycle Review Support

The Contractor shall support USG Team participation in facility, GSE and vehicle walk-downs, production readiness reviews, stage pre-ship reviews, test readiness

reviews, and other related processes to begin and complete major activities in the LV production cycle. The Contractor shall make related documentation available. (Electronic Data Access)

3.6.6.1 Pre-Ship Readiness Review: The objective of the Contractor's Pre-Ship Review is to verify readiness to ship flight hardware to the launch site. The review would include end-item product configuration status, technical risk summary from mission design reviews, production summary including status of transferred work and remaining open work, product non-conformances and time/cycle life status, and transportation plan.

3.6.6.2 Launch Site Readiness Review: The objective of the Contractor's Launch Site Readiness Review is to verify launch site readiness to receive and process flight hardware. The review includes verification and validation results for ground (GSE and facilities) configuration, resolution of significant issues identified during refurbishment/modification and verification and validation activities, site operational readiness, and an aggregate list of accepted residual risk to date (GSE, facilities only)

3.6.7 Office of Space Launch Independent Validation and Verification
The NRO/OSL IV&V Team refers to the NROL/OSL and includes the Aerospace Corporation, OSL SETA contractors and other IV&V contractors as designated by NRO/OSL.

3.6.7.1 For NRO missions, the Contractor shall provide the OSL IV&V Team access to the Contractor's mission analysis and flight software assumptions, data, reports, and expertise in order to develop independent tools, analyses, and assessment, and participation in the recurring working groups described in paragraph 3.6.1.

3.6.7.2 For NRO missions, the Contractor shall hold meetings as necessary for discussion and resolution of concerns regarding changes to the Contractor processes and products.

3.6.7.3 For NRO missions, the Contractor shall maintain logs of data requests and provide data delivery schedules upon requests. The Contractor shall inform the OSL of delays to original data delivery dates. (Electronic Data Access)

3.6.7.4 For NRO missions, the Contractor shall provide insight into changes to mission analysis and software process or products caused by the post-flight data analysis process.

3.6.8 National Reconnaissance Office/Office of Space Launch Mission Assurance Team

3.6.8.1 For NRO missions, the Contractor shall assign personnel to be members of the OSL Mission Assurance Team (MAT). These members shall provide the following functions: MAT Program Manager, data management coordination, and technical experts to be members of each of the three MAT Panels (Propulsion, Avionics, and Structural/Mechanical). They will also provide technical insight and support to mission areas outside of the MAT Panels as required by the OSL MAT. The Contractor shall ensure that the assigned MAT

personnel are physically located in areas conducive to maintaining cognizance within their assigned areas of technical or programmatic responsibilities. The Contractor MAT members shall perform the following duties, under the direction of the OSL MAT Chair and the OSL Mission Director:

3.6.8.1.1 Support MAT day-to-day insight into the LV program activities and site reviews

3.6.8.1.2 Brief LV status and issues to MAT Chair, MAT Chief Engineer, and MAT Panel Leads

3.6.8.1.3 Document LV technical issues in the MAT database and perform risk assessments

3.6.8.1.4 Provide support to the preparation of the OSL Mission Director Briefings

3.6.8.1.5 Coordinate, track, status, and respond to RFIs when issued by the MAT

3.6.8.2 For NRO missions, the Contractor shall facilitate interchange of mission assurance issues between the MAT and the LV program or any Contractor-sponsored independent mission assurance reviews.

3.6.8.3 For NRO missions, the Contractor shall facilitate full access to design, qualification, build, assembly, or test data on LV mission manifesting NRO PLs. The Contractor shall acquire, reformat, or reduce data when requested by the MAT Chair to identify or address the following for mission critical hardware:

(1) First-time flight use and last-use hardware and issues
(2) Class I and Class II engineering and process changes
(3) OOP and significant rework/repair activity
(4) Product/process non-conformances
(5) Significant OOF issues
(6) Industry quality and defect issues and relationships
(7) Waivers and Deviations
(8) Launch processing anomalies, flight anomalies, past action items or concerns and corrective actions

3.6.8.4 For NRO missions, the Contractor shall identify and assist in scheduling MAT participation in the launch system baseline and readiness reviews, including supplier reviews, HARs, process audits, and any relevant failure, reliability, or ERBs.

3.6.8.5 For NRO missions, as necessary, the Contractor shall conduct TIMs, reviews, and audits when requested by the MAT Chair. The agenda of TIMs shall include in-depth technical examination, understanding OOF observations, or addressing adverse failure trends or escapements to established manufacturing quality screens.

3.6.8.6 For NRO missions, the Contractor shall facilitate the ability of the MAT to shadow National Aeronautics and Space Administration (NASA) Mission Success Reviews and Pedigree Reviews.

3.6.8.7 For NRO missions, the Contractor shall provide insight to the MAT into any launch system issues which may impact the mission risk assessments.

3.6.8.8 For NRO missions, the Contractor shall evaluate the inclusion of MAT requested agenda items and RFIs in the Contractor baseline readiness review process.

3.6.8.9 For NRO missions, the Contractor shall publish mission and readiness review related activity/products on a MAT-sponsored restricted access unclassified collaborative environment and classified Web servers.

3.6.8.10 For NRO missions, if applicable, the Contractor shall support the MAT with access to restricted data from foreign suppliers within the limits imposed by the USG and Foreign Governments for third-party access to proprietary data.

3.6.9 National Reconnaissance Office Mission Integration Group

For NRO missions, the Contractor shall provide the necessary data, documents, SMEs, processes, and reviews to support technical assessments for certification of the NRO mission interface.

3.6.9.1 The Contractor shall provide the Mission Integration Group (MIG) an overview and familiarization of the LV, launch facility, GSE, and mission-specific satellite vehicle electrical and mechanical interfaces. (Electronic Data Access)

3.6.9.2 The Contractor shall provide support for reviewing the ICD requirements process, verification methodology, and provide verification closure evidence of ICD “shall” requirements. (Electronic Data Access)

3.6.9.3 The Contractor shall provide data and documents allowing review of mission-specific electrical and mechanical interface compatibility analysis and integrated testing results. (Electronic Data Access)

3.6.9.4 The Contractor shall provide support to the MIG’s electrical interface compatibility assessment; whose objective is to review all electrical functionality, electrical continuity, and signals across the LV/SV interface (end-to-end drawing audit).

3.6.9.5 The Contractor shall provide the data and results for ERBs/ARBs (or equivalent) that address issues affecting the LV/SV interface. (Electronic Data Access)

3.6.9.6 The Contractor shall facilitate MIG team participation in on-site observation of integrated LV/SV testing and milestone reviews held at the launch base.

3.6.9.7 The Contractor shall provide access to integration process documentation to aid in understanding how the LV/SV interface and mission integration process is executed. (Electronic Data Access)

3.6.9.8 The Contractor shall support MIG monthly status meetings to provide integration status, upcoming meetings and reviews, and in work interface issues.

3.7 QUICK REACTION AND ANOMALY RESOLUTION

The Contractor shall perform quick reaction and/or anomaly resolution activities in accordance with contract clause SMC--H005 using appropriately balanced labor skill mixes including senior level personnel. Examples of quick reaction and/or anomaly resolution activities contemplated under this contract include, but are not limited to, the following: additional mission analyses, such as performance and guidance accuracy analysis, coupled dynamic loads analysis, pre-flight controls and stability analysis, and payload/expended stage separation analysis. (CDRL C001)

3.8 MISSION-UNIQUE LAUNCH VEHICLE SERVICES

The Contractor shall manufacture and provide mission-unique hardware, any associated engineering design and integration analysis of the mission-unique hardware and software, and any additional mission-unique integration analysis necessary to deliver a LV in accordance with the applicable Mission Requirements Annex (for USAF missions only) and IRD (for NRO missions only). Mission-unique requirements typically include any SV-unique accommodations to the standard core vehicle, upper stage, PLF, or connecting hardware; and associated adapters or additional mission analyses necessary to meet the mission-specific ICDs. Additional Data Rights IAW DFARS 252.227-7013 RIGHTS IN TECHNICAL DATA--NONCOMMERCIAL ITEMS will be added as required.

APPENDIX A: GLOSSARY OF TERMS

This glossary defines terms used in this Performance Work Statement (PWS) or that may be used in support of this contract.

ACADEMICS: Academics sessions are presented to the entire integrated launch team participating in the exercise prior to each rehearsal to provide the rehearsal participants information on mission-specific requirements including, but not limited to, required and mandatory telemetry assets, lightning requirements, and video requirements. Academics also provide rehearsal specific information such as initial conditions and 24-hour Collision Avoidance for the respective rehearsal. Academics sessions nominally contain the following elements:

(1) Introduction
(2) Lessons Learned (if applicable)
(3) Entry and Exit Criteria
(4) Rehearsal Overview
(5) Countdown Summary
(6) Launch Vehicle (LV) Overview
(7) Space Vehicle (SV) Overview
(8) Range Operations Overview
(9) National Reconnaissance Office (NRO) Operations Squadron (NOPS) Overview
(10) Integrated Processes
(11) Rehearsal Weather
(12) Initial Conditions

ACCEPTANCE: The process by which as-built hardware and software are evaluated against requirements for compliance with specification and acceptability for shipment and subsequent processing.

ACCEPTANCE DATA PACKAGE (ADP): Documentation provided by the supplier at the time of delivery of a critical component. ADP contain varying degrees of data (mentioned in the Pedigree Review definition), but typically do not include the build paper. The data is used by the Engineer to make the flight worthiness assessment of various components. Documentation delivered in the Contractor's format is acceptable.

ALERT: An alert (such as a Government-Industry Data Exchange Program [GIDEP] or equivalent notification) is a Government and industry mechanism to share information on problem components or parts.

ANOMALY: Any observation that does not meet the criteria of a mishap and includes one or more of the following: it was not predicted, it cannot be explained, root cause is not understood, or it contributes to an elevated mission risk. Additionally, any observation that is a contributing factor to a mission anomaly or mission failure shall be classified as an anomaly.

ANOMALY RESOLUTION: Activities taken to identify reasons for any LV performance deviations from expected baselines.

ASCENT OPERATIONS WORKING GROUP (AOWG): The AOWG provides a forum for coordinating telemetry and tracking activities for each mission, to include associated operations, and coordinating and resolving plus count-related operational issues and concerns. The AOWG is chaired by the Contractor and is responsible for ensuring program requirements for data collection are satisfied. Participants include the United States Government (USG) Team, SV

Team (for United States Air Force [USAF] missions), Launch System Integration Contractor (LSIC) (for NRO missions), Office of Space Launch (OSL) (for NRO missions), NOPS, and Goddard Space Flight Center (GSFC) (Tracking and Data Relay Satellite System [TDRSS]).

COMMAND MEDIA: The collection of internal policies, procedures, and directives created by the Contractor that specify how the Contractor implements customer and industry standards, company business philosophy, and management goals pertaining to LV production, mission integration, mission assurance, launch operations, and business operations.

COORDINATE: USG Team will be involved with activity and must be in agreement with Launch Vehicle Contractor (LVC) action/activity/decision process prior to taking action. USG member is polled for agreement. Action discussions are allowed. Action items may be generated.

CRITICAL GROUND SUPPORT EQUIPMENT (GSE): Critical GSE is GSE that, if damaged or not meeting operational specifications, may preclude meeting the mission processing schedule or contracted launch date.

CROSSOVER: A piece of hardware or software at which a crossing is made with other LV configurations or launches. For example, a flight computer flown on one LV configuration is similar or identical to a flight computer flown on another LV configuration OR a software code used on a LV configuration for a launch is similar or identical to software code used on another mission with the same LV configuration.

CURRENT LAUNCH SCHEDULE REVIEW BOARD (CLSRB): A semi-annual forum chaired by 14 Air Force Commanders and attended by senior officers, program managers (PM), and commercial representatives from the launch community. The purpose of the CLSRB is to review resource, satellite, and launch assessments; prioritize launches; and approve the Current Launch Schedule.

DATA ACCESSION LIST (DAL): A list of Contractor internal data generated by the Contractor which the Government may request (available upon request). The DAL is not the report, but a list of their internal data pertaining to this contract that is available upon request.

DAY OF LAUNCH (DoL): Time period associated with execution to the launch countdown procedure. DoL may involve more than 1 calendar day.

DAY OF LAUNCH WORKING GROUP (DOLWG) MEETINGS: The objective of the DOLWG is to provide participants an overview of the established LV DoL processes and review the SV operations plan with a focus on finalizing integrated interfaces and inputs, and resolving potential conflicts or issues between the LV and SV processes. Specific attention is placed on understanding recycle requirements, anomaly resolution, polling, and T-0 coordination. The DOLWG shall address and resolve any Concept of Operations (CONOPS) or process issues identified in the Integrated Crew Exercises (ICE), and provide an opportunity for additional process familiarization to the team.

DIRECTORATE: The organization responsible for the acquisition and management of the respective space system.

DISCREPANCIES: Discrepancies are functional failures or any hardware or software anomalies that may affect mission performance and/or mission schedule.

ELECTRONIC DATA ACCESS: The ability of the USG Team to access the Contractor's host systems for the purpose of reviewing, uploading, or downloading specific, identified program-related information on Contractor host systems. Unless otherwise specified in this PWS or Contract Data Requirements List (CDRL) descriptions, data products required shall be provided via electronic file share and via hard copy only if not electronically available. Specific electronic connectivity requirements are stated in PWS Section 3.1.1.

ELECTRONIC PEDIGREE REVIEW (ePedigree): A pedigree review held remotely in which all pedigree data is provided in electronic format through a Contractor-provided terminal or other means of data access.

ENCAPSULATED ASSEMBLY (EA): The physical configuration comprised of the payload(s) (PL) enclosed by the payload fairing (PLF) (including any required flight adapters (e.g. payload adapter PLA) and GSE).

ESCAPEMENT: A nonconforming product identified by a work center in the nonconforming condition from the previous work center.

EVOLVED EXPENDABLE LAUNCH VEHICLE (EELV) PROGRAM: EELV is a funded Air Force program of record that provides Space Launch Services for National Security Space (NSS) PLs.

FAILURE REVIEW BOARD (FRB): A board of Contractor representatives that is necessary to identify causes of test/operational failures and implement corrective actions.

FLEET SURVEILLANCE: The surveillance of common components across the provider's entire manifest.

FLIGHT CRITICAL ITEM: A flight critical item (hardware or software) is an item that has been determined through a systematic analysis process (e.g., FMECA, FTA, PRA) whose failure can affect the system operations sufficiently to cause the loss of the stated vehicle objectives or a partial loss of the mission, or a hardware or software item whose performance is essential from both a range safety and SPO mission assurance standpoint.

FLIGHT READINESS REVIEW (FRR): The FRR evaluates the space flight worthiness and readiness of the entire mission, including flight hardware and software, facilities, personnel and training. It also notes the readiness of launch and support facilities (ground systems), range and orbital operations. The review includes a safety, suitability, and effectiveness verification of the integrated system. Space and Missile Systems Center (SMC)/Engineering Directorate (SMC/EN) shall organize the FRR in coordination with the Government Mission Director (GMD) or LV PM. The GMD shall present the review to the SMC Commander (SMC/CC) or designated representative. The briefing will provide the SMC/CC with hardware and software mission status for the LV, the spacecraft, ground systems, ground processing, launch and orbit operations, PL ground station, and associated interfaces. The review will take place after final integration of spacecraft to LV as close to launch as possible, typically 7–14 calendar days prior to launch. At completion of the FRR, the SMC/CC will assess and may certify space flight worthiness of the integrated system for all missions under this contract. For USAF-managed spacecraft and LV in support of non-USAF customers, the SMC/CC will be responsible for certifying only the USAF-acquired mission-critical elements. The FRR may be tailored to meet the requirements of

specific missions. A FRR is done only when the USAF is responsible for the LV or primary PL on a mission.

GOVERNMENT INDEPENDENT HARDWARE REVIEW TEAM: The Government Hardware Review Team is the team comprised of USAF, civilian, Systems Engineering and Integration (SE&I), and Aerospace FFRDC personnel directly involved with supporting and performing independent hardware reviews. The OSL/Mission Assurance Team will also support these reviews.

GOVERNMENT INTEGRATED MEETING (GIM): Chaired by 14 AF/A3 with participation from Headquarters Air Force Space Command (AFSPC)/A3S, SMC/LE, NRO, and National Aeronautics and Space Administration (NASA), the GIM is held shortly prior to the CLSRB to make scheduling decisions as directed by 14 AF/CC and to queue any other appropriate decisions for the CLSRB.

GOVERNMENT LAUNCH OPERATIONS TEAM: The Government Launch Operations Team is the mission team comprised of USAF, OSL, civilian, SE&I, and Aerospace FFRDC personnel directly involved with planning and execution of government launch operations for a specific mission. This includes personnel at Los Angeles Air Force Base (LAAFB) and the respective 30 SW or 45 SW at the launch site.

GOVERNMENT MISSION DIRECTOR (GMD): The Senior Air Force or NRO-OSL official who is assigned responsibility for successfully delivering the integrated LV/SV stack to the proper orbit. The GMD must be involved in issue resolution for both the LV and the SV through the launch campaign.

GMD STATUS REVIEW: A review of mission risks and issues, launch system status, launch operations schedule, Space Vehicle Contractor (SVC) and LVC Interface Control Document (ICD) verification status, range status, and SV status.

GOVERNMENT MISSION INTEGRATION MANAGER (GMIM): For USAF missions, the GMIM is the lead interface between LV and SV programs orchestrating launch campaigns, including operations planning, flight certification, and mission rehearsals. The GMIM also manages technical and funding changes between the SV and the LV and coordinates LV-to-SV interface requirements. For NRO missions, the GMIM is the lead interface between SMC/LE and OSL.

GROUND OPERATIONS READINESS REVIEW (GORR): The objective of the GORR is to verify the Launch Range, Payload Processing Facility (PPF) Contractor, and LVC are ready to support mission-specific launch site operations prior to shipment of the SV to the launch site.

GROUND OPERATIONS WORKING GROUP (GOWG): The objective of the GOWG is to coordinate launch site activities and resolve launch site operations issues and concerns. The GOWG is responsible for coordinating the launch site operations schedule, mission integration schedule, launch site facility and ground equipment interface requirements, and hazardous operations. The GOWG reviews and approves plans procedures and timelines associated with processing, testing, and launching the integrated SV/LV.

GROUND SUPPORT EQUIPMENT (GSE): Ground Support Equipment consists of, but is not limited to, fixed, portable, or mobile equipment, components, and systems that are necessary for the processing, operations, testing, transporting, facilities, refurbishment activities and proper

launch and safing of flight hardware (PL and/or Booster). These support equipment, components, and/or systems are typically, but not limited to, locations at, or in close proximity to, flight hardware, the launch systems, launch pad, facilities, and/or infrastructure that support mission operations.

HARDWARE ACCEPTANCE REVIEW: Review conducted by the prime Contractor, with appropriate USG Team representative attendance, to ensure the quality and reliability of the hardware before integrating units or other configuration items into subsystems or systems at the prime Contractor, subcontractor, or other facility.

HOLD: A command issued over channel 1 of the command network, signaling the need to stop the Launch Countdown.

HOTWASH: A Hotwash is held as soon as practical following each exercise. The Hotwash is typically conducted in person for ICE #1 and ICE #2, and over the communications net for Mission Dress Rehearsal (MDR). During the Hotwash, LV SIM will lead the review of the rehearsal and introduce each planned and unplanned anomaly, if applicable, and further discuss the anomaly description, expected reaction, and actual reactions of the team. Following anomaly discussions, the SMC/LE SIM will provide an assessment summary of the integrated launch team to the MD based on the integrated team's achievement of the rehearsal objectives. The MD will then make the final determinations that the exit criteria (Appendix C) have been met and of team readiness to proceed to the next milestone, be it the next rehearsal or launch. Following ICE #2 Hotwash, the MD will determine if the team requires additional training or rehearsal activities.

INCIDENT: An unplanned event that causes (or may cause) significant interruption to scheduled manufacturing and launch operations and/or degraded product/service quality. This includes near-miss events that could result in high-severity discrepancies or personal injuries.

INDEPENDENT GOVERNMENT MISSION ASSURANCE: Independent Mission Assurance is the SMC/LE's technical and management process that is rigorously, continuously, and iteratively employed over the life-cycle of a Launch System (mission conception to upper stage disposal) to maximize mission success. Independent Mission Assurance assesses the launch Contractor's system engineering, development, qualification, risk management, quality assurance, and program management to increase confidence that the mission will be successful.

INSERTION INTO THE PRESCRIBED ORBIT: This term is defined as the orbital location of the PL at the time of the PL's separation from the LV, within the altitude, velocity, inclination, and other such conditions, as specified in the System Performance Requirements Document (SPRD) and the appropriate approved mission ICD.

INSIGHT: Unescorted/unrestricted participation in activities and access to all matters which allow the USG Team to observe the Contractor's progress towards meeting the PWS requirements. This access includes, but is not limited to, the following: (1) Contractor facilities, including launch sites at Cape Canaveral Air Force Station and Vandenberg Air Force Base; (2) Contractor meetings conducted in the performance of this PWS, to include scheduled program reviews, Technical Interchange Meetings (TIM), configuration control boards, production scheduling reviews, etc., with participation in discussions during these meetings and in any follow-up dialogues on the subject matters discussed; (3) program activities such as, but not limited to, observing test events; (4) Contractor training programs including but not limited to on-the-job training; (5) information and analyses regarding any incidents or anomalies occurring

during fabrication, assembly, test, handling, transportation, launch, and ascent which could affect the integrity of the EELV system; and (6) all data directly related to the program.

INTEGRATED CREW EXERCISE (ICE): A rehearsal designed to familiarize the SV and LV team with the countdown procedures, anomaly resolution processes, and how their operations will be integrated into the LV countdown. The ICE also includes a rehearsal familiarization 1 calendar day prior to the rehearsal and either an in-person or on-net Hotwash.

A. ICE #1 is typically a SV-centric rehearsal used to introduce the PL Team with the Launch Countdown Process, timelines, launch decision flow, and anomaly resolution. It typically includes demonstration and verification of the following:
    (1) delivery of timely and accurate status to and from the PL Team;
    (2) execution of the Integrated Anomaly Resolution and Hold/Recycle/Scrub processes;
    (3) timely launch decision flow and polling;
    (4) identification of shortfalls and improvements in the proposed CONOPS; and
    (5) familiarization with the voice communication network.

B. ICE #2 is an all-inclusive SV/LV rehearsal intended to prepare integrated Government and PL teams for DoL CONOPS execution. It typically includes demonstration and verification of the following:
    (1) delivery of timely and accurate status to and from the Integrated Government and PL Teams;
    (2) execution of the Integrated Anomaly Resolution (LV stand-alone, Integrated, and SV only) and Hold/Recycle/Scrub processes;
    (3) timely launch decision flow and polling;
    (4) familiarization with SV, LV, and Range launch criteria; and
    (5) exchange of flight performance status and information after LV liftoff.

INTEGRATED OPERATIONS: At a minimum, integrated operations planning will address installation of LVC staging of equipment at the PPF, SV GSE at the launch pad, combined LV/SV operations at the PPF PLF encapsulation at the PPF, transport of the encapsulated SV from the PPF to launch complex, mate of the encapsulated SV to the LV, SV/LV interface verification testing, SV access provisions at the launch pad, and DoL operations.

INVITE: USG Team will listen in or observe activity. USG approval of LVC action/activity/decision process is not required. Clarification questions are permitted. No action items can be generated.

ISSUE: Any deviation or suspected deviation from the qualified Launch System baseline.

LAUNCH DATE: The calendar date within the Launch Slot during which the Launch is scheduled to occur.

LAUNCH GROUP: Includes Space Launch Squadrons and subordinate units that provide generation and launch execution of space launch systems.

LAUNCH INFRASTRUCTURE: The launch site(s), launch pad(s), and launch support facilities/equipment.

LAUNCH MISHAP: A launch mishap is any significant unplanned event or performance expectation, such as unintentional death, injury, occupational illness, damage to or loss of equipment or property, or damage to the environment, occurring after ignition.

LAUNCH OPPORTUNITY: A time period during which the Contractor may provide a Launch Service (including Launch Period, Launch Slot, and Launch Date).

LAUNCH PAD: A Launch Pad is defined as the on-site infrastructure contained within a Space Launch Complex required in launching a LV of any proposed configuration.

LAUNCH PERIOD: A period of 90 calendar days during which the Launch is scheduled to occur.

LAUNCH READINESS REVIEW (LER): The LER provides the forum for final assessment of all launch system preparations and each customer's individual certifications (SMC/LE and SV Directorate) of launch readiness. The purpose of the LER is to ensure that SV systems, LV systems, facilities and GSE, and all supporting organizations are ready and committed to support the final launch preparations, countdown, and launch. The Contractor conducts an LER at the launch site to provide a final pre-launch assessment of the integrated SV and LV system and launch facility readiness. Representatives from each key organization present a summary of their preparations and rationale for their readiness to proceed with the final launch preparations and countdown. The meeting concludes with a poll of each organization to express their readiness and commitment to launch.

LAUNCH SCHEDULE: A set of dates that include a Launch Period, Launch Slot, and Launch Date for a particular Launch Service.

LAUNCH SCHEDULE OPTIONS ASSESSMENTS: Analysis of alternatives to accommodate changes to the LV and associated spacecraft, mission schedule, and operational requirements. The analysis evaluates all launch constraints, including the following: launch throughput, LV readiness, SV ILC, launch pad availability, ground equipment availability, all liens, resolution date, and any applicable funding constraints.

LAUNCH SERVICE: The total effort required to deliver PL(s) to the prescribed orbit in accordance with Mission Requirements Annex (MRA), mission ICD, and target specification requirements. The launch service includes program management, systems engineering, LV production, mission integration, launch operations, independent Government mission assurance support, base and range support, and mission commodities.

LAUNCH SLOT: A launch slot is a 30-calendar-day window, with associated launch pad location assignment, given to a mission and integrated LV configuration for when the Launch is scheduled to occur. This is assigned in conjunction with AFSPC's CLSRB.

LAUNCH SUPPORT CENTERS: USG Team operations facilities where they execute their operational roles during LV processing events and DoL.

LAUNCH SYSTEM: A Launch System includes the LV, launch pad, GSE, and infrastructure required to launch a LV.

LAUNCH SYSTEM DATA: Fleet-wide data used and generated in the development, design, analysis, fabrication, qualification, acceptance, integration, and flight of LV and ground support hardware and software.

LAUNCH VEHICLE: An LV is the core vehicle, upper stage, additional solid or liquid boost rocket motors as required for a specific mission, PLF, associated interstage adapters, fittings, and any ship loose items. This term does not include the PL.

LAUNCH VEHICLE CONTRACTOR: Used interchangeably with Contractor, to identify the party responsible for supplying the LV.

MAJOR MAINTENANCE: Any maintenance if not accomplished that will impact launch infrastructure, launch capability, processing, or schedule, including upgrades and modifications to launch infrastructure.

MAJOR NON-CONFORMANCE: A non-conformance that (a) has adverse impacts on performance, reliability, effective use or operation, maintainability, interchangeability, safety, health, weight, appearance (when a factor), or contractual requirements; and (b) cannot be either completely eliminated by rework or reduced to a minor non-conformance by repair.

MANAGEMENT WORKING GROUP (MWG): The MWG is a forum for coordination and management of the EELV launch and mission integration. The MWG is comprised of the Government and their representatives, SV Team (for USAF missions), LSIC (for NRO missions), OSL (for NRO missions), and the LVC representatives, as required. The individuals that comprise the MWG are the key decision-makers in mission management from the initiation of the contract through launch and post-launch activities. A typical MWG agenda includes contract status, the mission status, LV production status, mission integration status, review and approval of the mission integration schedule and program documentation, action item status, results of any TIMs, and special topics items, as deemed necessary.

MANIFEST: Manifest is used to describe multiple PLs grouped for launching over a period of time (e.g., “the FY13–17 manifest” would include all mission PLs over the time frame from Fiscal Year [FY] 13–17).

MANIFEST REVIEW: A manifest meeting, chaired by the LVC, which reviews the enterprise launch manifest and addresses manifest related issues, including but not limited to, watch-items, decision points, and courses of action.

MASTER LAUNCH OPERATION SCHEDULE: A Master Launch Operations Schedule includes, but is not limited to, major launch operation events such as flight hardware transports, LV on-stand operations, major electrical verification tests, tanking tests, PL transport and integration, launch countdown rehearsals, and initial launch capability.

MATERIAL REVIEW BOARD (MRB): A board of Contractor representatives that is necessary to review, evaluate, and determine or recommend disposition of nonconforming material.

MINOR NON-CONFORMANCE: A non-conformance that does not adversely affect health or safety, performance, interchangeability, reliability or maintainability, effective use or operation, weight or appearance (when a factor), or contractual requirements.

MISHAP: An unplanned event or series of events resulting in death, injury, occupational illness, or damage to or loss of equipment or property damage or damage to the environment.

MISSION: A mission can include one or more SVs that are launched by a LV.

MISSION CONTINGENCY PLAN: Describes what the plan is in the event of a launch mishap, and is included in the Launch Console Handbook. It includes identification of the primary team and communication plans.

MISSION DIRECTOR STATUS REVIEW: A recurring mission status review beginning after the Mission Readiness Review (MRR) that includes the LVC, SV Team, and USG Team. The review topics include technical items, launch processing schedule, critical milestones and decision dates, mission integration status, and SV processing status.

MISSION DRESS REHEARSAL (MDR): The MDR consists of an abbreviated countdown and an On-Net Hotwash. MDR is focused on validation of the integrated USG Team and SV team DoL CONOPS and includes the following:

(1) validation, to the Mission Director, of the proficiency of the integrated launch team to successfully execute the launch countdown;
(2) validation that the lessons learned from previous exercises are understood and demonstrated;
(3) validation of the DoL voice communications matrix; and
(4) validation of the accuracy of DoL documentation.

MISSION FAILURE: The inability of a LV, after launch, to deliver the mission PL to the prescribed orbital insertion parameters; and/or LV causes damage to the PL that makes the PL inoperable.

MISSION INTEGRATION: Mission Integration includes all activities required to successfully plan, develop, verify, and validate the technical and operational requirements for connections and interfaces between the SV and the LV, including all launch planning, analysis, mission design, documentation, and LV-to-SV compatibility assessments required. These interfaces are captured and updated in the mission ICD.

MISSION INTEGRATION SCHEDULE: A schedule that reflects all mission-specific activities required to integrate the PL with the launch system, beginning with Launch Service Authority to Proceed through conclusion of the USG Post Flight Review (PFR). The schedule includes ICD and verification plan development, mission-specific launch system modifications (mechanical, electrical, and software), deliverables between the LVC and SVC, mission analyses (mission design, environments, interface compatibility), PL access assessments, mechanical and electrical trailblazer activities, interface fit checks, launch site integrated operations, and post-flight activities.

MISSION INTERFACE CONTROL DOCUMENT (ICD): A document that provides technical requirements for launch of the spacecraft and characteristics and constraints of the LV relating to the interface with the spacecraft. The ICD defines PL to launch system interfaces via physical, functional, environmental, operational, and performance requirements that are allocated to either the LVC or SVC/LSIC. For USAF missions, the ICD is signed by LVC, LV Government Program Office, SVC, and SV Customer Program Office. For NRO missions, the ICD is signed

by LVC, the OSL Contracting Officer's Technical Representative (COTR), the OSL Mission Manager (OMM) and the LSIC.

MISSION KICKOFF REVIEW: The mission integration kickoff review marks the start of the standard mission integration activity between the four-party mission team. The agenda includes analyses to be conducted, interrelationships of SV data inputs to LV analysis schedules, and LV products.

MISSION READINESS REVIEW (MRR): Reviews conducted incrementally throughout the vehicle manufacture, assembly, test, integration, check-out, and launch, which represent major milestones of the launch schedule.

MISSION REQUIREMENTS ANNEX (MRA): For USAF missions, a document that defines mission requirements.

MISSION-SPECIFIC: Items that are tailored for a specific mission as part of the standard launch service.

MISSION-UNIQUE: Items that are tailored for a specific mission but are not included in the standard launch service.

NOTIFY: USG Team members are told officially about an action, activity, or decision process.

OBSERVATION: After an initial review of flight data, any levels, trends, or visual evidence that appear unusual, unexpected, or undesirable in the Launch Event and Flight are identified and recorded as an Observation.

OPERATIONAL SAFETY, SUITABILITY & EFFECTIVENESS (OSS&E): Operational safety is the condition of having acceptable risk to life, health, property, and environment caused by a system or end item when employing that system or end item in an operational environment. Operational Suitability is the degree to which a system or end item can be placed satisfactorily in field use, with consideration given to availability, compatibility, transportability, interoperability, reliability, maintainability, wartime use rates, full-dimension protection, operational safety, human factors, architectural and infrastructure compliance, manpower supportability, logistics supportability, natural environmental effects and impacts, and documentation and training requirements. Operational Effectiveness is the overall degree of mission accomplishment of a system or end item used by representative personnel in the environment planned or expected (e.g., natural, electronic, threat) for operational employment, considering organization, doctrine, tactics, information assurance, force protection, survivability, vulnerability, and threat (including countermeasures; initial nuclear weapons effects; and nuclear, biological, and chemical contamination threats).

OUT OF FAMILY (OOF): Operation or performance is OOF if it does not conform to performance requirements, does not meet specification limits, or is outside expected values from previous samples and experience.

OUT OF POSITION (OOP) WORK: OOP work is work scope that has been moved from its baseline location or sequence to another. A new location of the work scope shall not constitute a new designation for that work scope.

PAPERLESS SYSTEM: Electronic systems for real-time or archival creation, modification, storage, upload or download and display of documents, data, and/or telemetry.

PARTICIPATE: USG Team will be involved with activity. USG approval of LVC action/activity/decision process is not required. Active discussions are allowed. Action items may be generated but will not be a constraint to non-NSS missions.

PATHFINDER: A demonstration of planned integrated operations starting with PLF encapsulation of a payload simulator in the PPF through mate of the EA to the LV upper state.

PAYLOAD (PL): The system(s) provided by the SV Directorate to be delivered to space. The PL consists of the SV(s), SV dispensers (if used), the PL adapter, SV-supplied propulsive elements, the SV-supplied separation system, and any SV-supplied airborne support equipment.

PAYLOAD FAIRING (PLF): A PLF is the top portion (shroud) of the LV that houses the SV(s) or mission PL during ascent.

PAYLOAD PROCESSING FACILITY (PPF): A generic term referring to any facility used for spacecraft processing at or near the launch site.

PEDIGREE NOTIFICATION PACKAGE: A package consisting of the Review Notification (at a minimum), which includes the appropriate part numbers and serial numbers (if applicable) of items to be reviewed; directions to the review location, including the building and room number, and point of contact information; and any required documents and instructions that relate to visitor control requirements. The package may also contain, if requested by the SMC/LE Review Team Lead through the Pedigree Manager, a Technical Data pre-read package.

PEDIGREE REVIEW: Consists of verifying hardware (and software as applicable) fabrication, assembly, inspection, test data, build paperwork, departures from engineering baseline, non-conformance data, test anomalies, and storage and transportation history in order for the USG Team to make a space flight worthiness assessment.

PROPELLANTS: Liquids, gases, or solids required to fuel mission-specific and non-mission-specific SVs or LVs. This may also be used to describe any launch pad maintenance propellants.

QUICK-LOOK: An initial technical review of available data.

REHEARSAL ANOMALY TEAM (RAT): The RAT, consisting of representatives from each agency participating in the launch, is responsible for planning rehearsals. The RAT generates launch countdown scenarios, including anomalies that will exercise their teams for DoL preparation.

REHEARSAL WORKING GROUPS (RWG): Face-to-face meetings of the rehearsal stakeholders for the purpose of establishing the framework and structure of the ICEs and rehearsals.

RELATED OPERATION: An operation conducted to achieve an objective not associated to, but dependent upon, a major operation for meeting planned objectives.

REQUEST FOR INFORMATION (RFI): Specific to pedigrees, an RFI is a standardized form used to document and track action items that have not received an adequate response by the end

of an independent hardware review. An RFI should be written anytime an action item has not received an adequate LVC/supplier response by the end of the review, the item is not a Review Item Discrepancy (RID), and the SMC/LE Review Team Lead deems the request necessary to determine the space flight worthiness of a component (e.g., analysis dispositions a non-conformance as "Use As Is," but the analysis is not attached to the non-conformance. The Reviewer asks for the analysis, but it is not supplied by the end of the review, so the RFI is written to supply the analysis).

RESPONSIBLE ENGINEER (RE): A qualified engineer responsible for a component or subsystem through design, production, test, and launch.

REVIEW ITEM DISCREPANCY (RID): Specific to pedigrees, a standardized form used to document and track hardware non-conformances discovered as a result of an independent hardware review, regardless of who discovers the non-conformance. RIDs impose a lien on the affected hardware until the non-conformance has been properly dispositioned (e.g., an out of tolerance condition/result is found during the review, whether the requirement was on an Engineering Drawing or Engineering Performance Specification. The RID should document the "Is" and "Should Be" requirement and actual result to state the mismatch for disposition. A non-conformance will have to be written and completely dispositioned, usually with corrective action).

REWORK: Action performed to convert non-flight worthy components to flightworthy status.

SENIOR MANAGEMENT REVIEW (SMR): A monthly forum chaired by SMC/LE to discuss the current launch manifest and any related issues. Representatives from across the launch community meet in this forum to discuss their respective program status as it pertains to the launch schedule.

SHIP LOOSE: Components of the LV that are predetermined to be assembled at the launch site.

SPACE FLIGHT WORTHINESS CERTIFICATION: Measures the degree to which the PL, LV, and critical ground system(s), have the capability to perform their mission with the confidence that significant risks are known and deemed acceptable. Per AFSPC Instruction (AFSPCI) 10-1208, Spacelift Operations, the SMC/CC will certify flight worthiness for NSS missions launching SMC-procured PL(s) on SMC-procured LV. For NRO missions launching NRO-procured PL(s) on SMC-procured LV, the SMC/CC will certify LV flight worthiness to the NRO as part of the NRO mission certification.

SPACE VEHICLE (SV): An autonomous element of the PL that separates at the PL-provided separation plane and is delivered to the defined orbit around the earth.

STANDARD LAUNCH SERVICE: The total effort required to place PL(s) into the prescribed orbit, excluding mission-unique launch services. The EELV Standard Interface Specification (SIS), SPRD, and Competitive Launch Services PWS define the minimum set of standard launch service capabilities.

TARGET SPECIFICATION: A document that defines the target orbit parameters for a specific mission. The target specification is provided by the SVC/LSIC or SV Directorate/OSL after launch service contract award.

TECHNICAL INTERCHANGE MEETINGS (TIM): Meetings in support of conveying technical rationale, as coordinated through working groups composed of Contractor, Government, and Government Contractor subject matter experts.

TEST-LIKE-YOU-FLY: A test philosophy that examines all applicable flight characteristics and determines the fullest practical extent to which those characteristics can be applied in testing. “All applicable flight characteristics” are concurrent attributes including, but not limited to, environments, automated flight sequences, commanded operations, activity order and timing, up/downlinked telemetry, data product generation, signal services, mission planning, and end-user evaluation. The “fullest practical extent" identifies the physical and engineering limitations, and balances what can be done in a flight-like manner with acceptable and understood risk and program resources. The test article can be anything from a component, through all levels of integration, up to and including all space and ground assets involved in conducting the mission.

UNITED STATES GOVERNMENT (USG) CERTIFIED/APPROVED LAUNCH VEHICLE (LV) CONFIGURATION: Any launch vehicle configuration presented to and approved by the Government through SMC/CC certification. A USG certified/approved launch vehicle configuration is documented and controlled by Government requirements documents, Government approved requirement deviations, and Contractor requirements documents. Any changes to a USG certified/approved launch vehicle configuration must be reported and once approved through SMC/CC certification become the new USG certified/approved launch vehicle configuration allowed for use on NSS missions.

UNIVERSAL DOCUMENTATION SYSTEM (UDS): The formal documentation system used to communicate user support requirements at military test ranges.

UNRESTRICTED PHYSICAL ACCESS: The Government member is allowed to observe the facilities, hardware, personnel, or activities first hand and in-person any time the Government member requires access.

UPPER STAGE: An LV Upper Stage includes all housings, components, propulsion system, and any associated fittings or adapters to join to the core and to the SV.

VIRTUAL TRAILBLAZER: A computer simulation of integrated operations in the PPF beginning with staging of the PLF and associated GSE through departure of the EA on the transporter from the PPF. The virtual trailblazer will include computer-aided design (CAD) models of the PPF, LV flight hardware and associated GSE, and SV flight hardware and associated GSE

WALK-DOWN: A comprehensive review of the LV and applicable Critical GSE systems prior to or following significant operations, conducted by engineering and operations personnel, both Contractor and USG Team, as appropriate. A walk-down includes the commodities supply plans and status; examines the physical state of the LV and Critical GSE; notes discrepancies from print, delivery, or last tested configurations; and examines non-conformances identified to date, with resolution summaries/plans.

WHITE CARDS: White Cards document all pertinent details of a launch rehearsal anomaly. Each RAT organization develops White Cards, based on the anomaly template provided by SMC/LE Rehearsal Simulation Lead, for their specific anomalies. The white cards are either LV only or LV-integrated anomalies. The number of white cards required for each

rehearsal will vary from mission to mission and from rehearsal to rehearsal, and that number is defined by the SMC/LE SIM. The LVC shall provide varied anomalies for each rehearsal.

WORK AUTHORIZING DOCUMENT (WAD): A WAD is any Contractor production or launch site document that authorizes work to be performed to manufacture, build, assemble, transport, integrate, test, repair, modify and launch flight hardware and associated ground systems per configuration-controlled drawings, schematics, specifications, and ICDs. The WAD implements design intent at the factory and launch sites.

APPENDIX B: ACRONYMS AND ABBREVIATIONS

Table B-1: Acronyms and Abbreviations

ACRONYM	DEFINITION
30 SW	30th Space Wing
45 SW	45th Space Wing
ADP	Acceptance Data Package
AERO CE	Aerospace Chief Engineer (for NRO)
AFPEO/SP	Air Force Program Executive Officer/Space
AFI	Air Force Instruction
AFSPC	Air Force Space Command
AFSPCI	Air Force Space Command Instruction
AFSPCMAN	Air Force Space Command Manual
AFSS	Autonomous Flight Safety System
AGO	Aerospace General Offices
AIAA	American Institute of Aeronautics and Astronautics
AOWG	Ascent Operations Working Group
ARB	Anomaly Review Board
AT	Anti-Terrorism
ATP	Authority to Proceed
CAB	Corrective Action Board
CCB	Change Control Board
CCAFS	Cape Canaveral Air Force Station
CCTV	Closed Circuit TV
CDRL	Contract Data Requirements List
CEMP	Comprehensive Emergency Management Plan
CLSRB	Current Launch Schedule Review Board
CNSSP	Committee on National Security Systems Policy
COC	Certificate of Conformance
COLA	Collision Avoidance
CONOPS	Concept of Operations
COPV	Composite Overwrapped Pressure Vessels
COTR	Contracting Officer's Technical Representative
CSDR	Cost and Software Data Reporting
CSOSA	Commercial Space Operations Support Agreement
DAL	Data Accession List
DCAA	Defense Contract Audit Agency
DCMA	Defense Contract Management Agency
DGMD	Deputy Government Mission Director
DoD	Department of Defense
DoDI	Department of Defense Instruction
DoL	Day of Launch
DOLWG	Day of Launch Working Group
EA	Encapsulated Assembly

ACRONYM	DEFINITION
ECMRA	Enterprise-wide Contractor Manpower Reporting Application
EELV	Evolved Expendable Launch Vehicle
ELSA	Emergency Life Support Apparatus
ELSS	Engineering Launch Support System
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EO	Executive Order
ePedigree	Electronic Pedigree
ERB	Engineering Review Board
FFRDC	Federally Funded Research and Development Center
FMECA	Failure Modes/Effects/Criticality Assessment
FOD	Foreign Object Damage
FRB	Failure Review Board
FRR	Flight Readiness Review
FTA	Fault Tree Analysis
FY	Fiscal Year
GIDEP	Government-Industry Data Exchange Program
GIM	Government Integrated Meeting
GMD	Government Mission Director
GMIM	Government Mission Integration Manager
GORR	Ground Operations Readiness Review
GOWG	Ground Operations Working Group
GPS	Global Positioning System
GSE	Ground Support Equipment
GSFC	Goddard Space Flight Center
HAR	Hardware Acceptance Review
HDV	Hooded Demand Valve
IAQ	International Aerospace Quality Group
IAW	In Accordance With
ICD	Interface Control Document
ICE	Integrated Crew Exercise
IEC	International Electrotechnical Commission
IMS	Integrated Master Schedule
IPG	Information Protection Guide
IRD	Interface Requirements Document
IRIG-B	Inter-Range Instrumentation Group – Time Code Format B
IRRT	Independent Readiness Review Team
IS	Information Systems
ISO	International Organization for Standardization
IT	Information Technology
IV&V	Independent Validation and Verification
KSC	Kennedy Space Center

ACRONYM	DEFINITION
LAAFB	Los Angeles Air Force Base
LCH	Launch Console Handbook
LDR	Launch Date Recommendation
LEAF	Launch External Affairs Forum
LE	Launch and Range Systems Directorate
LER	Launch Readiness Review
LSIC	Launch System Integration Contractor
LSR	Launch Slot Recommendation
LV	Launch Vehicle
LV-1	Launch Vehicle Lead
LVC	Launch Vehicle Contractor
MAT	Mission Assurance Team
MDR	Mission Dress Rehearsal
MIG	Mission Integration Group
MIL-STD	Military Standard
MIMP	Mission Integration Management Plan
MRA	Mission Requirements Annex
MRB	Material Review Board
MRR	Mission Readiness Review
MSPSP	Missile System Prelaunch Safety Package
MWG	Management Working Group
Nadcap	National Aerospace and Defense Contractors Accreditation Program
NAS	National Aerospace Standard
NASA	National Aeronautics and Space Administration
NECG	New Entrant Certification Guide
NISPOM	National Industrial Security Program Operation Manual
NLT	No Later Than
NOPS	National Reconnaissance Office Operations Squadron
NRO	National Reconnaissance Office
NROL	National Reconnaissance Office Launch
NSS	National Security Space
OLMS	On-Line Lightning Measurement System
OMM	OSL Mission Manager
OOF	Out of Family
OOP	Out of Position
OPSEC	Operations Security
OSL	Office of Space Launch
OSS&E	Operational Safety, Suitability, and Effectiveness
PCO	Procuring Contracting Officer
PCM	Pulse Code Modulation
PL	Payload
PLA	Payload Adapter

ACRONYM	DEFINITION
PLF	Payload Fairing
PM	Program Manager
PMP	Parts, Materials, and Processes
PMR	Program Management Reviews
POC	Point of Contact
PPE	Personal Protective Equipment
PPF	Payload Processing Facility
PPIP	Program Protection Implementation Plan
PPP	Program Protection Plan
PPS	Program Protection Survey
PRA	Probabilistic Risk Assessment
PRM	Pedigree Review Matrix
PWS	Performance Work Statement
QE	Quality Engineer
RAT	Rehearsal Anomaly Team
RCC	Range Commander's Council
RE	Responsible Engineer
RF	Radio Frequency
RFDCS	Radio Frequency Detection/Collection System
RFI	Request for Information
RFPI	Radio Frequency Power Impingement
RID	Review Item Discrepancy
RMB	Risk Management Board
RMP	Risk Management Plan
RWG	Rehearsal Working Group
SCAR	Supplier Corrective Action Request
SE&I	Systems Engineering and Integration
SEP	Systems Engineering Plan
SETA	Systems Engineering and Technical Assistance
SFW	Space Flight Worthiness
SIS	Standard Interface Specification
SMC	Space and Missile Systems Center
SMC/CC	Space and Missile Systems Center Commander
SMC/EN	Space and Missile Systems Center/Engineering Directorate
SMC/LE	Space and Missile Systems Center/Launch Systems Directorate
SMC-G	Space and Missile Systems Center Guide
SMC-S	Space and Missile Systems Center Standard
SMR	Senior Management Review
SPRD	System Performance Requirements Document
SRD	System Requirement Document
SSWG	System Security Working Group
SV	Space Vehicle

ACRONYM	DEFINITION
SVC	Space Vehicle Contractor
SW	Space Wing
TDRSS	Tracking and Data Relay Satellite System
TIM	Technical Interchange Meeting
TIRP	Technical Issue Resolution Process
TOR	Technical Operating Report
TRB	Technical Review Board
TSN	Trusted Systems and Networks
UDS	Universal Documentation System
USAF	United States Air Force
USG	United States Government
VAFB	Vandenberg Air Force Base
VER	Verification Evidence Record
VPM	Verification Planning Matrix
WDR	Wet Dress Rehearsal

APPENDIX C: COMPLIANCE DOCUMENTS

Table C-1: Contract Requirements

Document Number/Abbreviation	Revision/Date	Document Title
SPRD (Note 8)	Revision A April 2014	Systems Performance Requirements Document
SIS (Note 8)	Revision B 9 November 2013	Standard Interface Specification
AFSPCMAN 91-710 (T) (Vol 1-7) (Note 1)	1 July 2004	Range Safety User Requirements
AIAA S-080-1998 (Note 2)	1998	Space Systems, Metallic Pressure Vessels, Pressurized Structures, and Pressure Components
AIAA S-081A-2006 (Note 2)	2006	Space Systems – Composite Overwrapped Pressure Vessels (COPV)
AIAA S-110-2005 (Note 2)	2005	Space Systems – Structures, Structural Components, and Structural Assemblies
AIAA S-113-2005 (Note 2)	2005	Criteria for Explosive Systems and Devices Used on Space and Launch Vehicles
AIAA S-114-2005 (Note 2)	2005	Moving Mechanical Assemblies for Space and Launch Vehicles
AIAA S-120-2006 (Notes 2 and 9)	2006	Mass Properties Control for Space Systems
CNSSD No. 505 (Note 2)	7 March 2012	Committee on National Security Systems Directive 505, Supply Chain Risk Management
CNSSI No. 1200	7 March 2014	National Information Assurance Instruction for Space Systems Used to Support National Security Missions
CNSSP No. 12	28 November 2012	National Information Assurance Policy for Space Systems Used to Support National Security Missions
CNSSP No. 22	January 2012	Policy on Information Assurance Risk Management for National Security Systems
CPIA 655 (Note 2)	January 1997	Guidelines for Combustion Stability Specifications and Verification Procedures for Liquid Propellant Rocket Engines
DoD 5000.04-M-1	4 November 2011	Cost and Software Data Reporting (CSDR) Manual
DoD 5220.22-M	28 February 2006	National Industrial Security Program Operating Manual (NISPOM)
DoDI 8581.01 Enclosure 3, paragraph a.4.e.	8 June 2010	Department of Defense Instruction (DoDI) 8581.01, Information Assurance (IA) Policy for Space Systems Used by the Department of Defense

Document Number/Abbreviation	Revision/Date	Document Title
DoDI 8582.01	6 June 2012	Security of Unclassified DoD Information on Non-DoD Information Systems
EELV OPSEC Plan	25 March 2014	EELV Operations Security (OPSEC) Plan
EELV PPP (Draft)	March 2014	Draft EELV Program Protection Plan, Version 4.0
EELV SCG	30 April 2012	EELV Security Classification Guide
GPS III MRA (Note 4)	14 June 2016	Mission Requirements Annex
ISO 17666 (Note 2)	2003	Space Systems – Risk Management
ISO/IEC 27000/02 (T)	2013	International Organization for Standardization/International Electrotechnical Commission 27002 Certification
MIL-STD-461F (Note 2)	10 December 2007	Electromagnetic, Emissions, and Susceptibility, Requirements for the Control of Electromagnetic Interference
MIL-STD-882E (T) (Note 10)	11 May 2012	Systems Safety Program Requirements
MIL-STD-1528A (Note 2)	9 September 1986	Production Management
MIL-STD-1542B (Note 2)	1991	EMC Grounding Requirements for Space System Facilities
Mission ICD (Note 3)		Mission Interface Control Document (ICD)
NASA-STD-5012 (Note 2)	15 January 2015	Strength and Lift Assessment Requirements for Liquid-Fueled Space Propulsion System Engines
NROL IPG	21 February 2012	NRO Launch Information Protection Guide
RCC 319-10 (T) (Note 1)	October 2010	Range Commander's Council (RCC) Flight Termination Systems Commonality Standard
RCC 324-11 (T) (Notes 1 and 5)	February 2011	Global Positioning and Inertial Measurements Range Safety Tracking Systems' Commonality Standard
RCC 501-08	January 2008	Range Commander's Council (RCC) Universal Documentation System
SAE AS9100C	13 January 2009	Quality Management Systems – Requirements for Aviation, Space and Defense Organizations

Document Number/Abbreviation	Revision/Date	Document Title
SMC-S-001 (Notes 2 and 7)	12 July 2013	Systems Engineering Requirements and Products
SMC-S-002 (Note 2)	13 June 2008	Configuration Management
SMC-S-003 (T) (Note 2)	8 May 2015	Quality Space and Launch Requirements Addendum to AS9100C
SMC-S-005 (Note 2)	28 February 2015	Space Systems – Flight Pressurized Systems
SMC-S-006 (Note 2)	13 June 2008	Solid Rocket Motor Case Design and Test Requirements
SMC-S-008 (Note 2)	13 June 2008	Electromagnetic Compatibility Requirements for Space Equipment and Systems
SMC-S-011 (Note 2)	31 July 2015	Parts, Materials, and Processes Control Program for Expendable Launch Vehicles
SMC-S-013 (Note 2)	13 June 2008	Reliability Program for Space Systems
SMC-S-016 (Note 2)	2014	Test Requirements For Launch, Upper-Stage and Space Vehicles
SMC-S-018 (Note 2)	13 June 2008	Lithium Ion Battery for Launch Vehicle Application
SMC-S-020 (Note 2)	3 June 2009	Technical Requirements for Wiring Harness, Space Vehicles
SMC-S-021, Volume 1 (Note 2)	15 September 2009	Technical Reviews and Audits for Systems, Equipment and Computer Software

Note 1: Compliance documents may be tailored as approved by Range Safety.
Note 2: Reference Contract Data Requirements List (CDRL) B005 for the requirement.
Note 3: Reference Performance Work Statement Section 3.4.4 and Contract Data Requirements List (CDRL) B009 for the requirement for mission Interface Control Document (ICD).
Note 4: For United States Air Force (USAF) missions only.
Note 5: Applicable to Global Positioning System (GPS) Metric Tracking.
Note 6: For National Reconnaissance Office (NRO) missions only.
Note 7: The Contractor shall use SMC-T-005 (2014) for the tailoring of SMC-S-001.
Note 8: The Contractor may horizontally mate the EA to the LV, horizontally perform post-mate activities, and horizontally rollout to the pad and remain in compliance with SIS rev B paragraph 4.7 and SPRD rev A paragraphs 3.2.5 and 4.2.5 (refer to PWS paragraph 3.5.1.9).
Note 9: The Contractor shall use SMC-T-002 for tailoring AIAA S-120-2006.
Note 10: The Contractor shall use SMC-T-004 (2012) for tailoring of MIL-STD-882E.

COMPLIANCE DOCUMENT TAILORING

a. ISO/IEC 27000/02 (T):

1. INFORMATION SECURITY

1.1 ISO 27000/02 (T) Certification

The Contractor shall obtain and maintain International Organization for Standardization/International Electrotechnical Commission (ISO/IEC) 27000/02 (T) certification.

1.2 ISO 27000/02 (T) Security Controls for Mission Systems

The Contractor shall identify and implement appropriate ISO 27000/02 (T) security controls for its mission systems (Launch vehicle and ground support systems) augmented with Government selected controls from CNSSI 1253 in accordance with the EELV PPP. [Security Attributes: Confidentiality = Moderate, Integrity = High, Availability = High]

1.3 ISO 27000/02 (T) Security Controls for Development Systems

The Contractor shall identify and implement appropriate ISO 27000/02 (T) security controls in accordance with the EELV PPP for development systems used to produce flight control software and operations support software. [Security Attributes: Confidentiality = Low, Integrity = High, Availability = Low]

b. MIL-STD-882E (T):

The following tasks are applicable in addition to the definitions in Section 3.2 and all of Section 4 in MIL-STD-882E: 101, 102, 104, 106, 108, 202, 205, 206*, 301, 304, and 401.

* Existing documentation will be assessed for adequacy of operational hazard analysis

APPENDIX D: REFERENCE DOCUMENTS

The documents listed in Table D-1 are intended to provide information and guidance to the Contractor.

Table D-1: Evolved Expendable Launch Vehicle Reference Documents

Document Number/Abbreviation	Revision/Date	Document Title
AFI 10-245	25 June 2015	Anti-terrorism
AFI 10-701	8 June 2011	Operations Security (OPSEC)
AFI 10-1202_AFSPCSUP	17 July 2013	Space Test Program (STP) Management
AFI 20-114	7 June 2011	Air and Space Equipment Structural Management
AFI 31-101	7 March 2013	Integrated Defense
AFI 31-101_AFSPCSUP	29 January 2014	Integrated Defense Air Force Space Command Supplement
AFI 63-101/20-101	7 March 2013	Air Force Instruction (AFI) 63-101/20-101, Life Cycle Systems Engineering
AFI 91-202_AFSPCSUP_I	11 Jul 2014	The US Air Force Mishap Prevention Program
AFI 91-204_AFSPCSUP_I	19 September 2014	Safety Investigations and Reports
AFI 91-217	17 April 2014	Space Safety and Mishap Prevention Program
AFMAN 91-222_AFSPCSUP_I	2 January 2007	Space Safety Investigations and Report
AFSPCI 10-1208	29 August 2013	Spacelift Operations
AFSPCI 13-1213	18 September 2013	Air Force Space Command Instruction (AFSPCI) 13-1213
ASTM E1548	2009	Standard Practice for Preparation of Aerospace Contamination Control Plans
CNSSI No. 1253	27 March 2014	Security Categorization and Control Selection for National Security Systems
DoDI 4140.67	26 April 2013	DoD Counterfeit Prevention Policy
DoDI 5000.02	7 January 2015	Interim Operation of the Defense Acquisition System
DoDI 5200.39	28 May 2015	CPI Protection Within the Department of Defense
DoDI 5200.44	5 Nov 2012	Protection of Mission Critical Functions to Achieve Trusted Systems and Networks (TSN)
DoDI 8500.01	14 March 2014	Cybersecurity
DoDI 8510.01	12 March 2014	Risk Management Framework (RMF) for DoD Information Technology (IT)
ELSS SRD	13 February 2013	EELV Engineering Launch Support System (ELSS) System Requirements Document (SRD)
JANNAF	14 December 2010	Test and Evaluation Guidelines for Liquid Rocket Engines
MIL-STD-881C Appendix J	3 October 2011	Work Breakdown Structures for Defense Material Items

Document Number/Abbreviation	Revision/Date	Document Title
MIL-STD-1367A	2 October 1989	Packaging, Handling, Storage, and Transportability Program Requirements for Systems and Equipments
MIL-STD-1791A	19 November 2012	Designing for Internal Aerial Delivery in Fixed-Wing Aircraft
MIL-STD-2073-1E(1)	7 January 2011	Standard Practice for Military Packaging
Nadcap AC7004	June 2013	Aerospace Quality System
NAS 411	1994	National Aerospace Standard (NAS) 411: Hazards Materials Management Program
NECG	27 October 2011	United States Air Force Launch Services New Entrant Certification Guide
OSL BLRP	17 October 2011	OSL Baseline Launch Rehearsal Plan
OSL Baseline DoL Plan	8 September 2009	Baseline Day of Launch (DoL) Plan
SAE AS9003	July 2012	Inspection and Test Quality Systems, Requirements for Aviation, Space, and Defense Organizations
SAE AS9120	June 2009	Quality Management Systems – Requirements for Aviation, Space and Defense Distributors
SMC-G-1201	7 October 2009	Assurance of Operational Safety, Suitability, and Effectiveness (OSS&E) for Space and Missile Systems
SMC-G-1202	7 October 2009	Space Flight Worthiness Criteria (SFWC)
SMC-G-1203	13 October 2009	Independent Readiness Review Team (IRRT)
SMC-G-1204	31 October 2013	SMC Space Launch Readiness Review
SMC-S-004	13 June 2008	Independent Structural Loads Analysis
SMC-S-012	13 June 2008	Software Development for Space Systems
SMC-S-019	Rev A, 2008	Program and SubContractor Management
SMCI 62-110	24 July 2014	Space Debris Mitigation Management
SMCI 63-1205	28 June 2011	SMC System Safety Program
SMC/LE Generic Government Baseline Launch Rehearsal Plan	8 May 2014	SMC/LE Generic Government Baseline Launch Rehearsal Plan
SMC/LE EELV MAP	April 2012	Launch Systems Directorate Evolved Expendable Launch Vehicle Mission Assurance Plan
SMC/LE RMP	Version 3.0 June 2014	Launch and Range Systems Directorate (SMC/LE) Risk Management Plan (RMP)
EELV SEP	Version 2, July 2013	EELV Systems Engineering Plan (SEP)

Document Number/Abbreviation	Revision/Date	Document Title
SMC/LE TIRP	15 August 2015	SMC/LE Generations and Operations Division (GENOPS) Technical Issue Resolution Process (TIRP)
TOR-2005(8583)-4019	29 April 2005	Risk Management Plan Guide for Space Acquisition Programs
30SWI 90-202	17 October 2012	30th Space Wing Instruction (30SWI) 90-202, Management of Reimbursable Programs
30SWI 91-101	30 July 2009	30th Space Wing Instruction (30SWI) 91-101 Launch Support Team Process
30 SW Base Support Policy	3 February 2011	Annex B to Commercial Space Operations Support Agreement (CSOSA), 30 SW Base Support Policy
30 SWOP 91-204, Vol. 2	22 July 2013	30th Space Wing Operating Plan (SWOP) 91-204, Volume 2, Investigation of Launch and Launch Processing Mishaps
45 SW Base Support Policy	28 February 2008	Annex A to Commercial Space Operations Support Agreement (CSOSA), 45th Space Wing (SW) Base Support Policy
45 SW CEMP 10-2	November 2010	45th Space Wing (45 SW) Comprehensive Emergency Management Plan (CEMP) 10-2
45 SWOP 91-204, Vol. 2	12 December 2011	45th Space Wing Operating Plan (SWOP) 91-204, Volume 2, Investigation of Launch and Launch Processing Mishaps
VAFB CEMP 10-2	November 2009	Vandenberg AFB (VAFB) CEMP10-2

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APPENDIX E: UNITED STATES GOVERNMENT TEAM CALL-OUTS

PWS paragraph	Quick Synopsis of requirement	No. of individuals for scope purposes
1.2.4	Electronic Data Access	900
3.0	Space Launch Service	Unlimited
3.1.1	Launch System Data	Unlimited – Electronic Data Access
3.1.2	Launch System Electronic Data Access Training	Unlimited – Electronic Data Access
3.1.5	Program Management Reviews*	50
3.1.6.1	Launch Schedule Option Assessment	Unlimited – Electronic Data Access
3.1.6.2	Launch Slot Recommendation	N/A - see CDRL
3.1.9	Safety Training	Best case: 40 Expected: 75 Worst Case: 100
3.1.10	Launch System Familiarization Course*	Unlimited (attendance limited by the size of Government facility)
3.1.11.1	EELV Program Protection Survey	N/A
3.1.11.3	Development of the EELV PPP Contractor-specific Annex	N/A
3.1.14.1	Environmental impact analysis	Unlimited – Electronic Data Access
3.1.14.2	Environmental coordination	Unlimited – Electronic Data Access
3.1.16	Incident and Discrepancy Reporting	Unlimited – Electronic Data Access
3.1.16.1	Post Emergency Response Incident Reporting	Unlimited – Electronic Data Access
3.1.16.2	Post Emergency notification	N/A
3.1.18	Program Milestone Reviews	Best case: 50 Expected: 80 Worst Case: 100
3.2	Systems Engineering Functions and Tasks	Unlimited

3.2.1	Technical Interchange Meetings	Best case: 8 Expected: 12 Worst Case: 25 (Telecom acceptable)
3.2.2	Contractor Engineering Database	Unlimited – Electronic Data Access
3.2.3	Systems Engineering Boards and Processes	Best case: 8 Expected: 12 Worst Case: 25 (Telecom acceptable)
3.2.4	Launch Vehicle Configuration Change Reporting	Unlimited – Electronic Data Access
3.2.4.1	Notification of Class 1 Changes	Unlimited – Electronic Data Access
3.2.4.2	Notification of Class 2 Changes	Unlimited – Electronic Data Access
3.2.5	Non-Recurring Engineering and Processes	Unlimited – Electronic Data Access
3.2.6	Launch System Testing	Unlimited – Electronic Data Access
3.2.7	Launch System Parameters	Unlimited – Electronic Data Access
3.2.8	Post-Flight Review	Best case: 30 Expected: 50 Worst Case: 80
3.2.8.1	Post-Flight Data Review: Quick Look Assessment Meeting	Best case: 30 Expected: 40 Worst Case: 70 (Telecom acceptable)
3.2.9	Aging and Surveillance Program	Unlimited – Electronic Data Access
3.2.11.3	Quality Audits	One USG Team observer per auditor Unlimited – Electronic Data Access for access to audit reports
3.2.11.4	Quality Metrics	Unlimited – Electronic Data Access
3.2.11.5	Participation in Quality meetings with suppliers	Best case: 8 Expected: 12

		Worst Case: 25 (Telecom acceptable)
3.3.1.3	Notification of transportation discrepancies	Unlimited – Electronic Data Access
3.3.1.4	Office accommodations at primary production and engineering facilities*	Best case: 15 Worst Case: 30
3.4.2	Mission Integration Activities	Best case: 10 Worst Case: 15
3.4.2.3	Notification of and participation in Other Contractor Mission Readiness Reviews	Best case: 8 Expected: 12 Worst Case: 25 (Telecom acceptable)
3.4.3.1	Providing information provided to SV team	Unlimited – Electronic Data Access
3.4.7.1	Providing integrated SV/LV operations schedule	Unlimited – Electronic Data Access
3.4.7.1	Daily meetings during integrated SV/LV operations	Unlimited – Electronic Data Access
3.4.8	Launch Rehearsal Support	N/A - Contractor role defined in PWS
3.4.8.4	Supporting launch rehearsal events	N/A - Contractor role defined in PWS
3.4.10	USG Team participation in ICD requirements verification	N/A - per CDRLs
3.4.11	Flight Hardware Interface Checks: Coordinating schedules for flight hardware interface checks	N/A - per CDRL
3.4.12	Ground Hardware Interface Checks: Coordinating schedules for ground hardware interface checks	N/A
3.4.13	Launch Safety Collision Avoidance (COLA) and Radio Frequency Power Impingement (RFPI) Data	N/A
3.4.14	Launch Range Coordination	Unlimited – Electronic Data Access
3.5	Launch operations Insight	Unlimited – Electronic Data Access
3.5.1.1	Launch operations procedures	Unlimited – Electronic Data Access
3.5.1.2	Access to WAD	Unlimited – Electronic Data Access
3.5.1.3	Providing Master launch operations schedule	Unlimited – Electronic Data Access
3.5.1.4	Physical access to Launch site operations	Best case: 40 Expected: 75 Worst Case: 100

3.5.1.4.2	Launch operations daily schedule	Unlimited – Electronic Data Access
3.5.1.4.2	Launch integration and scheduling meetings	Unlimited – Electronic Data Access
3.5.1.6	Inclusion in Contractor Readiness Reviews	CAPE and VAFB: 4 (MIN) / 20 (MAX)
3.5.1.7	Contractor support to USG Team readiness reviews	N/A
3.5.1.8.1	Invite LV transportation meetings	CAPE and VAFB: 4 (MIN) / 14 (MAX)
3.5.1.8.2	Inclusion in LV transport activities	CAPE and VAFB: 4 (MIN) / 14 (MAX)
3.5.1.8.3	Inclusion in pre-route survey	CAPE and VAFB: 2 (MIN) / 14 (MAX)
3.5.1.14	Operational Surveillance Requirements	Unlimited
3.5.1.14.3.2	Contractor workstations at launch sites	30*
3.5.1.14.4.5	Operational Surveillance Requirements: User training on Contractor console systems	30 - see PWS paragraph 3.5.1.14.3.2
3.5.1.14.5	Maintenance of Contractor telemetry, data, and monitoring systems	Unlimited
3.5.1.14.8	Real-time anomaly investigation	Government Launch Operations Team
3.5.1.14.9	Providing the flight software steering load	Unlimited
3.5.1.14.10	Providing upper stage orbital vector and attitude data at time of PL separation	Unlimited – Electronic Data Access
3.5.1.16 and 3.5.1.16.1	Participation in launch mishap investigation	Government mission: -Best case: 80 -Expected: 150 -Worst Case: 200 (Telecom acceptable) Non-contracted mission: -Best Case: 15 -Expected: 30 -Worst Case: 50
3.5.1.16.2	Launch Mishap: Mission Contingency Plan	Unlimited – Electronic Data Access
3.5.1.16.3	Launch Mishap: Support ensuring safety and protection of launch site resources	Unlimited
3.5.1.16.5	Providing all data and reports applicable to Contractor's launch mishap investigation	Unlimited – Electronic Data Access

3.5.2.1	Invite to Contractor-led facility and infrastructure meetings	Best case: 8 Expected: 12 Worst Case: 25 (Telecom acceptable)
3.5.2.2	Providing DoL Readiness Assessment	Unlimited – Electronic Data Access
3.5.2.3	Launch Infrastructure documentation	Unlimited – Electronic Data Access
3.5.2.4	Launch Complex critical GSE performance anomaly findings	Unlimited – Electronic Data Access
3.5.2.5	Corrective actions/repairs to launch complex	Unlimited – Electronic Data Access
3.5.4	Mission Commodities sampling reports	Unlimited – Electronic Data Access
3.6.1	Space flight worthiness meetings questions from the USG Team	Best case: 8 Expected: 12 Worst Case: 25 (Telecom acceptable)
3.6.2.1	Government Participation in Contractor Production and Engineering Forums: Invite to regularly scheduled and ad hoc production and engineering forums	Best case: 8 Expected: 12 Worst Case: 25 (Telecom acceptable)
3.6.2.2	Invite to engineering and production reviews associated with process changes	Best case: 8 Expected: 12 Worst Case: 25 (Telecom acceptable)
3.6.2.3	USG Team participation in test failures investigation	Best case: 8 Expected: 12 Worst Case: 25 (Telecom acceptable)
3.6.2.4	Providing test failure analysis reports	Unlimited – Electronic Data Access
3.6.2.5	Invite to Launch Site status meetings	Best case: 8 Expected: 12 Worst Case: 25 (Telecom acceptable)
3.6.2.6	Launch Vehicle and critical GSE walk-downs prior to flight closeout	15
3.6.2.7	Invite to engineering review certifying flight readiness of the system	Best case: 8 Expected: 12 Worst Case: 25 (Telecom acceptable)

3.6.3.2	Support to SMC/LE issue resolution process	Unlimited
3.6.3.3	SMC/LE issue resolution process	Unlimited
3.6.3.4	Government Issue Closure - USG team observation and participation in engineering investigations	Best case: 8 Expected: 12 Worst Case: 25 (Telecom acceptable)
3.6.3.5	Government Issue Closure - provide mitigation for risk	Unlimited
3.6.3.6	SMC/LE issue resolution process	Unlimited
3.6.4	Launch Vehicle Parts List	Unlimited – Electronic Data Access
3.6.5	Attendance at HARs	Best case: 8 Expected: 12 Worst Case: 25 (Telecom acceptable)
Appendix G	Independent hardware reviews	N/A
Appendix G	Follow-up independent hardware reviews	Unlimited
3.6.6	Participation in facility, ground support equipment and vehicle walk-downs	Best case: 14 Expected: 18 Worst Case: 25 (Telecom acceptable) (Documentation via unlimited electronic data access)
3.6.8.3	Support for Government readiness reviews and assessments for NRO missions	Unlimited

1 * The requirement is satisfied for all EELV Phase 1A missions once met for one contracted EELV mission.

APPENDIX F: NON-RECURRING ENGINEERING DATA PRODUCTS

Item No.	Data Product
1	Requirements
1.1	SPRD and SIS Requirements allocation to system level and sub-tier specifications. Provide verification evidence for SPRD and SIS Requirements. (SMC-S-001)
1.2	The Contractor shall tailor or provide equivalent documentation that meets the intent of the following standards in accordance with CDRL B005:
1.3	SMC-S-011 Parts, Materials, and Processes Control Program for Expendable 45Launch Vehicles; SMC-S-003 (T) Quality Assurance for Launch vehicles; SMC-S-001Systems Engineering requirements and products; SMC-S-016 Test Requirements for Launch, Upper Stage, Space Vehicles; SMC-S-021, Volume 1: Technical Reviews and Audits for Systems, Equipment and Computer Software; SMC-S-001, Systems Engineering Requirements and Products to include SMC-T-005, Tailoring OF Risk Management Requirements in SMC-S-001; SMC-S-002, Configuration Management
1.4	Interface Control Documents (ICD) or contractor equivalent documentation for Electrical interfaces, LV-SV electrical and mechanical interfaces at SIP, Second Stage Interface to Payload Adapter, First stage interface with Second stage, LV-Ground electrical and mechanical interfaces, First stage interface with strap-on, First Stage Interface with Booster Engines and Strap-On Engines, as well as Strap on Solid rockets attachments.
1.5	Functional analysis and preliminary requirements allocation; technical and schedule risk assessment; preliminary system performance specification; candidate external system interfaces; operational concepts; system internal and external interface requirements. (SMC-S-001 and SMC-S-021 IAW CDRL B005)
1.6	Performance specifications for each configuration item in the system and allocated baseline; functional and physical interface design; two-way traceability from the source of the functional baseline to the allocated baseline; hardware baseline design; software architectural design; Requirements flow-down and derivation from system to subsystem and from subsystem to component; Risk mitigation solutions. (SMC-S-001 and SMC-S-002 IAW CDRL B005)
1.7	Launch integration and processing CONOPS
2	System & Sub-system Design
2.1	Schematics, Drawings, Trade Studies, FMECA
2.2	Finite Element Models, Reports for Structural Analysis and Structural Static Qualification Tests, Engineering Drawings, Test Procedures, Qualification Report, Strength Report, Strength Models, Fatigue Life, Any Design Change since Qualification, Pressure Dependency Allowables
2.3	CDR Documentation, Hardware Drawings, Qualification Test Documentation, Stress Report, FEM Model Used in Stress Analysis

2.4	Vehicle Level Electrical compatibility analysis
3	Hardware Verification & Test
3.1	Component and System / Sub System Qualification and Acceptance test plans, test data, procedures and reports.
4	Manufacturing & Quality Assurance
4.1	CDR (Critical Design Review), design drawings, (manufacturing drawings), critical performance parameters, manufacturing work instructions, inspection/ quality control instructions, Internal Contractor Processes (ex. PCA)
5	Mission Analysis
5.1	- Performance
5.1.1	Payload Planner's Guide trajectories (trajectory memo, simulation input file, simulation output file, aerodynamics modeling, engine propulsion performance, engine modeling, weight summary, mass properties (CG, MOI, POI), detailed SOEs, attitude control modeling & inputs, listing of optimization constraints & variables), Reference Trajectory
5.2	- Guidance Navigation and Control
5.2.1	Simulation Data Book (Aerodynamics, Actuator model, Coordinate System, Propulsion System, Mass Properties – include sign conventions for inertia tensor, sequencing descriptions, sub-system description, Atmosphere, Winds, Earth Model, Error Budgets including navigation sensor and vehicle performance dispersions, tracking station data, sensor models), Flight Software, Trajectory Simulation including inputs and high frequency outputs, FSW Data load corresponding to trajectory, High Fidelity sequence of events, and contractor's simulation data for comparison.
5.2.2	Algorithm description document describing guidance equations
5.2.3	Flight Software description including antenna switching analysis
5.2.4	Generic trajectory and error analysis, including navigation error sensitivities and covariances at key events.
5.2.5	Preliminary Auto pilot parameters
6	Environments
6.1	- Aerodynamics
6.1.1	IOP/HIP/Flame Duct Analysis Report
6.1.2	Aerodynamic Data Development report
6.1.3	Buffet Forcing Function Development Report
6.1.4	Generic Venting Analysis Report
6.1.5	Generic CCAM Analysis Report
6.2	- Thermal
6.2.1	Booster and SRB Thermal Analysis Report, Component material properties and drawings.

6.2.2	Generic Thermal Protection Design / Analysis Report
6.2.3	ECS Plume Impingement Analysis Report
6.2.4	Generic PLF Thermal and Free Molecular Heating (FMH) Analyses Report
6.2.5	Second Stage Propellant Slosh Analysis Report
6.2.6	Hydraulic Analysis Report
6.2.7	Transient Analysis Report
6.2.8	Thermal analysis for Flight critical hardware (ex: valves)
6.2.9	Booster Humidity / Rain Assessment Report
6.3	- Contamination
6.3.1	LV Contamination Control Plan (CCP), Generic LV to SV contamination model, Hardware Cleanliness, Non-Metallic Materials Requirement, Metallic Materials Restriction.
6.3.2	Generic CCAM Analysis Report
6.4	- Dynamic Environments
6.4.1	LV Acoustic, Shock and Random Vibe analysis. Include component specs, test procedures and reports. The reports must include: all locations and results of all raw (un-scaled) microphones (SPL) and accelerometers (PSD or SRS), test set-up and instrumentation diagrams. If raw (un-scaled) measurements are not available, then provide scaled data and scale factors separately. All microphone measurements in 1/3 octave frequency bands and accelerometer measurements in 10 Hz or 1/6 octave frequency bands from 10 to 10,000 Hz.
7	Structures / Mechanical
7.1	LV (Booster, SRBs, Interstage, Upper Stage, Adapters, PLF) Finite Element Models, Reports for Structural Analysis and Structural Static Qualification Tests, Engineering Drawings, Test Procedures
7.2	LV Qualification Report, Strength Report, Strength Models, Fatigue Life, Design Change post Qualification, Pressure Dependency Allowables
7.3	Hardware Drawings, Qualification Test Documentation, Stress Report, FEM Model Used in Stress Analysis
7.4	Design Loads for all Vehicle Systems, Centerline Loads in Compressions, Tensions, Shear, LV/SV I/F Loads, Attach Hardware, Flight Events, and Time of Flights
8	Launch Decision Validation
8.1	Documentation of LVC tools and processes for performance, guidance, navigation, controls placarding tool development and calculation of percent of limit. Consistent input/output parameters (velocity reserve, etc.) from LVC analysis for a previous mission.

8.2	Documentation of contractor process for calculating percent of limit during launch operations. Flow charts showing data and communication flow necessary to conduct launch day operations, wind library and LVC steering parameters
9	Flight Software
9.1	Requirements spec, e.g. SRS, ICD or contractor equivalent documentation, sub system requirements documents, study reports, PDR Documentation.
9.2	Flight Computer Hardware Architecture, Chipset Specifications, Flight Computer Programmer's Manual, MIL-STD for Flight Computer Processor and Communication devices
9.3	Software Development Folders, coding standards, etc.
9.4	Flight Computer and INU hardware for IV&V
9.5	Test plans and Test Results for component , software/hardware integrated testing and formal qualification testing
9.6	Flight Software Code, compile/link/load scripts, linker output, loader output, and Mission Data Load
9.7	Design documentation, (e.g. SIRD, design notebooks, study reports, Software Design Document [SDD], Algorithm Design Document [ADD], Sequence table)
9.8	Mission constants database and loading procedures.
9.9	Processes for version control, version change log, software version qualification, software version delivery, documentation delivery, and test plans and results delivery.
10	Launch Sites
10.1	PDR, CDR and final design certification documents
10.2	Design Concept Review (DCR) documentation, system and segment specifications, Internal Control Documents (ICD) or contractor equivalent documentation.
10.3	Launch Facility Design Information
10.4	Ground System Test procedures and documentation.
10.5	Test and Verification of Launch Vehicle EMC/EMI, RF Interference, and RF Communications and TDRSS System End-to-End.
11	Loads
11.1	Design Review Documentation for Loads and Environments
11.2	Quasi Static Acceleration (SV, CG Limits) Analysis, documentation, and implementation
11.3	- Loads Analysis Methodologies

11.3.1	LVC Documentation of Methodology and Implementation for the following: Liftoff & Abort Event, Core Shutdown Event, Non-Symmetric Strap-on Burnout (NSBO), Buffet Event, Unit-Angle-of-Attack STEL, Gust Event, Lack-of-Wind Persistence, Dispersion, Atmospheric Flight Loads Combination Methodology, Maneuvering (Flight Controls) Loads, Upper Stage Transient Event, Transportation / Handling / Hoist Loads, Strap-On Jettison (SOJ), POGO Stability, Stage ½ Separation, Payload Fairing Separation, Max G (Quasi-static Acceleration; CG Limits), LV/SV Separation Analysis, Upper Stage Coupled Structural/Propulsion System Loads (LVC to identify code used for analysis), SRB Jettison
11.4	- Coupled Loads Analysis Computer Simulation Tools Development
11.4.1	Liftoff and Abort Simulation: LV/SV OTM and LOC Results: Max-min summary of LV and SV OTM and LOC results (for combined as well as individual event cases), along with description of data and uncertainty factors used. Time history data (including time vector) of payload interface for transient analyses, and PSD or spectra (including frequency vector) for frequency domain analyses. Pad reaction force time-histories and initial conditions.
11.4.2	Time history data (including time vector) of payload interface for transient analyses, and PSD or spectra (including frequency vector) for frequency domain analyses for the following: Core Shutdown (Partial and Complete) Simulation, Non-Symmetric Burnout (NSBO) Simulation, Buffet Simulation STEL Simulation, Gust Simulation, Maneuvering Loads Simulation, Upper Stage Ignition and Shutdown Simulation, Strap On Jettison (SOJ) Simulation, Upper Stage Coupled Structural/Propulsion System Loads, LV/SV Separation Analysis, Stage ½ Separation, SRB Jettison , Payload Fairing Separation, and Max G.
11.4.3	LVC Documentation of methodology and implementation for Wind Persistence Simulation, Dispersion Simulation, and Atmospheric Flight Loads Combination Equation.
11.4.4	Documentation of Transportation / Handling / Hoist Loads
11.4.5	Documentation of POGO stability simulation and code used for simulation.
11.5	- LV Dynamic Model Validation and Verification

11.5.1	LVC dynamic model and associated FEMs for the following: Liftoff and Abort Event Model, Core Shutdown (Partial and Total MECO) BV Model, Airloads (Transonic) Events BV Model, Airloads (Max-Q) Events BV Model, Upper Stage Ignition Events Model, Upper Stage Shutdown Events Model, SRB Jettison, Transportation / Handling / Hoist Loads Model, Strap On Jettison (SOJ) Model, Stage ½ Separation Model, Payload Load Fairing Separation Model, Max G Model, LV / SV Separation Analysis, Pogo specific subsystem models, Pogo Vehicle Level stability models.
11.5.2	Development and Documentation of Pogo stability analysis tool
11.5.3	Documentation of stability analysis and code used for Core Pogo Stability analysis and Upper Stage Pogo Stability analysis.
11.5.4	Documentation of system models used and all associated draws of structural and engine drawings regarding Upper Stage Coupled structural/propulsion system models
11.6	- Forcing Function Verification
11.6.1	LVC forcing functions used for this event and documentation identifying source data to come up with forcing function in regards to:
11.6.2	Liftoff and Abort: Engine Thrust (ME and Strap-ons) and Dispersions, Liftoff: Ignition Overpressure (IOP), Liftoff: Wind Induced Oscillation (WIO), Liftoff: Ground Winds, Core Shutdown (Partial and Total) Transients, Core Shutdown (MECO) Chugging and/or Modal Noise, Airloads: Buffeting Forces, Airloads: Gust / Turbulence Forcing Functions, Upper Stage Shutdown transients, Strap-on Burnout/jettison Transients, POGO-specific Forcing Functions, Upper Stage Coupled Structural/Propulsion System Forcing Functions, LV / SV Separation Analysis, SRB Jettison, Stage 1/2 Separation, and BETO forcing functions.
11.6.3	Documentation of STEL Profiles, Aerodynamic Coefficients, and identification of source data or test in regards to Airloads
11.6.4	Documentation of Airloads dispersion, wind persistence, and identification of source data to come up with forcing function. Documentation of Airloads Autopilot Formulation and Implementation, Maneuvering Loads Forces, as well as forcing functions for Autopilot Limit Cycle Oscillation, Upper Stage Ignition Transients, Transportation / Handling / Hoist Loads Forcing Functions.
11.7	- Coupled System Model Assembly and Implementation
11.7.1	LVC LV dynamic model and all associated FEMs
11.7.2	LVC LV model synthesis validation/verification methodology and results
11.7.3	LVC LV/SV loads models and all associated FEMs

11.7.4	LVC LV/SV loads models validation/verification methodology and results.
11.7.5	LVC LV and LV/SV loads model dynamic characteristics.
11.8	- Response Calculations
11.8.1	LV/SV OTM and LOC Results: Max-min summary of LV and SV OTM and LOC results (for combined as well as individual event cases), along with description of data and uncertainty factors used. Time history data (including time vector) of payload interface for transient analyses, and PSD or spectra (including frequency vector) for frequency domain analyses. This applies to the following: Calculation of LV and SV Loads, Accelerations, Deflections; Calculation of Loss of Clearance (internal LV/SV)
11.8.2	- Separation / Staging Analyses
11.8.2.1	LVC dynamic models, requirements, mass properties, drawing and documentation for Booster Staging Analysis, PLF Separation analysis, LV/SV Separation analysis, and Strap on Separation analysis.
12	Avionics
12.1	Failure Modes and Effects Criticality Analysis (FMECA) at Component and System level, Redundancy Analysis (Cross-strapping, switching), Fault Tree Analysis, Corona and Multipaction Analysis, and Bent Pin Analysis for each avionics component (as required).
12.2	Worst Case Circuit Analysis, Sneak Path Circuit Analysis, Electronic Parts Stress Analysis (per Parts De-rating Guidelines), and Packaging Stress analyses (thermal, vacuum, structural - vibration, shock) for each avionics component. Need hardware drawings, parts lists and schematics for independent verification
12.3	Margin assessments and analyses - e.g. Mass and Power for all avionics components; Memory loading, CPU loading, Bus loading, Digital Timing and Signal Integrity Analysis for flight computer and other digital data processing avionics components
12.4	- "Flight Equivalent" Avionics
12.4.1	PDR, CDR and final design certification documents. Completed Facility and Test Bed Drawing Packages (Detail Drawings, Schematics/Wiring Drawings, and Development Test Procedures). Documentation for certification and control of test equipment including interface requirements, test software, and preventative maintenance. This is specific to Ground Test Facilities for Guidance and Navigation and Flight Control Development, Test and Evaluation - Software-In-the-Loop (SIL) and Hardware-In-the-Loop (HIL) Flight Simulation Laboratories w/Integrated “Flight Equivalent” Avionics
12.5	- Avionics Systems Components

12.5.1	Contractor and supplier Mission Assurance Management and Control Plans - Parts, Materials and Processes (PMP) Control Plan, Contamination Control Plan, Packaging, Handling, Storage and Transportation (PHST) Plan, along with Quality Assurance Requirements Flowdown and Verification Management at Sub-tier Suppliers. Documentation for certification and control of component-level test equipment including interface requirements, test software, and preventative maintenance.
12.5.2	Internal Contractor Processes (ex. Functional Configuration Audit (FCA) and Physical Configuration Audit (PCA)) Reports. Completed Component Drawing Package (Detail Drawings, Assembly Drawings, Assembly and Installation Drawings/Procedures, and Schematics/Wiring Drawings. Acceptance Test Procedure, and Product Baseline Record [PBR]).
13	Propulsion
13.1	CDR package for Propulsion-Cryogenics and Mechanical/Propulsion ground support equipment
13.2	- Booster Propulsion System Validation
13.2.1	Analytical models/tools, model description, input parameters, model results and summary report in regards to Propellant system tool development and analysis, Propellant residuals tool development and analysis, Pressurization and Venting tool development, engine performance model analysis and development
13.2.2	Analytical models/tools, model description, input parameters, model results and summary report in regards to Pressurization and Venting analysis
13.2.3	Analytical models/tools, model description, input parameters, model results and summary report in regards to engine performance model development
13.3	- Upper Stage Propulsion System Validation
13.3.1	Analytical models/tools, model description, input parameters, model results and summary report in regards to Propellant utilization system tool development and analysis, Propellant residuals tool development and analysis, Pressurization and Venting tool development and analysis
13.3.2	Analytical models/tools, model description, input parameters, model results and summary report in regards to Performance model development and analysis
13.3.3	Analytical models/tools, model description, input parameters, model results and summary report in regards to engine performance model development and analysis
14	Telemetry Data
14.1	Launch vehicle TLM frame mapping, scale factors, and conversions

APPENDIX G: GOVERNMENT HARDWARE REVIEW FORMAT

1. The Contractor shall coordinate with SMC/LE to schedule a domestic hardware review NLT 28 calendar days prior to the review. The Contractor shall coordinate with the Government to schedule a foreign supplier hardware review NLT 90 days prior to the review. The Contractor shall provide access/training/support as required to all essential data needed to conduct a Government Hardware Review of foreign and domestic suppliers.

2. The Contractor shall coordinate with SMC/LE to determine the number of calendar days required for each review based on the complexity of the component under review and the amount of data being reviewed. The Contractor shall provide a notification package for each Category 1 review. (CDRL B019)

3. The Contractor shall arrange for interpretation or translation services for any required vendor review of non-English data.

4. The Contractor shall provide the Government Hardware Review Team physical access to production equipment and the opportunity to review physical production and quality processes, and written procedural information associated with components under review, without affecting on-going operations.

5. The Contractor or Subcontractor team supporting an on-site hardware review shall include engineer(s) with direct knowledge of component design, production and testing. For off-site reviews, the Contractor or Subcontractor shall provide access to engineers with direct knowledge of component design, production and testing as required by the USG Team.

6. For on-site reviews the supplier shall make available a factory tour up to one (1) hour at the discretion of the Air Force Pedigree Team Leader.

7. Facilities shall be provided by the contractor/subcontractor at each on-site pedigree review location to support a maximum of 16 government attendees unless otherwise noted. Seating arrangements shall include a desk or table for each attendee's workspace. Facilities shall include a telephone for making long distance calls and a copy machine. Facilities shall have 110 VAC outlets and internet access for each member of the team.

8. The Contractor shall provide access to the following information in support of a hardware review:

    a. An introductory brief that includes:
        i. a description of pedigree review documentation, the Contractor's organization, and associated manufacturing flows and processes;

        ii. a description of any major non-conformance of the specific components under review;

        iii. all engineering changes for the specific parts under review;

        iv. identification of waivers and deviations for the specific components under review;

        v. a description of any OOF test data results; and

vi. a description of any OOP work accomplished during the hardware build and test;

vii. a drawing tree of the launch vehicle part number, revision, and traceability identification from top level vehicle part number down to region-level part number, to stage-level part number, to primary structure level, to component assembly level, and to component subassembly level, including circuit boards;

viii. a summary of the part number and revision deltas/mismatches between the as-design and as-built configurations, including identification, reconciliation, resolution, and disposition information;

b. Documentation for review to include:

i. evidence of compliance with source control drawings and specifications (appropriate revision);

ii. engineering drawings, data sheets, end-item specifications and source control drawings;

iii. production instructions, build logs, work orders, and other similar data; production build paper, references (procedures, standard/detailed process instructions, etc.), and identification of out-of-sequence work;

iv. qualification, acceptance, test, and checkout data and notification of and corrective action plans related to failures and anomalies; open qualification items, acceptance test requirements/procedures, production test record documents, test failures and anomalies analyses and corrective actions, retest results, cumulative operating time/cycles, vibration, and temperature exposure logs, data demonstrating successful completion of qualification testing, and analyses for first-flight article quality inspection data;

v. OOP work documentation; OOP work instructions with appropriate engineering, manufacturing, and quality approvals;

vi. waivers and deviations; provide rationale and status of waivers and deviations, including those approved and pending request/decision, expiration dates of life-limited materials and rationale for extensions;

vii. non-conformance records and associated analysis (i.e., root cause) of those records; related sibling records (currently and previously being tested); rework and repair non-conformance data, non-conformance system corrective and preventive actions, and corrective action implementation status; unverified failures with associated risk analysis, including analysis of worst case repairs, as applicable;

viii. material acceptance records and associated analysis of those records; supplier information requests, supplier data transmittals, incoming inspection results from prime Contractor and key Subcontractors, applicable industry and Government-Industry Data Exchange Program (GIDEP) alerts;

ix. material certifications; certifications for materials, parts, and subassemblies (Certificates of Conformance [COC], Acceptance Reports, etc.), lot codes, serial

numbers, thermal, shock, and vibration environments experienced to date, storage, handling, and transportation history with associated environments (and any requirements for temperature, humidity, cleanliness level, or nitrogen purge) and monitored data, films from radiographic inspection;

x. as-designed versus as-built configuration descriptions with appropriate reconciliation of any deltas (status accounting); engineering as-built configuration description;

xi. Class I and II changes to the approved qualification baseline, and traceability of parts, materials, and subassemblies;

xii. training and calibration certifications; access to inspection certifications, training certifications, calibration records, and shelf-life information as it relates to the hardware being reviewed;

xiii. Summary of Open Work Items;

xiv. environment levels for thermal cycle, thermal vacuum, random vibration, EMI/EMC, radiation and testing;

xv. analysis of trend data (test and manufacturing data) across the unit being tested and comparison with other like units currently and previously tested for out of family behaviors.;

xvi. test equipment and software (as applicable), along with critical calibration results;

xvii. product, closeout, and walkdown photos of subassemblies, CCAs, and higher level assemblies showing important characteristics such as part and serial numbers and cable connections;

xviii. engineering data and analysis from Functional Configuration Audits (FCAs), Physical Configuration Audits (PCAs), and First Article Inspections (FAIs) IAW SMC-S-021.

9. Actions generated during the review will be addressed and closed during the designated review period established for each part or supplier location whenever possible. Action item closure will be expedited by the following plan:

a. The USG Pedigree Team Lead will collaborate with the applicable Launch Service Provider and Supplier personnel at the conclusion of each review day to define daily open actions.

b. Open actions will be worked to closure during the Pedigree Review to the maximum extent possible. Any open RFl/RIDs must be closed within 30 days (or sooner) of initiation.

c. Actions may address all aspects of hardware pedigree as necessary to ensure the flight worthiness of the components under review, including definition of requirements imposed by the Contractor on their suppliers

10. The Contractor shall coordinate, track, issue status on, and respond to RFIs and Review Item Discrepancies (RID) that are issued by the independent hardware review team.

11. The Contractor shall notify SMC/LE, within 5 calendar days, whenever any of the following conditions exist to allow the USG Team to conduct a follow-up independent hardware review:

    a. An article/LV component for which an independent hardware review has been performed and which subsequently receives a MRB-level rework, repair, or use-as-is disposition, or an engineering change has been incorporated into the article or LV component;

    b. Aging, storage, or transportation issues arise after the original independent hardware review;

    c. Changes to the manufacturing process, materials, or inspection equipment which were not reported to the review team during the independent hardware review;

    d. The hardware is similar to other flight hardware that failed to perform properly during test or launch operations; or

    e. An Alert has been issued that could affect the hardware.

12. The Contractor shall communicate with the USG Team any “flight-critical hardware remove and replace” change to the integrated vehicle systems accomplished for any reason. (Electronic Data Access)

13. The Contractor shall provide USG insight into any “non-critical flight hardware remove and replace” change to the integrated vehicle systems driven by anomalies, risks, design, or production changes. (Electronic Data Access)

APPENDIX H: PROGRAM MILESTONE REVIEWS

Nominal Timeline	Program Milestone Review	Required Contractor Support
L-23 mo	Mission Kickoff	Support the development of mission-specific requirements and verification methods. Mission specific requirement include, but are not limited to, mission design, environmental (e.g., thermal, contamination, vibration, pressure, EMC, shock, RF, and lightning), and hardware. Identify preliminary derived requirements (contingent upon early integration information being available) to a level adequate to verify launch vehicle performance capabilities. Capture design restrictions, limitations, and known violations. Physical, mechanical, electrical, functional, avionics, and separation interface requirements shall be identified. (contingent upon early integration data being available) Identify mass properties, orbital requirements, launch vehicle performance, launch window injection, deployment attitudes and rates, and acquisition assistance messages requirements. Identify flight and ground critical items along with rationale to include an initial As Built Configuration List shall be provided. Identify status of the Launch Vehicle Test and Verification Plan. Identify and discuss changes to vehicle baseline and first flight items, qualification and analysis plans, new TLYF exceptions and updated system test requirements. Identify significant technical or programmatic challenges to include closure plans and progress made on the NRE Work Closure Plan (CDRL B020). Identify analyses to be conducted, interrelationships of SV data inputs to LV analysis schedules, and LV products. Provide status of compliance documentation. Provide roadmap for delivering all analysis data (CDRL B010) deliverables. Identify tasks that encompass launch processing of all ground and flight hardware test, encapsulated spacecraft mate, and launch.

Nominal Timeline	Program Milestone Review	Required Contractor Support
L-12 mo	Mission Design Review	Provide mission unique trade studies to include analyses performed and results along with comparisons to any similar proven designs. Evaluate the safety of the design and its ability to meet safety requirements. Requires USG Team approval. Demonstrate all mission unique requirements have been traced to the subsystem and component level and the flow down is adequate to verify system performance. Demonstrate overall mission architecture and all launch vehicle to payload interfaces have been identified and are verifiable. Provide launch vehicle-to-payload Interface Control Document (ICD) development status and verification plans. Demonstrate the design solution can be produced based on existing processes and techniques; if not, risk areas, which require unique and unproved processes, are identified and risk mitigation plans are established. Demonstrate an acceptable operations concept. Define preliminary launch vehicle interfaces. Provide preliminary personnel fairing access study. Provide preliminary plans for end-to-end testing methodologies. Release 90% mission unique drawings. Provide updated flight and ground critical items to include rationale and an updated As Built Configuration List. Provide status of the execution of the Launch Vehicle Test and Verification Plan and NRE Work Plan activities. Identify and discuss any additional changes to vehicle baseline and first flight items, qualification and analysis plans, new TLYF exceptions and updated system test requirements Provide updated roadmap for delivering all analysis data (CDRL B010) deliverables. Provide updates to the tasks that encompass launch processing of all ground and flight hardware test, encapsulated spacecraft mate, and launch.

Nominal Timeline	Program Milestone Review	Required Contractor Support
L-6 mo	Mission Verification Review	Demonstrate the design, fabrication, qualification testing and analysis are complete. Review all mission specific items for the payload and mission requirements to verify qualification, compliance, and systems-level compatibility using completed analyses, test, inspection, and demonstrations results. The mission unique system acceptance shall be subject to USG Team's approval. Review any updates to mission analyses and methodologies/tools from mission design review. Provide status of Launch Vehicle-to-payload Interface Control Document (ICD) requirement verification activities. Provide results of the mission specific acceptance reviews of the major suppliers or major subsystems. Identify design changes that occurred subsequent to MDR or changes as a result of new flight data. Summarize applicable component tests (test setups, test cases, results and significant anomalies), analyses, margins, or similarity assessments to include component qualification rationale (similarity, test, analysis) for all affected components that are new, changed or subject to new environments or functional requirements. Demonstrate methodology and results of current analyses at 90%. Provide updated flight and ground critical items to include rationale and an updated As Built Configuration List. Provide status of the execution of the Launch Vehicle Test and Verification Plan. Identify any additional changes to vehicle baseline and first flight items, qualification and analysis plans, new TLYF exceptions and updated system test requirements. Provide launch vehicle/payload compatibility test plans. Demonstrate all key subsystem and/or component engineering analyses are complete. Provide integrated safety analysis identifying any remaining hazards and proposed resolution. Provide updated roadmap for delivering all analysis data (CDRL B010) deliverables. Identify any updates to the tasks that encompass launch processing of all ground and flight hardware test, encapsulated spacecraft mate, and launch.

Nominal Timeline	Program Milestone Review	Required Contractor Support
L-3 mo	Ground Operations Readiness Review (GORR)	Review mission-specific launch site operations schedule, LV flight hardware/software and facility / ground support equipment (GSE) status, integrated operations procedure status, integrated operations changes from previous mission (if applicable), and lessons learned from previous mission (if applicable). Review integrated operations plan, to include SV GSE installation at launch complex (LC), payload fairing (PLF) encapsulation, encapsulated assembly (EA) transport from payload processing facility (PPF) to LC, EA mate to LV, and LC operations through launch. Provide status of Launch Vehicle-to-payload Interface Control Document (ICD) requirement verification activities at the launch site.
No later than 2 business days before LV ship	Pre-Vehicle Ship Review	The main objective of the Contractor's Pre-Ship Review is to verify readiness to ship flight hardware to the launch site. The review would include end-item product configuration status, technical risk summary from mission design reviews, production summary include status of transfer work and remaining open work, product non-conformances and time/cycle life status, and transportation plan. Review shall document end item configuration, first flight items, significant technical issues encountered during the manufacture of the launch vehicle, all out of position work being transferred to the launch site, test or equipment waivers, non-conformance list with brief description, any liens to the hardware.
L-2.5 mo	Component and Subsystem Readiness Review (CSRR)	Provide the final integrated assessment of the maturity and residual risk of the mission and launch vehicle design, build, analysis, and test activities to determine acceptability to proceed into integrated operations to include: 1. Review first flight items and their qualification. 2. Review verification and validation results summary/status for launch vehicle configuration. 3. Review significant issues identified during build and validations and verification activities. 4. Review aggregate list of accepted residual risks to date (Launch Vehicle only). 5. Review any updates to mission analyses and methodologies/tools from Mission Verification Review 6. Review and document fleet crossover risks identified to date. 7. Review relevant fleet crossover risks.

Nominal Timeline	Program Milestone Review	Required Contractor Support
L-6 weeks	Integrated Operations Readiness Review	Demonstrate the launch site and launch vehicle are ready for payload mechanical and electrical integration. Review action item status, safety status, payload mating plan, closure plan, payload integration/launch site documentation, interface verifications, checkout and launch software status, nonconformance reports, launch site status, S/C readiness, and review of flight profile. Provide a detailed schedule showing all activities remaining to achieve an on-time launch.
L-14 to L-7 days	Flight Readiness Review (FRR)	Provide launch vehicle configuration to include baseline configuration, first flight items and mission unique items. Provide mission profile overview from lift off through disposal. Provide milestone schedule and identify any issues impacting ILC. Provide summary of vehicle margins and launch availability estimates. Provide summary of ground facility and support equipment readiness. Provide summary of launch opportunities. Provide status of issues and anomalies identified by the USG Product Line Chief Engineer to include any “Low-Medium” or higher risk, first flight items, and all open issues.
L-5 to L-3 days	Pre-Launch Readiness Review	Provide closure of any actions open from FRR. Provide status on any issues that were identified after FRR due to vehicle non-conformances, walk-down findings, or product line crossovers. Review any updates to verification and validation results. Summarize and status of the launch system configuration and operations. Review resolution of any new significant issues identified during launch site activities. Review Engine and Motor Subcontractor readiness, if applicable.

Nominal Timeline	Program Milestone Review	Required Contractor Support
L-2 days	Launch Readiness Review (LRR)	Review LV flight hardware/software, LC, and LV GSE status. Review flight operations status, to include readiness of all support elements such as LV telemetry collection assets. Review day of launch (terminal count) timeline and launch constraints.

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