# TEST AND OPERATIONS SUPPORT CONTRACT

# ATTACHMENT J-01

# PERFORMANCE WORK STATEMENT

## Contract Overview

The Test and Operations Support Contract (TOSC) provides a processing contract for the Kennedy Space Center (KSC) supporting multiple customers.  The scope of this contract includes program management and control; safety and mission assurance; information management; processing support systems and integration; flight hardware processing; ground systems operations, maintenance and sustaining engineering; logistics and Spaceport Services.

TOSC provides for the management and performance of activities to accomplish ground processing for launch vehicles, spacecraft and payloads in support of the International Space Station (ISS) Program; Exploration Systems Development (ESD) comprised of the Ground Systems Development and Operations (GSDO), Space Launch System (SLS), and Multi-Purpose Crew Vehicle (MPCV)  Programs; and Launch Services Program (LSP) customers.

TOSC also provides ground processing for launch vehicles, spacecraft and payloads in support of emerging programs, commercial entities and other government agencies as designated by the Government.  Services include advanced planning and special studies; development of designated ground systems; operational support for design and development of flight hardware and ground systems; spacecraft, payload, and launch vehicle servicing and processing; ground systems services; and logistics and other processing support services.

Contract activities will be performed in the most cost-effective and efficient manner supporting the Government's priorities for safety, mission success, customer satisfaction and innovation while maintaining flexibility and responsiveness to changing requirements.

## 1   Program and Business Management

The contractor shall provide program and business management functions to perform the requirements of this contract.  The contractor shall provide and maintain program management systems for the planning, organization, implementation, direction, control and reporting of all activities required by this contract.  The contractor shall utilize these management systems to accomplish safety, technical, schedule and cost objectives.

The contractor shall manage and perform activities to accomplish ground processing for launch vehicles, spacecraft and payloads in support of the ISS, GSDO, SLS and MPCV Programs and LSP spacecraft customers.  The contractor shall manage and perform Spaceport Services for existing and emerging programs, commercial entities and other government agencies as designated by the Government.

The contractor shall perform the contract requirements in a cost-effective and efficient manner while supporting the Government's priorities for safety, mission success, customer satisfaction and innovation.  The contractor shall provide personnel and other resources necessary to accomplish the requirements of the contract.  The contractor shall maintain flexibility and responsiveness to changing requirements.

The contractor shall establish and maintain team-oriented working relationships with the Government at all levels in the organization.  Through formal and informal interaction, the contractor shall work with Government counterparts to ensure requirements are clearly communicated, mutually understood, and satisfied.  The contractor shall ensure timely, accurate, and thorough response to the Government's requests for information.  The contractor shall work cooperatively with other KSC and program contractors to ensure timely, efficient and effective implementation of requirements.

The contractor shall develop, update and implement a *Program Management Plan* (Data Requirement (DR) 1-1) to provide the program services for operational, business, budgetary, risk and schedule planning for program-related functions.  The contractor shall develop, update and maintain an organizational structure within the *Program Management Plan* that provides traceability to the contract Work Breakdown Structure (WBS).

## 1.1    Program Management

The contractor shall perform program management including program and project reviews, Certification of Flight Readiness (CoFR), risk management, program control, continuous improvement, emergency preparedness and public affairs.  The contractor shall perform program and project management in accordance with NPR 7120.5 *NASA Space Flight Program and Project Management Requirements* and KNPR 7120.5 *KSC Space Flight Program and Project Management.*

The contractor shall implement a program management approach that integrates technical, cost and schedule baselines.  The contractor shall implement project controls for managing performance-to-plan and changes to the integrated technical, cost and schedule baselines.

The contractor shall perform planned and contingency operations, and shall respond to emergency situations.  The contractor shall coordinate with the Government prior to execution of unplanned operations (e.g., program-declared emergency).

The contractor shall provide the Government unrestricted access to all data generated or compiled in the performance of this contract and shall respond within a reasonable amount of time to Government requests for data that is not immediately available.  Data generated during contract performance will remain the property of the Government.

The contractor shall develop, update and maintain an electronic *Work Breakdown Structure (WBS) and WBS Dictionary* (DR 1.1-1).  The WBS shall serve as the framework for contract planning, budgeting, cost recording and schedule reporting to the Government.

### 1.1.1   Program and Project Reviews

The contractor shall participate in and support program and project meetings and reviews. Activities include presentations covering the contractor's areas of responsibility; identification of impacts due to proposed requirements changes; planning and implementation of program and project meetings and reviews; and coordination and resolution of action items with the Government and other contractor representatives.  Examples of meetings and reviews include:
- Program/project control and change boards
- Milestone reviews (e.g., Stage, Launch, Flight, and Readiness)
- Project, vehicle, element, operations, test and verification control boards and panels
- System Requirements Reviews
- Design Reviews
- Pre-ship reviews and acceptance review boards
- Business and performance reviews
- Crew briefings
- Pre-test and Post-test briefings
- KSC institutional reviews and boards
- Manifest reviews and panels

- Schedule integration meetings
- Launch countdown working groups

## 1.1.2  Certification of Flight Readiness

The contractor shall develop and implement an auditable approach to verify and ensure completion of TOSC flight preparation requirements.  The contractor shall develop, update and implement a *Certification of Flight Readiness (CoFR) Plan* (DR 1.1-2) in accordance with:

- SSP 50108 *Certification of Flight Readiness Process Document (ISSP)*
- SSP 52054 *ISS Program Payloads Certification of Flight Readiness Implementation Plan, Generic*
- SSP 50902 *Transportation Integration Office/Commercial Vehicle Certification of Flight Readiness Implementation Plan (ISSP)*
- KPL-PLN-50001 *Kennedy Space Center Spacecraft Processing Certificate of Flight Readiness Implementation Plan*
- Exploration Systems Development (ESD) TBD document(s)

## 1.1.3  Risk Management

The contractor shall develop and implement a management approach to identify, analyze, plan, track, communicate, mitigate and control risks.

The contractor shall develop, implement, and maintain a *Risk Management Plan* (DR 1.1-3) in accordance with NPR 8000.4 *Agency Risk Management Procedural Requirements*.

The contractor shall also comply with applicable program-specific requirements:

- SSP 50175 *ISS Risk Management Plan*
- KDP-P-1702 *ISS/Spacecraft Risk Management*
- ESD TBD document(s)
- KSC Ground Processing Directorate (GPD) TBD Risk Management Plan

Examples of risk categories include:

- Human space flight safety
- Mission success criteria
- Problem resolution
- Developmental projects
- Budget
- Launch window and hardware availability
- Security
- Environmental
- "Fail ops/fail safe" requirements
- Technology readiness
- Ground systems and maintenance requirements

## 1.1.4  Program Control

The contractor shall perform program control functions including:

- Developing and implementing policy and planning consistent with Agency, Program and Center directives, policies, operating procedures and requirements
- Assessing and reporting of performance-to-plan, including variance explanations
- Managing an integrated contract effort to meet technical, cost, and schedule requirements
- Establishing a process for developing, updating and tracking Memoranda of Understanding (MOUs), Memoranda of Agreement (MOAs), Information Action Requests (IARs), Associate Contractor Agreements (ACAs), Bilateral Exchange Agreements (BEAs) and any agreements with other contractors
- Planning, participating in and hosting program reviews, workshops, and presentations
- Developing and tracking metrics and other data to measure performance and progress
- Coordinating lessons learned and implementing resultant findings

For ongoing work transitioned from other contracts to TOSC, the contractor shall initially utilize and comply with existing standardized plans, practices, policies, procedures and agreements. The contractor shall review existing plans, practices, policies, procedures and agreements applicable to TOSC scope; and shall make any necessary corrections, revisions or recommendations for cancellation within one year of contract start to reflect strategies for mission success and operational efficiency.  The contractor shall obtain Government approval for modifications or cancellations to existing plans, practices, policies, procedures and agreements, with the exception of agreements between the contractor and other contractors.

## 1.1.5  Continuous Improvement

The contractor shall develop, implement and maintain *a Continuous Improvement Plan* (DR 1.1-4) with the overarching goals of improving productivity, streamlining processes, achieving cost reductions and savings, consolidating and scaling support functions, and achieving other economies and efficiencies across the full spectrum of performance of this contract and the performance of subcontractors.  The plan shall include the contractor's methods for capturing lessons learned and contributing knowledge to other entities and systems.

## 1.1.6  Emergency Preparedness

The contractor shall develop, implement and maintain an *Emergency Management Plan* (DR 1.1-5) in accordance with KNPR 8715.2 *Comprehensive Emergency Management Plan (CEMP).* The plan shall integrate the contractor's approach to emergency preparedness, mitigation, response and recovery to provide a safe work environment for the employees.  Following a declared emergency condition, the contractor shall execute the *Emergency Management Plan* and procedures to take immediate action to eliminate hazards to personnel, equipment or the

environment; prevent loss of or damage to government property; and restore essential services.

The contractor shall perform hurricane planning, preparations, contingency operations implementation and recovery.  The contractor shall support the Damage Assessment and Recovery Team (DART) and the Ride-Out Team as directed by the Government.

The contractor shall develop, implement and maintain a *Continuity of Operations Plan (COOP)* (DR 1.1-6) to ensure performance of mission-essential operations during emergency situations or disruptions.  The contractor shall simulate emergency situations and test contractor readiness to respond appropriately.  The contractor shall submit results annually in the *COOP Annual Test Report* (DR 1.1-7).

## 1.1.7  Public Affairs

The contractor shall provide a liaison to NASA Kennedy Space Center's Public Affairs Directorate.  The contractor shall coordinate NASA-related news (e.g., media interviews, news conferences, media scouts, photo opportunities, film crews) with NASA Public Affairs prior to release by the contractor.  If the contractor has knowledge of NASA-related news to appear in the media, web or social media prior to publication or broadcast, the contractor shall notify NASA Public Affairs.  The contractor is encouraged to distribute internal KSC communications (e.g., Center Director communications, KSC Daily News, KSC Employee Updates, KSC Security Flash) to its employees.

## 1.2     Business Management

The contractor shall ensure contract and financial management requirements are accomplished and accounted for in accordance with applicable federal and Agency procedures and regulations.

The contractor shall perform and integrate business and administrative functions across all areas of performance.  The contractor shall provide ongoing business and procurement analysis and respond to requests and inquiries from the Government relating to budget, schedule and cost performance.  The contractor shall implement strategies to establish and sustain appropriate relations with labor unions while using prudent business practices to facilitate cross-utilization of the workforce.  The contractor shall provide a copy of Collective Bargaining Agreements to the Labor Relations Officer and Contracting Officer within 30 days of ratification.

The contractor shall conduct monthly performance-to-plan reviews to provide the Government with insight into the overall progress of the contractor, subcontractors and vendors.  The contractor's planning, tracking and reporting shall include the integration of cost, technical performance, workforce and schedule data for all areas of the contract.  The contractor's integration of cost, technical performance, workforce, and schedule data shall include flight hardware processing; ground systems operations, maintenance, sustaining engineering and development; logistics services; information management; other support functions; and new work, baseline changes and task orders.  The contractor shall perform assessments of projected mission requirements and identify impacts to cost, technical performance and schedule.  Additionally, the contractor shall provide on-site and off-site headcounts and geographic economic impacts.  The contractor shall provide a recovery plan for tasks, activities or projects for which the contractor has responsibility when the estimate-to-complete exceeds established cost or schedule plans.

The contractor shall provide accumulated expenditures and projections of costs and workforce utilization, including all tiers of subcontractors with a total subcontract value greater than or equal to $50,000,000.

## 1.2.1   Contract Management

The contractor shall maintain management, technical control and visibility of contract resources including intra-company personnel, subcontractor resources, and vendor activities used to fulfill contract requirements.  The contractor shall develop, recommend and implement approaches consistent with government regulations that support and expedite the contract change process.

The contractor shall maintain accountability for the quality and timeliness of the goods and services subcontracted under this contract.  The contractor shall provide visibility for the Government into all aspects of intra-company, subcontractor and major vendor activities and shall ensure subcontractor management systems are able to support reporting requirements of the contractor.

The contractor shall submit procurement documents to the designated government quality representative for determination of the need for Government Source Inspection (GSI) in accordance with NPR 8735.2, *Management of Government Quality Assurance Functions for NASA Contracts* and the FAR.  The contractor shall ensure Government access to subcontractor or supplier facilities as necessary to perform quality assurance functions.

The contractor shall develop and deliver the following DRs:
- *Advance Notification of Workforce Reductions Report* (DR 1.2-1)
- *Quarterly Contractor Workforce Report* (DR 1.2-2)
- *Quarterly Summary of 3rd Step Grievances and Arbitrations Report* (DR 1.2-3)

The contractor shall develop, implement and maintain a *Contingency Strike Plan and Notification of Potential Labor Dispute Plan* (DR 1.2-4).


## 1.2.2  Financial Management

The contractor shall utilize and maintain a financial management system to capture costs incurred through the performance of the contract.  The system shall be flexible to ensure compliance with the variety of cost charging and reporting requirements of the Government based on customers and sources of funds.  The system shall have adequate internal checks, balances and audit steps to isolate and identify erroneous or incomplete data and procedural deviations.  The contractor shall notify the Government immediately upon detection of significant errors in their accounting system that impact work or costs reported in any given period.

The contractor shall provide access to an automated, network accessible, ad hoc query capability to specific users, as identified by the Government, which provides actual and projected workforce and cost at all levels collected by the contractor.  The level of detail shall include the level reported in the NASA Form (NF) 533 reports by WBS, specific customers, unique projects, individual task orders and cost pools.  The capability shall also provide multi-year budget forecast(s), Government Fiscal Year (GFY) operating plans, monthly plan versus actuals through estimate-to-complete, and monthly contract value.  This capability shall be able to archive and reproduce all historical month-end financial data for the duration of the contract.

The contractor shall develop and submit, consistent with multi-program budget schedules, financial planning as required to support the government budget process to include but not limited to multi-year Planning, Programming, Budgeting and Execution (PPBE) calls; annual operating plan calls; Construction of Facility (CoF) calls; Information Technology (IT) budget calls; task orders; and special requests for budget impacts.  The format and content of the contractor's inputs and supporting rationale shall be in accordance with the budget or special request guidelines, and formats specified by the Government.  The contractor shall develop, implement, and maintain a planning tool that expedites the identification of resources needed

to satisfy projected mission requirements (e.g., manifest options) and impacts to cost, technical performance and schedule.

The contractor shall develop and deliver the following DRs:
- *Contractor Financial Management Analysis, NASA Form 533M & NASA Form 533Q Reports* (DR 1.2-5)
- *e533 Flat File* (DR 1.2-6)
- *Annual Phased Contract Operating Plan* (DR 1.2-7)
- *Planning, Programming, Budgeting, and Execution (PPBE) Cost Forecasts* (DR 1.2-8)
- *Rate-Volume Variance Analysis Report* (DR 1.2-9)
- *Direct and Indirect Rates Report and Review* (DR 1.2-10)
- *Prime and Subcontractor Contract Value (CV) Status Report and Review* (DR 1.2-11)
- *Contractor-Held Asset Tracking Report* (DR 1.2-12)
- *Contractor-Held Newly-Acquired Capital Asset Report* (DR 1.2.13)
- *Shared Direct Cost Allocation Report* (DR 1.2-14)
- *Annual IT NASA Headquarters and Special IT Budget Report* (DR 1.2-15)
- *Phased Negotiated Estimated Cost Baseline Report* (DR 1.2-16)

The contractor shall reconcile and periodically audit all data contained in the DRs listed above to the contractor's financial management systems.

## 1.3    Security Management

The contractor shall establish an effective and comprehensive security program that encompasses industrial, physical, administrative, classified and unclassified information, export control, Sensitive But Unclassified (SBU), communication, personnel and threat analysis programs.

### 1.3.1   Physical Security

The contractor shall provide protection of personnel, assets, equipment, classified information or materials, and SBU data or information as required.

The contractor shall develop, implement, and maintain a *Security Management Plan* (DR 1.3-1) in accordance with:
- NPD 1600.2 *NASA Security Policy*
- NPD 1660.1 *NASA Counterintelligence (CI) Policy*
- NPR 1600.1 *NASA Security Program Procedural Requirement*
- NPR 1620.2 *Physical Security Vulnerability Risk Assessments*
- NPR 1620.3 *Physical Security Requirements for NASA Facilities and Property*
- NPR 1660.1 *Counterintelligence (CI)/Counterterrorism (CT) Procedural Requirements*
- NM 1600-52 *Personal Identity Verification (PIV) Policy and Procedures*
- NM1600-55 *Sensitive But Unclassified (SBU) Controlled Information*
- NM 1600-95 *NASA Identity and Credential Management*
- KNPR 1600.1 *KSC Security Procedural Requirements*
- DoD 5220.22 *National Industrial Security Program*

The contractor shall report allegations of espionage, terrorism threats or incidents providing counterintelligence indicators of the loss or potential loss of SBU, export controlled, proprietary or classified national security information to the appropriate Center Counterintelligence Office. The contractor shall fully cooperate in the conduct of inquiries, investigations and other government counterintelligence activities to the extent permitted by law.

### 1.3.2   Export Control

The contractor shall develop, implement, and maintain an *Export Control Plan* (DR 1.3-2) in accordance with:
- NPR 2190.1 *NASA Export Control Program*
- 15 CFR Parts 730-774, *Commerce and Foreign Trade*
- 22 CFR Parts 120-130, *International Traffic in Arms Regulations (ITAR)*

The contractor shall identify an Export Control Plan focal point that will be the contractor's representative to support the KSC Export Control Office. The contractor shall apply for all required export licenses within 30 days after contract start. The contractor shall classify and apply the proper markings on contractor generated documentation for hardware, software, services, technology and data.

### 1.3.3  Communications Security

The contractor shall act as the Communications Security (COMSEC) system-controlling authority for certain encrypted communications and provide certified personnel to perform limited cryptographic operations.  The contractor shall provide a COMSEC Account Manager and Alternate COMSEC Account Manager.

The contractor shall coordinate account activities (e.g., establishing accounts, nominating COMSEC Account Managers) with the NASA/KSC Central Office of Record (COR).

The contractor shall comply with federal, DoD 8523.01 *Communications Security (COMSEC)*, and NPR 1600.1 requirements for secure communications.  These systems shall provide for classified and SBU communications using administrative and physical controls.

The contractor shall provide and maintain encryption key management services in accordance with secure communications requirements.  The contractor shall provide for proper handling, storage and destruction of classified documentation.

The contractor shall perform the necessary limited cryptographic maintenance (requires a SECRET clearance), as well as day-to-day operations of the equipment and its interfaces.  The contractor shall provide COMSEC engineering expertise for day-to-day operations.

## 1.4    Environmental Management

The contractor shall ensure that TOSC activities and associated processing facilities comply with applicable NASA Headquarters directives consistent with NPD 8500.1 *NASA Environmental Management*; NPR 8570.1 *Energy Efficiency and Water Conservation*; federal, state and local environmental laws and regulations; and executive orders.  The contractor shall comply with NASA environmental requirements per KNPR 8500.1, *KSC Environmental Requirements*.

The contractor shall satisfy NASA's Sustainable Acquisition Program for TOSC procurements in accordance with NPR 8530.1 *Affirmative Procurement Program and Plan for Environmentally Preferable Products*.  The contractor shall also support KSC sustainability planning and initiatives by participating in Sustainability Working Group meetings, performing benchmarking, assessing processes and procedures for sustainable improvements, and implementing improvements when appropriate.

The contractor shall support NASA's Environmental Management System in accordance with NPR 8553.1 *NASA Environmental Management System*, including environmental management plans, targets and objectives consistent with KNPR 8553.1 *NASA Kennedy Space Center Environmental Management System (EMS)*.

The contractor shall develop, implement, and maintain an *Environmental Management Plan* (DR 1.4-1), which defines internal policies, procedures and guidelines for environmental compliance.

The contractor shall perform environmental reviews of TOSC operations including hazardous and controlled waste management.  The contractor shall ensure that all employees who are responsible for hazardous waste management activities receive annual hazardous waste training and, where applicable, have job descriptions that meet the requirements of 40 CFR 265.16  *Personnel Training*.

The contractor shall identify, interpret and apply new and existing environmental requirements with respect to TOSC activities.  The contractor shall review proposed environmental requirements and regulations with respect to TOSC activities and report potential impacts to the Government.

The contractor shall prepare environmental reports for permitted activities and regulatory requirements.  The contractor shall identify environmental permit strategies, develop permit applications and implement permit requirements for TOSC activities.

The contractor shall participate in project design reviews to ensure communication of environmental aspects to raise awareness of impacts to people, processes and the environment.  The contractor shall provide guidance and monitoring of corrosion control and construction operations for proper implementation of environmental requirements.

The contractor shall provide records of chemical usage and storage for each calendar year.  The contractor shall respond to data calls from the Government.  The contractor shall input the data into electronic databases, spreadsheets or other formats as provided by the Government.  The contractor shall support NASA environmental program requirements applicable to TOSC scope, including support to internal and external inspections and audits.

The contractor shall perform waste minimization and pollution prevention opportunity assessments such as reducing Toxic Release Inventory (TRI) chemical releases and hazardous waste.

The contractor shall ensure compliance with natural and cultural resource awareness and protection in accordance with KNPR 8500.1 *KSC Environmental Requirements*.  The contractor shall incorporate sustainable elements and practices in operations in accordance with Executive Order 13423 *Strengthening Federal Environmental, Energy and Transportation Management* and Executive Order 13514 *Federal Leadership in Environmental, Energy, and Economic Performance* including areas of energy efficiency, use of renewable energy, reduction in water consumption, acquisition of green products and services, pollution prevention, waste prevention, recycling and waste diversion, use of alternative fuel vehicles and alternative fuels, and electronic stewardship.

The contractor shall develop and implement environmental awareness, energy conservation and water conservation programs.

## 2   Safety and Mission Assurance

The contractor shall protect the public, the workforce, high-value equipment and property, and the environment from potential harm resulting from contractor activities and operations.  The contractor shall assure mission success through safe, reliable and high-quality processes and products.  The contractor's documented processes shall be auditable by the Government.

The contractor shall ensure independent lines of communication and hold performing organizations accountable for safety and mission success.

The contractor shall document lessons learned in the NASA Lessons Learned database in accordance with NPR 7120.6 *Lessons Learned Process*, NPR 7120.5 *NASA Space Flight Program and Project Management Requirements* and NPR 8621.1 *NASA Procedural Requirements for Mishap and Close Call Reporting, Investigating, and Recordkeeping*.  The contractor shall document, track, and implement corrective actions and evaluate the effectiveness of the actions taken.

## 2.1   Safety

The contractor shall develop, implement, and maintain a *Safety and Health Plan* (DR 2.1-1) in accordance with NPR 8715.3 *NASA General Safety Program Requirements* and KNPR 8715.3 *KSC Safety Practices Procedural Requirements*.  The contractor shall submit a *Safety Statistics Record* (DR 2.1-2).

## 2.1.1   System Safety

The contractor shall develop and implement an approach which ensures the identification of hazards; elimination, reduction, and/or control of hazards; and provision and updates of hazard documentation associated with ground processing throughout the life cycle of the program.

The contractor's approach shall include:
- Analytical methods, both quantitative and qualitative as appropriate (e.g., Hazard Analysis (HA), critical item risk assessment), to assess ground processing and ground support hardware and software, and to facilitate the decision process for risk identification and mitigation. Analytical methods shall meet the respective safety requirements of the applicable programs.
- System safety analyses in accordance with KNPR 8700.2 *KSC Systems Safety and Reliability Analysis Methodology Procedural Requirements*, SSP 30599 *Safety Review Process* for ISS processing, and ESD TBD document(s).
- Risk assessment process including approval by the appropriate Government or program entity for hazards and critical item risks not eliminated by design.
- Project or program approval of variances, deviations and waivers from safety requirements or other requirements with safety or mission success impact.  The contractor shall document their approach and results.

The contractor shall develop, maintain and provide hazard analyses and reports in accordance with KNPR 8700.2 *KSC Systems Safety and Reliability Analysis Methodology Procedural Requirements* and applicable program safety requirements.

The contractor shall review Government Industry Data Exchange Program (GIDEP) Alerts and update system safety products as needed to accurately reflect reliability performance.

## 2.1.2  Reliability, Maintainability and Supportability

The contractor shall develop, update and implement a process to ensure reliability, maintainability and supportability throughout the life cycle of the systems and equipment for which the contractor has maintenance or sustaining engineering responsibility.  The contractor's process shall include:
* Assessments of reliability, maintainability and supportability performance against baseline specifications
* Preparation, maintenance and control of reliability assessments and trend analyses
* Assessments of materials and parts in support of operational integrity
* Evaluation and participation in failure reviews

The contractor shall develop their processes based upon the fundamental reliability, maintainability and supportability concepts and principles in accordance with KNPR 8720.2 *KSC Reliability & Maintainability Procedural Requirements,* and with PWS Sections 6 and 7.2.

The contractor shall develop, maintain and control the Failure Modes Effects Analysis and Critical Items List (FMEA/CIL) in accordance with KNPR 8700.2 *KSC Systems Safety and Reliability Analysis Methodology Procedural Requirements* for ground systems that the contractor has sustaining engineering responsibility.  The contractor shall comply with SSP 30234 *Failure Modes and Effects Analysis and Critical Items List for Space Station* for ISS ground systems and ESD TBD document(s).  The contractor shall integrate the results of the reliability assessments with the system safety function of risk identification.

## 2.1.3  Operations Safety

The contractor shall develop, implement and maintain a process, as documented in the *Safety and Health Plan* (DR 2.1-1), to identify, assess and document hazards associated with processing, testing, and ground systems operations and maintenance activities.  The contractor shall implement safety controls as identified in safety reviews and safety products (e.g., safety review panels, safety variances, safety data packages, and verification tracking logs).  The contractor shall provide a process for hazardous operation surveillance, hazardous procedure review, and risk assessments associated with deviations from procedures or safety and health requirements.  The process shall include provisions for program approval of risk associated with occupational hazards not eliminated or controlled.  The contractor shall coordinate and communicate risk to affected Government organizations and other contractors.

The contractor shall provide the Government, or authorized Government representatives, immediate access to the sites or areas where work under this contract is performed in order to conduct surveillance activities and determine the adequacy of the safety, health and mission assurance programs.  The contractor shall provide access to necessary records, including internal audit and assessment results and surveillance activities, for Government review.

The contractor shall develop, implement and maintain safety and risk analyses (e.g., Operating and Support Hazard Analyses, Ground Operations Risk Assessments) on hazardous operations in accordance with KNPR 8700.2 *KSC Systems Safety and Reliability Analysis Methodology Procedural Requirements*.

## 2.1.4  Occupational Safety

The contractor shall monitor activities, as documented in the *Safety and Health Plan* (DR 2.1-1)*,* to ensure compliance with Occupational Safety and Health Administration (OSHA), NASA and other federal, state and local regulatory requirements.  The contractor shall protect employees from workplace injury or illness resulting from contact with chemical, radiological, physical, electrical, mechanical or other workplace hazards in accordance with KNPR 8715.3 *KSC Safety Practices Procedural Requirements*.  Process safety management shall be performed per 29 CFR 1910.119 *Process Safety Management of Highly Hazardous Chemicals*.

## 2.1.4.1  Voluntary Protection Program Compliance

The contractor shall develop, implement and maintain a safety and health program that is compliant with OSHA's Voluntary Protection Program (VPP) in accordance with the requirements of OSHA Instruction CSP 03-01-003 *Voluntary Protection Program (VPP): Policies and Procedures Manual*.  As part of the implementation, the contractor shall submit a *VPP Application* (DR 2.1-3).  Until submission of the VPP application, the contractor shall submit quarterly reports regarding readiness activities.  The government will assess the contractor's implementation for compliance.  The contractor shall submit corrective action plans for identified discrepancies for Government approval within four weeks and provide monthly progress reports until corrective actions are completed.

## 2.1.4.2  Mishap Investigations and Reporting

The contractor shall develop, implement and maintain process(es) for reporting and investigating mishaps, in accordance with:
- NPR 8621.1 *NASA Procedural Requirements for Mishap and Close Call Reporting, Investigating, and Recordkeeping*
- KNPR 8715.3 *KSC Safety Practices Procedural Requirements*
- KDP-KSC-P-1473 *KSC Mishap Reporting and Investigating*
- KDP-KSC-P-2111 *Reporting Close Calls*

The contractor's mishap investigation process shall apply to activities for which the contractor is responsible, as well as activities performed by other government and non-government organizations within operational facilities controlled by the contractor.

The contractor shall submit reports on individual mishaps into the NASA mishap reporting database in accordance with NPR 8621.1 *NASA Procedural Requirements for Mishap and Close Call Reporting, Investigating, and Recordkeeping*.  The contractor shall obtain Government approval prior to resumption of work after Type A and B mishaps when occupational hazards identified have not been eliminated or controlled.

In the event of a Government mishap investigation, the contractor shall support the investigation and make available all pertinent documentation and personnel, as requested.  The contractor, for Government-led or independent Government investigations, shall provide Government first access to the site, personnel and documentation as requested.

The contractor shall allow the Government to participate on or observe contractor-led investigation boards.  The contractor shall provide summary data on all mishaps that occur during or as a result of TOSC activities.

## 2.1.4.3  Industrial Hygiene

The contractor shall develop, implement and maintain an industrial hygiene process, as documented in the *Safety and Health Plan* (DR 2.1-1), in accordance with the following requirements:
- KNPD 1800.2 *KSC Hazard Communication Program*
- KNPR 1840.19 *KSC Industrial Hygiene Program*
- KNPR 1820.3 *KSC Hearing Loss Prevention Program*
- KNPR 1820.4 *KSC Respiratory Protection Program*

The contractor shall provide a point of contact to interface with the KSC Industrial Hygiene Officer.

The Industrial Hygiene process shall manage internal and external interfaces, policies and resources as required for:
- Occupational exposure assessment and management
- Oversight of hazardous material acquisitions
- Hearing loss prevention
- Respiratory protection
- Confined space entry
- Hazard communication
- Ergonomics
- Indoor air quality
- Asbestos management

### 2.1.4.4  Health Physics

The contractor shall develop, implement and maintain a health physics process, as documented in the *Safety and Health Plan* (DR 2.1-1), in accordance with the requirements of KNPD 1860.1 *KSC Radiation Protection Program*, KNPR 1860.1 *KSC Ionizing Radiation Protection Program*, KNPR 1860.2 *KSC Nonionizing Radiation Protection Program,* and the requirements of the Nuclear Regulatory Commission (NRC).  The contractor shall ensure that potentially hazardous ionizing and non-ionizing radiation sources have approved Radiation Use Authorizations prior to any activity utilizing the sources.  The contractor shall provide a point of contact to interface with the KSC Radiation Protection Officer.  The contractor shall coordinate with the KSC Radiation Protection Officer in the planning for processing activities and launches containing radiological sources used for power or heat.

### 2.2  Quality

The contractor shall develop, implement and maintain a management system which is compliant with SAE AS 9100 *Quality Management Systems - Requirements for Aviation, Space and Defense Organizations* within one year of contract start as documented in their *Quality Management System* (DR 2.2-1).  The contractor shall provide quarterly progress reports regarding documenting, developing, implementing and maintaining their management system to comply with SAE AS 9100.  The Government will assess the contractor's implementation for compliance.  The contractor shall submit corrective action plans for identified discrepancies for Government approval within four weeks and provide monthly progress reports until corrective actions are completed and compliance is achieved.

The contractor shall develop a process to ensure compliance or consistency, as appropriate, with the latest revisions of documents identified in Appendix 2, *Compliance and Reference Documents* throughout the contract performance period.

### 2.2.1  Quality Assurance

The contractor shall perform work in accordance with applicable requirements and internal procedures.  The contractor shall ensure personnel are trained and have obtained required certifications prior to performing work.  The contractor shall verify work is performed per requirements and approved work instructions. The contractor shall utilize tools, equipment and measurement systems which are in compliance with KNPR 8730.1 *KSC Metrology and Calibration Procedural Requirements*.  The contractor shall implement the quality assurance requirements of KNPR 8730.2 *Quality Assurance Procedural Requirements* within their quality processes.

The contractor shall monitor, measure and verify key processes and attributes as defined in the *Quality Management System* (DR 2.2-1).

The contractor shall provide and maintain Acceptance Data Packages (ADPs) for hardware and software items in its custody which will be delivered or transferred to the Government.  For ISS

and LSP, the contractor shall provide and maintain ADPs in accordance with SSP 30695 *Acceptance Data Package Requirements Specification*.   For ESD, the contractor shall provide and maintain ADPs in accordance with ESD TBD document(s).

The contractor shall capture and provide digital imagery documentation for planned and unplanned work including closeouts, configuration management, test and verification, non-conformances and anomalies.  For ground systems, the contractor shall input images and data sheets into the KSC imagery repository, Institutional Computerized Archival System (ICAS).  The contractor shall participate in the appropriate program and Center Imagery Working Groups (IWGs) and prepare imagery plans for IWG approval.  The contractor shall capture digital imagery of processing activities as defined by the appropriate program's IWG requirements.  For other digital imagery, the contractor shall utilize the services provided in Appendix 14, *Government-Furnished Services*.

For ISS, the contractor shall participate in the ISS Program IWG and prepare Pre-flight Imagery Plans for IWG approval per KSC-UG-2003 *CAPPS Preflight Imagery Requirements for the IWG*. The contractor shall ensure the cataloging of flight hardware imagery to document ISS hardware configuration during assembly, test, integration, closeout and post-flight in accordance with IWG requirements.  The contractor shall input ISS images and data sheets into the ISS Digital Imagery Management System (DIMS) at Johnson Space Center (JSC).  The contractor shall capture digital imagery in accordance with IWG requirements for the following:
- Government Furnished Equipment (GFE) and payload items
- Flight hardware closeouts
- Final integration

For ESD, the contractor shall provide imagery support consistent with ESD TBD document(s).

## 2.2.2  Quality Engineering

The contractor shall ensure documents affecting configuration and work instructions are developed and implemented in accordance with applicable requirements and internal procedures.  The contractor shall request Government approval in accordance with applicable requirements when procedures, processes, hardware or software do not conform to documented requirements or specifications.  The contractor shall document and track remedial, corrective and preventive actions to closure.

The contractor shall identify and utilize a nonconformance, Problem Reporting And Corrective Action (PRACA) system in accordance with KNPR 8730.2 *Quality Assurance Procedural Requirements*.  The contractor shall provide access and user privileges for Government and Government-designated personnel to the system.

For ISS, the contractor shall identify, report, and resolve non-conformances in accordance with SSP 41173 *Space Station Quality Assurance Requirements* and SSP 30223 *Problem Reporting and Corrective Action for the Space Station Program*.

For ESD, the contractor shall identify, report, and resolve non-conformances in accordance with ESD TBD document(s).

The contractor shall develop, implement and maintain an *Inspection Plan* (DR 2.2-2) subject to Government approval based upon applicable program requirements and criteria.

### 2.2.3  Government Industry Data Exchange Program

The contractor shall participate in the GIDEP consistent with NPR 8735.1 *Procedures for Exchanging Parts, Materials, and Safety Problem Data Utilizing Government-Industry Data Exchange Program and NASA Advisories.*  The contractor shall participate in the GIDEP in accordance with the following:
- GIDEP S0300-BT-PRO-010 *GIDEP Operations Manual*
- S0300-BU-GYD-010 *Government-Industry Data Exchange Program (GIDEP) Requirements Guide*

### 2.2.4  Support for Government Assurance Activities

For tasks in which the Government is providing lead mission assurance coverage (e.g., quality engineering and quality assurance), the contractor support shall include:
- Archiving historical documentation and retaining data per PWS Section 3.6
- Evaluating PRACA and reporting to appropriate program PRACA system(s)
- Maintaining storage area and controlling access to storage area for nonconforming articles, including Material Review Board (MRB) items
- Establishing and controlling logs and issuing identification tags
- Processing ADPs
- Performing mission assurance activities associated with contractor-led subtasks
- Performing mission assurance activities for Utilization payloads prior to integration into or post de-integration from the Payload Rack Checkout Unit (PRCU)

### 2.3    Software Safety and Assurance

The contractor shall develop, implement and maintain a software safety program, as documented in the *Safety and Health Plan* (DR 2.1-1), and a software assurance program, as documented in the *Quality Management System* (DR 2.2-1), in accordance with:
- KNPR 8750.1 *Software Assurance Procedural Requirements*
- KNPR 8700.2 *KSC System Safety and Reliability Analysis Methodology Procedural Requirements*

### 2.4    Mission Assurance

The contractor shall identify and document constraints, risks, and risk reduction strategies to the appropriate program, project and Center boards or panels.  The contractor shall provide storage, access, tracking, and retention of the contractor's mission assurance products.

## 2.4.1  Mission Assurance Analyses and Support

The contractor shall develop, implement and maintain a process for identifying, tracking and resolving alternate or dissenting opinions having safety-of-flight or mission-success implications.  The contractor shall perform or support the Government in performing independent analyses or reviews of processing activities, analyses and products.

## 2.4.2  Safety and Mission Assurance Review Panels

The contractor shall support Agency, program and Center quality, safety, reliability, and risk review panels and working groups.  Support activities include:
- Developing and implementing mission assurance products (e.g., hazard analyses, ground safety data packages, risk assessments, waivers, and deviations) and submitting for Government approval
- Leading review panel discussions of system safety and implementing corrections required for document approval
- Reviewing and providing impacts (e.g., technical performance, cost and schedule risks) of proposed changes to applicable NASA, federal, state and local laws, regulations, policies, and directives as well as industry standards
- Retaining and archiving safety and mission assurance board products (e.g., waivers, deviations, and risk assessments) that are submitted for Government approval

## 3   Information Management

Information Management is comprised of the Management Information System(s) (MIS), Information Technology (IT) tools and Data Management.  The contractor shall implement a comprehensive Information Management approach to provide an MIS that utilizes industry standard best practices for Information Technology tools and data management techniques.

Additionally, the contractor shall assess IT Legacy Systems and associated software and data for future use.  The contractor shall comply with applicable IT security requirements and shall ensure protection of sensitive and privacy information.  The contractor shall provide a records management program in compliance with applicable NASA and FAR requirements.  The contractor shall provide technical document centers.

### 3.1   Management Information System

The contractor shall provide, operate, maintain and sustain an electronic Management Information System(s) (MIS) with capability to plan, author, control, schedule, integrate, approve, document, track and monitor contract activities throughout all areas of the PWS. Example contract activities include logistics, scheduling, financial management, maintenance, project management, safety and mission assurance, work control, flow management, configuration management, requirements tracking, computer-aided design and engineering, and requirements verification.

The contractor shall utilize the Kennedy Data Center (KDC) as identified in Appendix 14 *Government-Furnished Services* for on-site housing of the MIS.  If an off-site data center, in whole or in part, is utilized for the MIS solution, the contractor shall satisfy the requirements of Appendix 17 *Offsite Data Center Requirements* and obtain Government approval.

The contractor shall provide electronic access to and use of MIS applications for Government and Government-designated personnel.  The contractor shall ensure that the MIS will accommodate Spaceport Services customers as required (reference PWS Section 8.4).

The contractor shall perform continuous assessment and improvement of MIS performance and architecture to ensure efficiency and performance.  The contractor shall develop a Government-approved process for MIS modifications.

The contractor shall develop and maintain documentation that reflects the configuration of the contractor's MIS architecture, including contractor-provided and Government-furnished applications.

### 3.2   Information Technology

The contractor shall provide IT systems and tools necessary to perform the requirements of this contract, including hardware, systems, application software, firmware, displays, databases and data storage systems, with the exception of the items listed in Appendix 14 *Government-*

*Furnished Services*.  The contractor shall utilize off-the-shelf products where possible and cost effective to the Government.

The contractor shall provide IT systems and tools to enable the MIS.  The contractor shall ensure its IT capabilities support ground processing activities with minimal disruptions.

The contractor shall develop, implement and maintain an *Information Technology Plan* (DR 3.2-1) in accordance with NPR 2800.1 *Managing Information Technology*.

The contractor shall develop, implement and maintain a *Software Management Plan* (DR 3.2-2) in accordance with NPR 7150.2 *NASA Software Engineering Requirements*.  The contractor shall address highly-specialized IT and embedded software within ground systems in the Information Technology and Software Management Plans.

The contractor shall implement an architecture that complies with the applicable Agency IT standards and enables bi-directional digital data sharing with Government representatives within the KSC and NASA domains.  The contractor shall comply with NPR 2830.1 *NASA Enterprise Architecture Procedures*.  The contractor shall register applications using approved authentication methods and using approved processes in accordance with NPR 2841.1 *Identity, Credential and Access Management*.

The contractor shall coordinate with the Government-furnished IT-service providers for testing, deploying and troubleshooting IT applications as required.

The contractor shall operate a user help desk for contractor-provided IT systems and services.  This help desk shall provide services to the contractor, Government and Government-designated users who require access to and use of contractor-provided IT systems.  If required, the contractor shall coordinate with the Government-furnished IT-service providers for problem resolution.  The contractor shall maintain a problem tracking system as part of the help desk function.  The contractor shall report to the initiator when the problem is resolved.

The contractor shall provide IT technical and cost data as requested by the Government (e.g., data calls, buy plans and compliance metrics).

## 3.3   Data Management

The contractor shall provide data management that supports a structured, searchable, and interoperable environment.  The data management environment shall minimize data replication, ensure efficient bi-directional data exchange, conform to consistent data definitions, maintain referential integrity and use industry standards and approaches to move beyond the storage of raw uncorrelated data.  The contractor shall develop, implement and maintain a *Data Management Plan* (DR 3.3-1) consistent with GEIA-859 *Data Management* standard with guidance from GEIA-HB-859, *Implementation Guide for Data Management*.  Emphasis should be given to data delivery in-place, establishing and using consistent data

definitions, data accessibility and discovery, data reuse, data sharing, and maintain data provenance.

Upon contract completion, the contractor shall provide all data owned by the Government in a format consistent with industry standards for digital data exchange (reference PWS Section 1.1).

## 3.4    Legacy Systems

The contractor shall assess legacy IT hardware, software and data to identify assets necessary to perform contract requirements.  The contractor shall either shutdown and excess IT Legacy Systems and archive associated software and data or transition the systems, software and data into the MIS as necessary.  The contractor shall develop a Government-approved Legacy IT Systems Transition Plan, including an implementation schedule, within six months of contract start.  The contractor shall implement the plan and complete all transition activities no later than 33 months after contract start.

The contractor shall accept, operate and maintain legacy hardware, databases, software and systems as defined in Appendix 13 *Government-Furnished Legacy IT Systems* until each item is excessed or transitioned.

## 3.5    IT Security Compliance

The contractor shall ensure IT security compliance for systems that generate, access, store or process information, regardless of whether the information resides on a Government-furnished or a contractor-provided system.  The contractor shall implement an IT security approach in accordance with NPD 2810.1 *NASA Information Security Policy*.

The contractor shall develop, implement, and maintain an *IT System Security Plan* (DR 3.5-1) for systems developed or operated in performance of this contract in accordance with NPR 2810.1 *Security of Information Technology*.  The contractor shall manage information security and implement security controls per NPR 2810.1 and NFS 1804.470-3.  The contractor shall incorporate IT security requirements at all phases of the System Development Life Cycle (SDLC) in accordance with NPR 2810.1.

The contractor shall encrypt sensitive information at rest and during transmission.  The contractor shall utilize the Government-provided capability to meet data encryption requirements.

The contractor shall implement privacy information protection in accordance with NPD 1382.17 *NASA Privacy Policy* and NPR 1382.1 *NASA Privacy Procedural Requirements*.  The contractor shall store and handle all SBU data in accordance with NPR 1600.1 *NASA Security Program Procedural Requirements*.

The contractor shall protect third-party data in support of designated Spaceport Services task orders.

The contractor shall adhere to Federal Information Security Management Act (FISMA) and provide data for reporting metrics.

## 3.6    Records Management

The contractor shall ensure accurate and complete records of Government business are maintained in accordance with the NPR 1441.1, *NASA Records Retention Schedules*. Information includes electronic and vital records, and legacy federal records inherited from previous contracts.  Records of Government business shall be segregated from company-owned records and from non-record materials.  The contractor shall provide NASA, or authorized representatives, access to Government records in accordance with FAR Subpart 4.7 *Contractor Records Retention*.  The Government reserves the right to inspect, audit, and copy record holdings.

The contractor shall develop, implement, and maintain a *Records Management Program Plan* (DR 3.6-1) and a *Records Management File Plan* (DR 3.6-2) for records produced as part of this contract.

At the completion of this contract, or as required by the records retention schedule, the contractor shall deliver Government records to the NASA KSC Records Manager in accordance with NPD 1440.6 *NASA Records Management* and  KNPR 1440.6 *KSC Records Management Programs*.

## 3.7    Technical Document Center

The contractor shall operate and maintain technical documentation centers within the Space Station Processing Facility (SSPF) and KSC LC-39 area to provide access and print capability for drawings and documentation.

The Contractor shall release engineering drawings and design documentation electronically for facility-based systems and ground support equipment (GSE) into the Configuration Management Data System (CMDS), or future systems used by the Government.  The contractor shall also provide an electronic copy of these released drawings and design documentation to the Engineering Data Center.

# 4 Processing Support and Integration

The contractor shall develop, implement, and maintain systems and processes for work planning, scheduling, control and authoring.

The contractor shall develop, implement and maintain systems and processes as well as perform the following:
- Configuration and requirement verification management
- Integrated scheduling
- Advanced planning
- Manifest planning
- Integration and coordination activities
- Facilities utilization

The contractor shall provide administrative support for meetings and boards in support of processing activities.

The contractor shall perform contamination and electromagnetic environmental effects control.

## 4.1 Work Planning, Scheduling, Control and Authoring

The contractor shall develop, implement, and maintain electronic work planning, scheduling, control and authoring system(s) and processes. These system(s) and processes shall provide the necessary identification, coordination, integration, sequencing, control and tracking of operational activities. The contractor shall provide Government and Government-designated users with unrestricted access to data collected or produced in these system(s). The contractor shall provide Government and Government-designated users with user privileges (e.g., authoring, scheduling work) and training for these system(s).

The contractor's work planning, scheduling, control and authoring system(s) and processes shall identify tasks, resources and constraints to accomplish processing activities. The system(s) shall accommodate schedule and requirement changes including unforeseen events and contingencies, support resource leveling, and track performance to plan.

The contractor's work control and authoring system(s) and processes shall:
- Control all work performed on flight and ground systems hardware and software
- Integrate processing across all areas of the PWS
- Ensure work is performed by trained, certified and authorized personnel
- Permit tracking of work in progress
- Identify work constraints including requirements for Government inspection and approval

- Track and report constraints, and preclude the performance of constrained work activities
- Support configuration and requirements verification management
- Provide as-run and historical data

The contractor's work authoring process shall comply with KNPR 8715.3 *KSC Safety Practices Procedural Requirements* for all work.

## 4.2    Configuration and Requirements Verification Management

The contractor shall develop, implement, and maintain a Configuration Management (CM) system and process for assigned configuration-managed systems and equipment.  The contractor's CM process(es) shall include configuration planning, identification, documentation, change management and control, status accounting, and verification and audit.  The contractor shall develop, implement, and maintain a *Configuration Management Plan* (DR 4.2-1) in accordance with NPR 7120.5 *NASA Space Flight Program and Project Management Requirements*, NASA-STD-0005 *NASA Configuration Management (CM) Standards*, KNPR-8040.1 *KSC Configuration Management Procedural Requirements* and applicable program, project and Center requirements.  For International Space Station (ISS) projects and activities, the contractor shall comply with KNPR 8040.4, *International Space Station/Spacecraft Processing Configuration Management Procedural Requirements*.

The contractor's CM system and process shall provide data on flight hardware configuration to programs for work performed during ground processing activities.

The contractor shall perform configuration management of assigned hardware listed in Appendix 7 *TOSC OMEU Matrix* (hardware for which the contractor has sustaining engineering responsibility), Appendix 4 *ISS Flight Certified Hardware,* and Appendix 16 *Legacy Flight Hardware*.

The contractor shall perform CM to include activities that:
- Identify and maintain baseline configuration of assigned systems
- Control and document changes to system configuration, interfaces and associated documentation (e.g., engineering drawings, flight and ground system work authorizing documents, interface control documents, and end items)
- Provide Configuration Status Accounting (CSA)
- Perform verification and audit to ensure that approved changes are incorporated and systems and equipment are in compliance with applicable configuration data

The contractor shall perform configuration management of the processes for documentation, work control, CoFR and risk management.

The contractor shall provide a CM receipt and release desk as a single point of contact to other CM receipt and release desks which will receive, disseminate, respond and track change traffic.

The contractor shall develop, implement, and maintain a closed-loop Requirements Verification Management (RVM) process to ensure assigned hardware, software, support equipment and ground systems processing and configuration requirements are accomplished.  The contractor shall comply with ESD TBD document(s).  The RVM process shall be documented in the *Configuration Management Plan* (DR 4.2-1).

The contractor shall perform RVM to include activities that:
- Identify applicable requirements
- Incorporate applicable requirements into work authorizing documentation
- Verify satisfaction of requirements upon work completion
- Report requirement completion to source requirement owner and the Government
- Prepare, process and present waivers and deviations for approval of requirements that cannot or will not be met
- Prepare, process and present requirements change notices or requests

## 4.3    Integrated Scheduling

The contractor shall perform scheduling to integrate ground processing activities (e.g., processing operations, preventive and corrective maintenance, construction of ground and facility systems).

The contractor shall provide scheduling information and assist the Government in the assessment of critical path, scheduling risks, schedule stability, milestone impacts, resource utilization and critical skills management.  The contractor shall identify resource conflicts, recommend options for resolution, and implement Government-approved solutions.  The contractor shall perform integrated schedule assessments for contingency and recovery activities.

The contractor shall submit periodic schedule reports per *KSC Schedule and Status Summary* (DR 4.3-1).

The contractor shall track and report performance to plan for processing activities.  The contractor shall analyze variances and identify improvements to the scheduling processes to enhance performance and reduce risk.

## 4.4   Advanced Planning

The contractor shall support advanced planning for ground processing.  Advanced planning activities include supporting the development, modeling, simulation and analysis of:
- Future flight systems
- Technical data products and requirements documents

- Processing strategies and methodologies
- Design for operability
- Concept of operations development and trade analyses for planning, development and implementation
- Commonality of parts and supply chain capability
- Facilities usage
- Ground systems operations, maintenance, and modification
- Flight hardware operations
- Contingency operations
- Reliability, maintainability and supportability
- Integrated testing
- Scheduling and time-line assessments
- Identification of cost impacts
- Life cycle cost analysis
- Manifesting of KSC-developed ISS research

The contractor shall participate in design reviews of flight elements and ground systems. The contractor shall visit flight hardware manufacturer sites for hardware familiarization and support facility system design reviews as directed by the Government. The contractor shall participate in Technical Interchange Meetings (TIMs) and Ground Processing Working Groups (GPWGs) in support of advanced planning as directed by the Government.

## 4.5   Manifest Planning

The contractor shall perform integrated manifest assessments including impacts to resource utilization (e.g., personnel, equipment, commodities, and facilities), technical performance, cost, and schedule for Government-provided manifests. The contractor shall provide supporting data relative to processing plans; timelines; launch rate capabilities; schedules; flight and ground hardware and software, facility and equipment utilization plans; and prioritization assessments. Facility utilization requirements include hardware lifts, ground systems layout, floor space allocation, and hardware arrival and departure dates. The contractor shall recommend facility assignments for Government approval, allocate resources, and produce an integrated assessment.

The contractor shall develop assessments of the manifest and proposed manifest options including providing cost and schedule risk mitigations, performing requirements analysis, and conducting studies to reduce turnaround times or improve performance to schedule. The contractor shall produce reports as required using two- and three-dimensional models of the flight hardware, ground systems and processing areas to show operational layouts and identify conflicts.

Manifest assessments shall integrate the activities of designated customers (e.g., NASA Programs, commercial entities and other government agencies).

## 4.6    Integration and Coordination Activities

When TOSC systems or activities may affect or be affected by the Government or other contractors, the contractor shall coordinate with those organizations to plan and arrange project schedules, requirements, facility or system access, outages, downtime, and work windows to ensure safety, schedule, and operational readiness requirements are met.

The contractor shall integrate resolution of anomalies and nonconformances with the sustaining organization on ground systems operated and maintained by TOSC and sustained by other organizations.  The contractor shall support the flight and ground system sustaining organizations in problem resolution activities when the anomaly is outside established design baseline.

The contractor shall develop, implement and maintain an outage management process to ensure ground systems, processing facilities and facility systems are available to support processing operations.

The contractor shall request external support and respond to support requests using the Support Requirements System (SRS) process.  The contractor shall document requirements including Program Introduction (PI), Program Requirements Document (PRD) and Operation Requirements (OR) in Universal Documentation System (UDS) format using the Government-provided tool.  The contractor shall document support response including Statement of Capabilities (SC), Program Support Plan (PSP) and Operations Directive (OD) in UDS format using the Government-provided tool.

The contractor shall coordinate with the appropriate institutional contractor to ensure digital video recording of flight hardware moves, lifts, hardware integration and post-landing activities is in accordance with the Center's IWG requirements.

## 4.7    Facilities Utilization

The contractor shall request and receive real property space assignments from the NASA Facility Utilization Officer (FUO) and shall input space utilization data into the institution-maintained Facility Space Utilization Application (FSUA).  The contractor shall utilize facility space listed in Appendix 5 *Government-Furnished Facilities* for ground processing and systems Operations and Maintenance (O&M), and other facility space as assigned in accordance with KNPR 8830.1 *Facility Asset Management Procedural Requirements*.  The contractor shall provide a Directorate Facility Utilization Manager (DFUM) to collect, integrate and coordinate TOSC facility requirements with the Center.

Where identified as "TOSC Lead Facility Integrator" in Appendix 5 *Government-Furnished Facilities*, the contractor shall integrate and coordinate activities within the facility.  The

contractor shall recommend and implement Government-approved scaling or consolidation of assigned facilities to reduce physical footprint and resources.

## 4.8      Administrative Support for Meetings and Boards

The contractor shall provide administrative meeting support as described in Appendix 15 *Meeting Support Matrix*.  Examples include integration of review material for status reviews, coordination of meetings, recording and distribution of minutes, tracking action items, and maintenance of associated records.

## 4.9      Contamination Control

The contractor shall develop, implement and maintain a *Contamination Control Plan* (DR 4.9-1) in accordance with KPL-PLN-50007 *KSC Payload Facility Contamination Control Requirements/Plan* and KPL-PLN-50008 *Payload Facility Contamination Control Implementation Plan* for assigned processing facilities and activities.  The plan shall include the process to assess and implement customer-unique cleanliness requirements.

## 4.10   Electromagnetic Environmental Effects Control

The contractor shall ensure man-made sources of electromagnetic energy are controlled to meet environmental requirements in accordance with KSC-STD-E-0023 *Ground System Electromagnetic Environmental Effects (E3) Requirements Document*.  The contractor shall control mobile and fixed Radio Frequency (RF) transmitters within contractor-assigned facilities. The contractor shall prohibit use of unauthorized transmitting devices and operationally control authorized transmitting devices.  The contractor shall work with the KSC Frequency Manager to determine the location of internal and external fixed transmitters affecting processing areas. The contractor shall participate as a member of the KSC Electromagnetic Environmental Effects (E3) panel for inclusion in the frequency authorization process.

The contractor shall be cognizant of the location and status of RF transmissions affecting processing activities.  The contractor shall provide input to KSC integrated schedules for frequency use.  The contractor shall report electromagnetic interference issues to the KSC Frequency Manager in accordance with KNPR 2570.1 *KSC Radio Frequency Spectrum Management Procedural Requirements*.  In the event the contractor identifies RF transmissions affecting a sensitive operation, the contractor shall suspend the operation until the impact is resolved.  The contractor shall operationally control and coordinate the use of RF equipment to protect operations requiring RF silence.

The contractor shall comply with ESD TBD document(s).

# 5  Flight Hardware Processing

The contractor shall perform processing operations for pressurized and unpressurized cargo and provide support for utilization payloads and research for the ISS.  The contractor shall provide host role services for LSP spacecraft customers.  The contractor shall perform flight hardware processing for the SLS and MPCV.  The contractor shall disposition and resolve anomalies and non-conformances on flight systems and hardware (reference PWS Section 2.2).

The contractor shall develop, implement and maintain work instructions for flight system processing activities to ensure work complies with all design specifications, drawings and operational and maintenance requirements.

## 5.1  International Space Station

The contractor shall process pressurized and unpressurized ISS Orbital Replacement Units (ORUs) and Flight Support Equipment (FSE).  The contractor shall support ISS Utilization activities including support for customer-led or Government-led testing and checkout of EXpedite the PRocessing of Experiments to the Space Station (EXPRESS) rack payloads, EXPRESS Logistics Carrier (ELC) payloads, Columbus-External Payload Facility (COL-EPF), and Japanese Experiment Module-External Payload Facility (JEM-EPF) as required (reference KPL-UG-50001 *Requirements/Guide for Spacecraft Processing at KSC* and SSP-52000-PAH-KSC *International Space Station Payload Accommodation Handbook*).

The contractor shall provide payload laboratory support for ISS life science payloads including pre-flight, in-flight, post-flight, ground control, and simulation activities.  The contractor shall provide support to other NASA-directed science missions (e.g., planetary protection; reference PWS Section 5.2.2).

The contractor shall provide mission integration to ISS Research (ISS-R) life science and similar payloads.  ISS-R mission platforms include non-ISS sorties, sorties to ISS, and on-orbit ISS facilities launched on commercial and international partner launch vehicles.

The contractor shall process ISS flight hardware and payloads as identified in SSP 50110 *Multi-Increment Manifest (MIM) Document*, Appendix 3 *TOSC Manifest* and SSP 50450 *Multi-Increment Payload Resupply and Outfitting Model*.

The contractor shall provide a focal to coordinate ISS host role services from other areas of the contract or other contractors, including services that:
- Provide facility space for customer operations and storage for shipping containers, Ground Support Equipment (GSE), and flight hardware
- Provide training for assigned facility ground systems the customer is authorized to operate per the mission plans and requirements
- Provide and operate ground systems, facility systems and equipment, including lifting and handling of equipment and flight hardware

- Provide bench stock expendables such as plastics, foams, adhesives, and cleaning materials
- Provide liquids, gases and associated servicing for experiments and ISS equipment
- Provide storage, transportation, activation, charging and conditioning of payload batteries
- Perform sharp edge inspections
- Coordinate support with Institutional contractors as identified in Appendix 14 *Government-Furnished Services* such as:
  - Component cleaning of flexhoses, servicing carts, gauges, and valves
  - Communication equipment
  - Sample and lab analyses
  - Handling, delivering, and coordinating procurement and provisioning of propellants, liquids and gases
  - KSC and Cape Canaveral Air Force Station (CCAFS) facility access
  - Personnel access requirements (e.g., badging, facility access training)

### 5.1.1  ISS Flight Hardware Processing

The contractor shall process pressurized and unpressurized ORUs and FSE and perform fluids servicing.

### 5.1.1.1  Orbital Replacement Unit and Flight Support Equipment Processing

The contractor shall provide ORU standalone servicing and checkout for hardware identified in the MIM and Appendix 4 *ISS Flight Certified Hardware*.  The contractor shall manage and integrate processing flow requirements from delivery through launch.  The contractor shall provide support to the Hardware Ready For Flight (HRFF) review conducted by the ISS vehicle sustaining contractor.

For pressurized ORUs requiring fluids servicing (e.g., Nitrogen/Oxygen Recharge System (NORS), Portable Breathing Apparatus), the contractor shall perform fluids servicing (reference PWS Section 5.1.1.2) and assemble and checkout FSE.  The contractor shall integrate and checkout the ORU-to-FSE assembly as defined in Table 5-1 P*ressurized and Unpressurized ISS ORUs*.

For unpressurized ORUs, the contractor shall perform fluids servicing (reference PWS Section 5.1.1.2) and assemble and checkout FSE.  Example ORUs that require fluids servicing include the Ammonia Tank Assembly, Nitrogen Tank Assembly and Pump Module Assembly. The contractor shall integrate and checkout the ORU-to-FSE assembly as defined in Table 5-1.  The contractor shall perform standard repairs on unpressurized ORUs and FSE.  The contractor shall provide FSE processing expertise to multiple payloads and customers as required (e.g., advanced planning, testing, fit checks, studies).

The contractor shall receive, ship and transport pressurized and unpressurized ORUs, FSE and associated Ground Support Equipment (GSE) to and from Commercial Resupply Services (CRS) or International Partner (IP) launch sites as defined in Table 5-1, including development and provision of necessary documentation for overseas shipping (e.g., customs, export control) (reference PWS Section 7.5.1). The contractor shall provide packaging, handling, storage and transportation of pressurized and unpressurized ORUs and associated FSE.

For pressurized ORUs not requiring fluids servicing, the contractor shall package, ship and transfer assigned flight hardware to the ISS cargo-packing contractor as defined in Table 5-1.

**Table 5-1 Pressurized and Unpressurized ISS ORUs**

|  | Unpressurized | | Pressurized | |
|---|---|---|---|---|
|  | ORUs manifested on Japan Aerospace Exploration Agency H-II Transfer Vehicle | ORUs manifested on Commercial Resupply Services | NORS | Other |
| **FSE Standalone Build-up (Assembly and Checkout)** | TOSC | As directed | TOSC | As directed |
| **ORU Standalone Servicing & Checkout** | TOSC | TOSC | TOSC | As directed |
| **ORU to FSE Integration (Assembly and Checkout)** | TOSC | As directed | TOSC | As directed |
| **Shipping, Receiving, and Transportation** | TOSC to ship ORU, FSE and GSE to the launch site | TOSC to ship or transport ORU and GSE to the launch site | TOSC to ship ORU and GSE to the launch site | TOSC to ship ORU to cargo packing contractor |
| **Post-delivery inspection, final configuration & closeouts** | TOSC | As directed | TOSC | As directed |
| **Install ORU/FSE Assembly into Vehicle** | TOSC Oversight for ORU/FSE integrity | TOSC ORU/FSE/GSE expertise as directed | N/A | N/A |

## 5.1.1.2  Fluids Servicing

The contractor shall perform fluids servicing in compliance with approved Operations and Maintenance Requirements Specifications (OMRS), drawings, specifications, and applicable pressure vessel safety standards as stated in PWS Section 6.4.1.

Fluids servicing includes production of ISS water for ORUs and component flushing.  Example fluids include Internal Thermal Control System (ITCS) water, de-ionized water, anhydrous ammonia, and gaseous oxygen, nitrogen, and helium.  Fluids servicing activities include receiving, inspecting Composite Overwrapped Pressure Vessels (COPVs), planning, developing procedures, safety, emergency planning, security, GSE setup and breakdown, flight hardware handling, leak checks, servicing, and launch configuration closeouts.

## 5.1.2  Utilization Payloads Operations

The contractor shall support Utilization Payloads including pre- and post-flight processing, control experiments, and customer-led or Government-led testing.  The contractor shall support ISS Utilization activities including support for customer-led or Government-led testing and checkout of the EXPRESS rack payloads, ELC payloads, COL-EPF, and JEM-EPF as required.  The contractor shall perform support services for Life Science payloads including proper controls and handling of Bio-Safety Level 1 and 2 organisms.

The contractor shall provide science laboratory and logistics support for contingency post-flight science activities at other NASA Centers and spacecraft landing sites when directed by the Government.

For external payloads (e.g., ELC, COL-EPF, JEM-EPF), the contractor shall assemble and integrate the FSE (reference PWS Section 5.1.1.1), as directed.  The contractor shall transport the integrated assembly to the launch site as described in Table 5-2 *Utilization Contractor and Government Responsibilities*.

The contractor shall support the payload customer and the Government and perform functions identified in Table 5-2.

**Table 5-2 Utilization Contractor and Government Responsibilities**

| Function | Government Responsibility | TOSC Responsibility |
|---|---|---|
| Approval authority for agreements with Utilization Payload customers | Agreement approval | N/A |
| Payload advanced integration planning | Perform | Perform per PWS Section 4.4 |
| Scheduling and planning | • Provide schedule input<br>• Develop internal schedules<br>• Resolve conflicts and impacts | • Integrate and coordinate government input into scheduling process<br>• Identify conflicts and impacts |

| Function | Government Responsibility | TOSC Responsibility |
|---|---|---|
| Systems engineering | • Develop work instructions<br>• Document and disposition nonconformances<br>• Perform hardware integration, de-integration, servicing (includes late and early access), weight and Center-of-Gravity determination for subrack or MLE sized payloads, and stand-alone and integrated testing (e.g. PRCU operation, ELC simulator operation, bench testing)<br>• Technical interface with Utilization Payload customers<br>• Closed-loop requirement and constraints tracking | • Provide engineering in support of payloads per manifest requirements (e.g., high rate data system configuration, lifting and handling)<br>• Support Closed-loop requirement and constraints tracking |
| Payload to FSE Integration | Coordinate customer requirements and funding for processing at KSC | • Provide offline SSPF processing area<br>• Provide FSE assembly and integration, as directed by the Government |
| Technicians | N/A | Provide |
| Safety and Mission Assurance | Perform | Perform per PWS Section 2.2.4 |
| Documentation production and release | N/A | Perform |
| Host services (per schedule requests) | N/A | Perform per PWS Section 5.1 and as defined in glossary |
| Operation, maintenance and sustaining of assigned systems and support equipment | N/A | Perform per PWS Sections 6.3 and 6.4 |
| Configuration management of Utilization Payload flight hardware | Use of and input to system and process | Use of and input to system and process, provide as-built vs. as-designed audit per PWS Section 4.2 |
| Risk management | Perform | Support |
| CoFR Responsibility | Perform per PWS Section 1.1.2 | Perform per PWS Section 1.1.2 |
| Training for payload customer and Government personnel | Provide and maintain certification if required | Provide training per PWS Section 7.4 |
| Logistics services | N/A | Perform receiving, shipping and transporting of utilization payloads to and from payload customer and CRS or International Partner launch sites as required, including development and provision of necessary documentation for overseas shipping (e.g., customs, export control). Perform per PWS Section 7 |
| Pre-launch and post-landing payload processing | Systems and project engineering | • Pre-launch handling and transportation support only<br>• Science support and logistics for post-landing as directed |

## 5.1.2.1  Life Science Utilization Payloads

The contractor shall perform support services for life science researchers, Principal Investigators (PIs) and payload developers at the SSPF and assigned Space Life Sciences Laboratory (SLSL) areas, including activities that:

- Gather and document support requirements and track science payload-unique requirements with science payload customer concurrence and Government approval
- Identify and coordinate unique payload laboratory and science protocols, tests, and experiment operations
- Coordinate readiness of laboratories, equipment, supplies, and specialized logistics and shipping (e.g., bio-hazards)
- Maintain expedited procurement process capability with 24-hour response time
- Maintain required portable lab equipment certifications and calibrations (e.g., laminar flow bench, microscope, bio-safety cabinet)
- Define alarm settings and monitor KSC critical laboratory GSE and flight hardware in accordance with payload requirements used by the automated monitoring system (i.e., Command, Monitor and Data System (CMDS))
- Plan and coordinate life science activities including assisting payload customer in obtaining federal, state and local permits for receiving and shipping of science specimens
- Maintain satellite accumulation areas, flammable materials lockers, and hazardous and bio-hazardous waste disposal capability
- Participate in reviews, working group meetings, and conferences to establish requirements definition and determine launch site processing criteria
- Maintain life science payload chemical pharmacy, storage and inventory
- Procure, receive and transport life science payload unique supplies and expendables
- Coordinate with the SLSL offline laboratory manager for processing space as required

The contractor shall perform pre- and post-flight support at other NASA centers or spacecraft landing sites as directed by the Government.

## 5.1.3  International Space Station Research

The contractor shall perform ISS-R mission integration during the complete payload life cycle for life science payloads developed at KSC and payloads partnered with other customers, including activities that:

- Provide ISS processing expertise with a focus on mission operations (including flight, post-flight de-integration, anomaly resolution, risk identification, and experiment reporting) of defined project plans for assigned science and payloads
- Coordinate between principal investigators and hardware developers for assigned payloads

- Review engineering products for assigned science and payloads, and coordinate implementation of requirements with other KSC contractors
- Ensure submittal of ISS data products in order to satisfy mission integration and certification requirements (e.g., flight safety data packages, flight hardware certifications and verifications, operational and safety verifications, data for CoFR)
- Prepare crew procedures and conduct crew training
- Compile operational information, post-test and flight reports, and data for life sciences archive requirements
- Provide support to ISS-R Control Board
- Procure experiment-specific supplies for ISS-R science flight activities and ground controls (reference PWS Section 7.5.1)
- Support ISS-R technical reviews as directed, PI integration activities, and flight crew training exercises at PI facilities or other NASA centers

## 5.2      Launch Services Program Support

The contractor shall provide spacecraft operations support to LSP spacecraft customers and support to the Planetary Protection Program.

## 5.2.1   Spacecraft Operations Support

The contractor shall perform spacecraft receiving, handling and offloading activities at KSC, including coordination and scheduling of security escorts with the applicable institutional security contractor.

The contractor shall provide host role services for spacecraft customers.  Examples of LSP host role services include:

- Support to spacecraft customer processing in accordance with mission plans, requirements, and operations and maintenance instructions
- Coordination of training for KSC and CCAFS facility access
- Training for assigned facility ground systems the customer is authorized to operate per mission plans and requirements
- Provision of clean room janitorial support
- Provision of shop support for fabrication and repair of spacecraft customer hardware
- Provision of bench stock expendables such as plastics, foams, adhesives, and cleaning materials
- Issuance of tools, materials, protective garments, and equipment
- Coordination of support with Institutional contractors as identified in Appendix 14 *Government-Furnished Services*
- Provision of transitory storage for shipping containers, equipment and flight hardware
- Coordination with the applicable institution security contractor for processing facility access for customer personnel

- Provision of access control to the spacecraft at the Payload Hazardous Servicing Facility (PHSF) and launch pad
- Provision of local transportation of spacecraft, equipment, tools and materials, between on- and off-site processing facilities as required

## 5.2.2 Planetary Protection Program Support

The contractor shall perform support services for the Planetary Protection Program in the SSPF offline laboratories (reference support services in PWS Section 5.1.2.1).

## 5.3 Space Launch System Offline Processing

The contractor shall perform offline processing of the Space Launch System (SLS) vehicle elements.  The contractor shall perform core stage, upper stage, and booster segment processing in accordance with ESD TBD Document(s).

## 5.3.1 Core Stage Processing

The contractor shall perform core stage receiving and processing.  The contractor shall unload the core stage from the barge at the Launch Complex 39 (LC-39) turn basin, transport to the Vehicle Assembly Building (VAB), and perform servicing and processing required to prepare the stage for integration.

## 5.3.2 Upper Stage Processing

The contractor shall perform upper stage (including interstage) receiving and processing.  The contractor shall unload the upper stage from the barge at the LC-39 turn basin, transport to the VAB, and perform servicing and processing required to prepare the stage for integration.

## 5.3.3 Booster Segment Processing

The contractor shall receive and inspect the Booster Forward Assemblies at the Assembly and Refurbishment Facility (ARF), and transport the assemblies to the VAB.

The contractor shall receive and inspect the assembled Booster Aft Skirts at the ARF and transport the aft skirts to the Rotation, Processing and Surge Facility (RPSF).

 The contractor shall receive the SLS booster segments at the Jay-Jay siding.  Transportation of the booster segments to the RPSF is a Government-furnished service.  At the RPSF, the contractor shall perform inspection of the SLS Booster segments and nozzle exit cone.

The contractor shall perform build-up and checkout of the aft booster assembly, including mating of the aft skirt and nozzle exit cone to the aft booster segment, installation of attach ring, integrated electronics assembly, thermal curtains, cabling and application of thermal protection, external hardware and closeouts.

The contractor shall transport booster segments and aft assemblies between the RPSF, Surge buildings and VAB.

## 5.4    Multi-Purpose Crew Vehicle Offline Processing

The contractor shall perform MPCV offline processing to include Crew/Service Module (CSM) processing; Launch Abort System (LAS) processing; equipment, payloads and cargo processing; Crew Module (CM) recovery and deservicing.

### 5.4.1  Crew/Service Module Processing

The contractor shall receive and visually inspect the CSM at the Operations & Checkout Building (O&C).  The contractor shall transport the CSM to the Multi-Payload Processing Facility (MPPF), provide conditioned air to the CSM while it is on the transporter, and perform post-transport inspection in accordance with ESD TBD document(s).

The contractor shall perform MPCV CSM servicing, processing, test and checkout operations in accordance with mission plans, requirements, and operation and maintenance instructions. Examples include:
- Servicing of hazardous commodities, including hypergolic propellants, high-pressure gases and ammonia
- Performing fit-checks of time-critical Portable Equipment, Payloads and Cargo (PEPC) and Flight Crew Equipment (FCE), installing non-time-critical PEPC and FCE, and performing required Interface Verification Tests
- Performing required closeout activities
- Preparing and transporting the MPCV CSM to the VAB and performing post-transport inspection

### 5.4.2  Launch Abort System Processing

The contractor shall receive and transport the assembled Launch Abort System (LAS) from the LAS assembly facility (i.e., Transporter/Canister Facility) to the VAB and prepare it for integration with the MPCV CSM.  The contractor shall transport the LAS ogive panels from the LAS assembly facility (or other storage area) for staging in the VAB.

### 5.4.3  Equipment, Payloads, and Cargo Processing

The contractor shall perform equipment, payload and cargo processing, stowage, integrated testing, and destow operations in accordance with ESD TBD document(s).

The contractor shall perform receiving, transport, fit-checks, installation, integrated testing and closeout activities for PEPC and FCE that will be launched in the CM.  For PEPC and FCE, the contractor shall perform offline processing to meet MPCV requirements; examples include mounting panel installations, sharp-edge inspections, and weight and Center-of-Gravity (CG) determination.

The contractor shall perform destow and reinstallation activities in support of off-nominal and contingency operations.  The contractor shall transfer post-mission destowed PEPC and FCE to the customer.

The contractor shall plan and perform the Crew Equipment Interface Test (CEIT).  The contractor shall coordinate with flight crew representatives to evaluate and resolve identified discrepancies.

## 5.4.4  Crew Module Recovery

The contractor shall perform planning, resource staging and readiness verification for each mission.

The contractor shall support the Government in performing CM recovery at sea.  Examples include:
- Initial safing and securing at the recovery site
- Crew egress assistance
- Post-mission removal of time critical PEPC and FCE, storage while on the ship, and turnover to the customer
- Storage of parachutes on the ship (after recovery by DoD swimmers)

The contractor shall perform post-landing operations at the port and transport the CM to KSC in accordance with ESD TBD document(s).  Examples include:
- Transfer of the parachutes to the transportation trailer at the seaport, and turnover to customer
- Post-mission removal of non-time-critical PEPC, FCE (including seats) and waste
- Loading and securing of the CM to the transportation trailer at the seaport, and transport of the CM and associated flight hardware to the MPPF

The contractor shall comply with Navy regulations for maritime transportation of hazardous materials while on the ship.  The contractor shall comply with Department of Transportation (DOT) restrictions and requirements during transport of the CM to the MPPF.

The contractor shall assist the Government in planning and developing contingency strategies and procedures for CM recovery and retrieval scenarios.  For contingency or off-nominal landings, the contractor shall accompany the NASA rapid response team to the retrieval site to perform initial safing and processing of the CM.  The contractor shall provide transportation of the CM from the seaport (or recovery site if on land) to the MPPF.

## 5.4.5  Crew Module Post-flight Deservicing

The contractor shall perform post-flight processing of the CM at the MPPF in accordance with ESD TBD document(s).  Example deservicing activities include:

- Deservicing of hazardous commodities, including hypergolic propellants, high-pressure gases and ammonia
- Removing non-time-critical PEPC and FCE
- Preparing and transporting the CM to the O&C Building

## 5.5    Integrated Vehicle Processing

The contractor shall perform integrated vehicle processing.  The contractor shall receive and integrate flight elements in the VAB, test and checkout the integrated launch vehicle and spacecraft, transport the vehicle to the launch pad, perform final vehicle processing at the pad, and plan for contingency operations.  The contractor shall perform launch operations.

### 5.5.1    Booster Stacking

The contractor shall perform booster stacking, a NASA-managed operation, on the Mobile Launcher (ML) in the VAB in accordance with ESD TBD Document(s).  Examples of integration and assembly tasks include:

- Hold-down post optical alignment and shimming
- Booster stacking including aft assembly, segments and forward skirt assembly
- Installation of pyrotechnic systems
- Cable installations, checkout, and cable tray cover assembly and closeout

### 5.5.2    Multi-Purpose Crew Vehicle and Launch Abort System Integration

The contractor shall perform MPCV integration, a NASA-managed operation, in the VAB in accordance with ESD TBD Document(s).  Examples of integration and assembly tasks include:

- Assembling CSM, LAS and ogive panels
- Interface Verification Tests (IVTs)

### 5.5.3    Vehicle Integration

The contractor shall perform vehicle integration, a NASA-managed operation, of the flight elements on the ML in the VAB in accordance with ESD TBD Document(s).  Examples of integration and assembly tasks include:

- Stacking and integration of the core to the boosters
- Stacking upper stage and interstage to core stage
- Stacking MPCV to upper stage
- Establishing umbilical connections with ML
- Establishing commodity purges
- Performing cryogenic tank pressurization and vent valve checkout
- Installing ordnance

### 5.5.4    Integrated Vehicle Testing

The contractor shall support Government-led MPCV and SLS pre- and post-integration system, interface, and integrated vehicle checkout and tests in accordance with ESD TBD document(s).

The contractor shall support pre-test planning, procedure development, and post-test reviews of results and procedures.

The contractor shall support Government-led integrated vehicle testing in accordance with ESD TBD document(s).  Examples include:  vehicle power up and channelization, ML T-0 interconnect checkout, combined element antenna pattern tests, countdown demonstration test, and integrated vehicle fit and functional checkout.

The contractor shall support flight-to-ground verification and validation testing on systems integrated with the vehicle for the first time.  Examples include:  crew access arms and umbilical functional and fit checks, end-to-end channelization of instrumentation and control hardware, vehicle hydraulics, and flight element heater systems.  Ground systems verification and validation is performed in PWS Section 6.2.

### 5.5.5  Transfer of Integrated Vehicle to Launch Pad

The contractor shall transport the ML and integrated launch vehicle from the VAB to the launch pad.

### 5.5.6  Pad Processing

The contractor shall perform launch pad integrated vehicle processing, test, checkout and closeout activities.  The contractor shall establish and verify mechanical and electrical interfaces between the ML and the pad.  The contractor shall configure the ML to provide access to the vehicle for pad processing. Integrated test operations performed during pad processing are Government-led activities.  The contractor shall install time-critical PEPC and FCE.  The contractor shall perform propellant systems preparations and vehicle servicing.  The contractor shall perform vehicle cooling, pressurization, and ordnance operations.  The contractor shall perform range and tracking systems testing.  The contractor shall secure assigned pad and ML systems and equipment for launch.

### 5.5.7  Contingency Operations

The contractor shall plan, develop, document and maintain contingency strategies and procedures for off-nominal conditions, hardware failure safing, launch scrubs and delays, and crew evacuations.  The contractor shall provide or coordinate necessary resources and perform contingency procedures when required.

### 5.5.8  Launch Operations

The contractor shall perform launch operations, including launch team training and launch preparations, and support Government-led launch execution.

### 5.5.8.1 Launch Team Training

The contractor shall train, qualify and certify personnel to implement launch countdown activities under the direction of the Government.

The contractor shall develop, implement and maintain a comprehensive training program. Examples of training program activities include:
- Launch countdown simulations
- Launch recycle and contingency simulations
- Integrated testing experience
- Operation of ground and flight hardware, software and support equipment
- Pad emergency egress training for the flight and closeout crews

The contractor shall develop, implement and maintain a *Launch Team Certification Plan* (DR 5.5-1). The contractor shall make this training available to Government personnel.

The contractor shall support development of launch countdown simulation and operational scenarios. The contractor shall identify and resolve procedural or technical deficiencies identified during the simulation exercises.

### 5.5.8.2 Launch Preparation

The contractor shall support the Government in the integration of requirements into launch countdown schedules and procedures. Examples include: support to identification of launch preparation activities, development of launch commit criteria, launch countdown working group activities and readiness reviews.

The contractor shall perform launch preparation activities. Example activities include:
- Requirement satisfaction tracking
- Verification that personnel, procedures and flight and ground systems are ready to support launch
- Resolution of launch constraints

The contractor shall develop, maintain and distribute launch countdown procedures, plans and schedules.

### 5.5.8.3 Launch Execution

The contractor shall support a Government-led launch team in the execution of launch operations. The launch team will be comprised of both Government and contractor personnel, working together seamlessly to ensure safety and mission success. The Government is responsible for launch commitment. The launch team positions and skill mix will be established by the Government.

The contractor shall perform launch processing activities during the launch countdown.
Examples of launch processing activities include:

- Removal of safe and arm pins
- Final walk-downs of the flight elements, ground systems and pad facilities
- Flight crew support, crew module ingress and cabin close-out
- Configuration of ML, pad and other required ground systems
- Initial post-launch safing and securing

# 6   Ground Systems

The contractor shall develop processes and perform activities required to manage ground systems projects; support NASA-managed ground systems projects; and perform operations, maintenance, sustaining engineering and analysis of ground systems assigned per Appendix 7 *TOSC OMEU Matrix*.

The contractor shall update and maintain Operation, Maintenance, sustaining Engineering and User (OMEU) Matrix data to accurately reflect TOSC ground systems responsibilities throughout the contract performance period.  The contractor shall obtain Government approval for proposed changes to the OMEU Matrix data.

Should performance of the requirements in Section 6 require the provision or use of architect-engineer services (as defined in FAR 36.601-4), the contractor shall notify the Contracting Officer and obtain approval to proceed.

For Lifting Devices and Equipment (LDE), the contractor shall comply with:
- NASA-STD-8719.9 *NASA Standard for Lifting Devices and Equipment*
- KNPR 8715.3 *KSC Safety Practices Procedural Requirements*
- KNPR 8719.9 *Examination and Licensing of KSC Operators of Special and Heavy Equipment, Cranes, and Hoists*

For Pressure Vessels Systems (PVS) assigned per Appendix 8 *Pressure Vessel Systems*, the contractor shall comply with:
- NASA-STD-8719.17 *NASA requirements for Ground Based Pressure Vessels and Pressurized Systems (PVS)*
- KNPR 8715.3 *KSC Safety Practices Procedural Requirements*

## 6.1   Ground Systems Project Management

The contractor shall manage the design, development and implementation of ground systems and facilities projects in accordance with:
- NPR 7120.5 *NASA Space Flight Program and Project Management Requirements*
- NPR 8820.2 *Facility Project Requirements*
- KNPR 8830.1 *Facilities and Real Property Management Procedural Requirements*
- KDP-KSC-P-1319 *Facility Project Approval and Implementation Guidance for Local Authority Projects*
- NPR 7150.2 *NASA Software Engineering Requirements*
- Applicable federal, state and local laws, regulations, Agency policies and directives, and industry standards (e.g., ASME standards)
- TBD ESD document(s)

The contractor shall manage ground systems projects from the planning and requirements development phase through design, fabrication and construction, verification, validation, operational turnover and project closeout activities.

The contractor shall perform project management and engineering functions on assigned ground systems that require modification (e.g., to resolve issues with safety, flight-to-ground interfaces, obsolescence, flight hardware processing).

The contractor shall develop and implement a Government-approved process to baseline projects or authorize new requirements.  The contractor shall formulate project plans that satisfy and document technical, budgetary and schedule requirements including final cost estimates, requirements documents, resource loading and integrated schedule.

The contractor shall monitor design and implementation activities performed by other contractors which have the potential to affect performance of assigned systems to ensure changes are understood and impacts mitigated.

The contractor shall identify and document systems that contain software per the *Information Technology Plan* (DR 3.2-1).  The contractor shall develop, modify and maintain software utilized within ground systems in accordance with the *Software Management Plan* (DR 3.2-2).

## 6.1.1  Ground Systems Project Design Engineering

The contractor shall provide design engineering for projects, upgrades and modifications on assigned systems.  The contractor shall develop requirements with the customer for design changes to ground systems.

The contractor shall conduct engineering studies to define project plans and requirements.  Examples of engineering studies include:  feasibility and trade studies, field investigations, computer-aided engineering analyses, environmental studies, existing-conditions studies, analysis of future requirements, conceptual project design studies and energy conservation studies.

The contractor shall perform project planning including the formulation of cost estimates and assessment of proposed project requirements for technical feasibility, safety, performance, operational constraints, site conditions, environmental regulations and life-cycle costs.

The contractor shall provide design calculations and analytical basis for review prior to design review milestones.

The contractor shall develop designs and conduct design reviews in accordance with:
- NASA-STD-5005 *Standard for the Design and Fabrication of Ground Support Equipment*
- KDP-KSC-P-1535 *Design Review Process*
- KSC-DE-512-SM *Facility, Systems, and Equipment General Design Requirements*
- GP-435 *Engineering Drawing Practices*

The contractor shall certify existing (as required), new or modified ground systems for which the contractor has responsibility in accordance with KDP-P-2713 *Technical Review Process* and ESD TBD document(s).

The contractor shall utilize Pro-E for mechanical and structural systems design drawing development and AutoCad Electrical for electrical and electronic systems design drawing development, unless authorized by the Government to use other design products.

The contractor shall release engineering drawings in electronic format and in accordance with KDP-KSC-P-1537 *Document Release Authorization (DRA) Process*.

For ISS, the contractor shall design ISS support equipment in accordance with SSP 50004 *ISS Ground Support Equipment Design Requirements*.

## 6.1.2  Ground Systems Project Implementation

The contractor shall perform implementation activities in support of projects.  Example activities include construction management and field engineering services.  During project implementation activities, the contractor shall report project status to the Government including performance to plan, variance from plan, and recovery plan as required.

The contractor shall coordinate ground systems project implementation with ground operations to ensure minimal impact (reference PWS Section 4.6).

The contractor shall perform surveillance, inspection and quality assurance of project implementation activities, including subcontracted work, to ensure compliance with safety, quality, environmental, and technical requirements.

## 6.2  NASA-Managed Projects

The contractor shall support NASA-managed project activities pertaining to ground systems, facilities, or facility systems.  The contractor's support shall encompass programmatic ground system development, Construction of Facilities (CoF), Local Authority (LA) and ground system survivability projects.

The contractor shall support the Government in the development of projects and project planning.  Examples of support activities include:  feasibility studies, field assessments, operations concept and requirements development and design review inputs.

The contractor shall support verification activities and perform validation activities for new or modified ground systems.  The contractor shall assist the developer by providing operational expertise and support (e.g., technicians for test execution, refining operational criteria, crane operation) for verification.  The contractor shall perform validation activities (e.g., procedural development, performance of validation testing and support to operational readiness activities).

## 6.2.1  Programmatic Ground System Development Projects

The contractor shall design and implement NASA-managed programmatic ground system development projects as authorized by the Government and listed in Appendix 9 *TOSC Authorized Projects.*

## 6.2.2  Construction of Facilities and Local Authority Facilities Projects

The contractor shall perform an annual assessment to identify CoF and LA facilities project requirements.

The contractor shall develop and maintain supporting project documentation in accordance with the requirements of NPR 8820.2 *Facility Project Requirements* and KSC-SPEC-G-0002 *Compiling Construction Cost Estimates*.

The contractor shall design and implement NASA-managed CoF and LA facilities projects as authorized by the Government and listed in Appendix 9 *TOSC Authorized Projects.*

## 6.2.3  Ground Systems Survivability Projects

The contractor shall develop a process to identify, forecast and track ground systems obsolescence and end-of-service-life issues and risks.

The contractor shall provide engineering data and documentation required to develop change requests, including supporting justification and project scope, identification of requirements changes, engineering assessments and analyses.

The contractor shall design and implement NASA-managed ground systems survivability projects as authorized by the Government and listed in Appendix 9 *TOSC Authorized Projects.*

## 6.3  Ground Systems Operations and Maintenance

The contractor shall plan, develop, schedule and perform operations, maintenance, and corrosion control on ground systems as assigned per Appendix 7.

The contractor shall develop, implement and maintain work instructions for ground system operations and maintenance activities.

The contractor shall comply with NPR 8831.2 *Facilities Maintenance and Operations Management* on applicable ground systems.

## 6.3.1  Ground Systems Maintenance Program

The contractor shall develop, implement and maintain a *Ground Systems Maintenance Plan* (DR 6.3-1) for assigned ground systems.

The contractor shall implement a process to initiate, disposition and resolve anomalies and non-conformances on assigned ground systems (reference PWS Section 2.2).

The contractor shall acquire and maintain warranty or guarantee records for procured equipment.  The contractor shall investigate the failure of warranted equipment or material, report findings to the Government, and preclude actions that would void a warranty without prior Government approval.

The contractor shall perform in-situ load tests for assigned cranes, hoists and lifting devices and equipment.

## 6.3.2  Corrosion Control

The contractor shall develop, implement, and maintain a *Corrosion Control Plan* (DR 6.3-2) on contractor-maintained ground systems.

The contractor shall perform corrosion control activities in accordance with NASA-STD-5008 *Protective Coating of Carbon Steel, Stainless Steel, and Aluminum on Launch Structures, Facilities, and Ground Support Equipment* and NPR 8530.1 *Affirmative Procurement Program and Plan for Environmentally Preferable Products*.

## 6.3.3  Non-Mission Direct Operations

The contractor shall operate ground systems as necessary to maintain operator proficiency or certification,  or perform other non-mission direct system-level operations.  Example activities include Crawler Transporter (CT) and VAB crane operations to train operators or a CT move in response to a hurricane threat.

## 6.4   Ground Systems Sustaining Engineering and Analysis

The contractor shall perform sustaining engineering and analysis on ground systems as assigned in Appendix 7.

## 6.4.1  Ground Systems Sustaining Engineering

The contractor shall perform sustaining engineering on assigned ground systems to support processing (e.g., to resolve issues with safety, support problem resolution, improve performance, incorporate vendor product updates or notes, or address high-failure rates).

The contractor shall maintain and update specifications and drawings for assigned ground systems.  The contractor shall comply with design standards and requirements in PWS Section 6.1.1.

The contractor shall analyze and incorporate changes to procedures, requirements documents, and analysis packages (e.g., System Assurance Analyses (SAAs), System Criticality Analyses (SCAs), and Logistics Support Analyses (LSAs)) for modifications and repairs that do not return product to print or are outside fair-wear-and-tear specifications.

The contractor shall develop and maintain operations and maintenance requirements for assigned systems and develop new requirements as systems are modified.

The contractor shall develop, implement and maintain a Government-approved process for implementing sustaining engineering actions on ground systems.

The contractor shall maintain the Government-approved System Documentation List (SDL) of active, configuration-controlled drawings on assigned ground systems.  The contractor shall develop a Government-approved process to incorporate engineering changes and maintain drawings identified on the SDL.

The contractor shall maintain ground-to-ground interface control documents for assigned ground systems.  The contractor shall coordinate ground-to-flight and ground-to-facility interfaces with the appropriate Government and contractor organizations.

The contractor shall analyze systems for marginal end-of-service-life or obsolescence risk, and develop requirements for system-level upgrade projects.  The contractor shall perform ground system end-of-life safing and disposition when the system is no longer required (reference PWS Section 7.5.2).

The contractor shall manage a PVS certification program for assigned systems.  The contractor shall implement and maintain certification and in-service inspection plans for PVS assigned in Appendix 8 *Pressure Vessels Systems*.  The contractor shall maintain Appendix 8 to reflect TOSC ground systems responsibilities and provide information to keep the NASA PVS database current.  The contractor shall perform periodic inspections, tests and recertification in accordance with KNPR 8715.3 *KSC Safety Practices Procedural Requirements*.

The contractor shall implement the *KSC Pressure System Manager's Risk-Based Plan* for certification, recertification or retirement of existing and future PVS.

## 6.4.2  Ground Systems Analysis

The contractor shall perform environmental analyses for ground systems processing and launch effects to define the relative environmental effects between ground systems and flight hardware to ensure safe and successful processing and launch activities.  Example analyses include:  weight and center of gravity, ground handling, vibro-acoustic, frequency response, over-pressurization, structural, heat and wind load calculations.

The contractor shall perform Electro-Magnetic Effects (EME), lightning, ionizing and non-ionizing radiation, and electrostatic discharge compatibility analyses.  Electromagnetic measurements are provided as a Government-furnished service per Appendix 14 *Government-Furnished Services*.  The contractor shall review and evaluate analytical and test data to assure compliance and compatibility in accordance with KSC-STD-E-0023 *Ground System Electromagnetic Environmental Effects (E3) Requirements Document*.

The contractor shall analyze lightning events and data to determine if system requirements have been exceeded.  The contractor shall perform inspections of ground systems after lightning events and perform necessary corrective action.

For ISS, the contractor shall ensure compliance and compatibility in accordance with SSP 30238 *Space Station Electromagnetic Techniques* and SSP 30237 *Space Station Electromagnetic Emission and Susceptibility Requirements*.

For SLS, the contractor shall perform analyses consistent with ESD TBD document(s).

The contractor shall support:
- Imagery system requirements development and implementation for launch vehicle, spacecraft and ground systems
- Debris requirements development
- Launch pad debris inspection analysis for day of launch
- Launch photo, video and debris transport engineering analyses

The contractor shall provide post-launch analyses to validate engineering pre-launch prediction tools and methodologies and provide visibility into ground processing for resolution of in-flight anomalies and vehicle performance outside of nominal flight.  The contractor shall participate in the resolution of in-flight anomalies.

# 7   Logistics

The contractor shall perform integrated logistics to include logistics engineering, depot-level manufacturing and repair, training, and logistics operations.

## 7.1   Logistics Management and Integration

The contractor shall provide an integrated logistics capability for ground processing activities. The logistics capability shall be in accordance with NPD 7500.1 *Program and Project Logistics Policy*. The contractor shall manage and integrate logistics functions to synergize and optimize support to operations. The contractor shall develop, implement and maintain an *Integrated Logistics Support Plan* (DR 7.1-1).

The contractor shall provide logistics project reports, metrics and operations support readiness status to the KSC logistics working group(s).

## 7.2   Logistics Engineering

The contractor shall perform logistics engineering for assigned systems and equipment.

The contractor shall perform acquisition logistics activities for new or modified systems including identification of initial parts lay-in, integrated logistics support planning, LSAs, level-of-repair analysis, maintenance task analysis, and operational spares analysis.

The contractor shall perform supportability assessments, and implement corrective actions and initiatives to ensure life cycle logistics support and to address potential disruptions to supply chain availability or capability for assigned systems and equipment.

## 7.3   Support Shops and Laboratories

The contractor shall perform depot-level repair, refurbishment and manufacturing required to support ground systems functionality for ISS, LSP, GSDO, MPCV and SLS.

The contractor shall operate and maintain Government-provided shops and laboratories listed in Appendix 6 *TOSC Shops and Laboratories*.

The contractor shall provide a depot-level repair and maintenance capability that supports ISS processing activities and flight hardware listed in Appendix 4 *ISS Flight Certified Hardware*. The depot shall be certified per SSP 50276 *Depot/Manufacturing Facility Certification Plan*. The facility certification for the NASA Spacecraft Services Depot (NSSD) shall be completed no later than six months after contract start.

The contractor shall recommend and implement Government-approved scaling or consolidation of assigned shops and laboratories to reduce physical footprint and resources.

The contractor shall utilize the Government-furnished shop and laboratory services listed in Appendix 14 *Government-Furnished Services*, including in-situ and laboratory services for Non-Destructive Evaluation (NDE), Non-Destructive Testing (NDT) and calibration.  If available services do not meet program requirements, the contractor shall obtain Government approval before establishing additional shops and laboratories per KDP-KSC-P-2779 *KSC New Laboratory and Developmental Shop Creation Process*.  Government-approved contractor NDE or NDT programs shall be compliant with NAS 410 *NAS Certification & Qualification of Nondestructive Test Personnel*.  Government-approved contractor calibration programs shall be compliant with KNPR 8730.1 *KSC Metrology and Calibration Procedural Requirements*.

## 7.4    Training

The contractor shall plan, develop, implement and maintain a technical training and certification program for personnel engaged in the performance of this contract.  The contractor shall develop, implement and maintain a *Training Plan* (DR 7.4-1).

The contractor shall ensure personnel involved in hazardous operations are appropriately trained to ensure safety of personnel in compliance with KNPR 8715.3 *KSC Safety Practices Procedural Requirements.*

The contractor shall document training and certification records to provide traceability and maintain licenses and certifications.

The contractor shall utilize Government-furnished training as stated in Appendix 14 *Government-Furnished Services*.  When the contractor is the subject matter expert, the contractor shall provide technical input to the Center to support the development of KSC training materials.

The contractor shall provide the Government access to the training schedule.  The contractor shall permit, track and record attendance of Government and Government-designated personnel for contractor-provided training.

## 7.5    Logistics Operations

The contractor shall perform material, property and vehicle management.

## 7.5.1  Material Management

The contractor shall perform material management activities including procurement, receiving, packaging, handling, storage, inventory management, transportation and issuance in support of ground processing operations and maintenance activities.  The contractor shall manage, track,

process and issue material and equipment in accordance with NPD 4100.1 *Supply Support and Material Management Policy*.

The contractor's inventory management system shall either utilize or be capable of interfacing with the NASA Material Management Initiative (MMI) system.

The contractor shall ship, transport and distribute equipment and material in accordance with NPR 6000.1 *Requirements for Packaging, Handling, and Transportation for Aeronautical and Space Systems, Equipment, and Associated Components*. The contractor shall obtain DOT permits as required and comply with DOT regulations for hazardous and bio-hazardous shipments. The contractor shall schedule, assemble and deliver materials required for work order kitting.

The contractor shall procure, maintain and provide spares inventory to meet processing and maintenance requirements in accordance with NPR 5900.1 *NASA Spare Parts Acquisition* and NPR 8530.1 *Affirmative Procurement Program and Plan for Environmentally Preferable Products*. The contractor shall procure system assets at the line replaceable unit, shop replaceable unit, piece-part, raw material and consumable levels as required. The contractor shall optimize material procurement and storage in order to minimize life cycle costs.

The contractor shall prevent the use of assets and materials with improper certification or traceability in equipment, systems and processes.

The contractor shall recommend and implement Government-approved scaling or consolidation of assigned warehouses and storage facilities to reduce physical footprint and resources.

The contractor shall review NASA, government and industry alerts (e.g., GIDEP) and identify affected contractor-accountable hardware including materials located at off-site vendors and depots, perform impact analyses, provide recommendations and implement Government-approved corrective actions.

The contractor shall perform packing, packaging, marking, labeling and crating in accordance with applicable federal regulations, standards and specifications as well as KNPR 6000.1 *Transportation Support System Manual*.

The contractor shall plan for usage and ensure availability of propellants, cryogenics, liquids, gases, bulk chemicals and other commodities to meet requirements. Commodities listed in Appendix 12 *Government-Furnished Commodities* are Government-furnished. The contractor shall develop and submit *Propellants, Fluids and Gases Usage Forecast* (DR 7.5-1) for Government-furnished commodities.

For ISS, the contractor shall utilize or interface with the JSC ISS Inventory Management System, GOLD™ for inventory management of ISS materials and equipment.

For ISS, the contractor shall implement the requirements for packaging, handling, storage and transportation and tri-annual inspection of ISS hardware in accordance with SSP 50520 *International Space Station Logistics and Maintenance Operational Support Concepts and Requirements*.

For ISS, the contractor shall receive, tag, inspect, control, record, store, issue, transport, track and return property and assets listed in Appendix 4 *ISS Flight Certified Hardware*.

For ESD, the contractor shall store, perform inventory tracking, maintain in a flight-like state, and issue legacy flight hardware identified in Appendix 16 *Legacy Flight Hardware*.

For ESD, the contractor shall coordinate with flight element providers for flight-certified expendables and materials required to support ground processing and shall procure with Government approval.

For ESD, the contractor shall stage material and equipment in support of CM recovery and transportation.

For ESD development activites in which TOSC does not perform development, the contractor shall assist the developer by providing logistics support (e.g., packaging, handling, storage, transportation, inventory coordination, procurement) as designated by the Government.

## 7.5.2  Property Management

The contractor shall identify and track Government property as listed in:
- Appendix 4 *ISS Flight Certified Hardware*
- Appendix 7 *TOSC OMEU Matrix*
- Appendix 11 *Contractor-Accountable Property (FAR 52.245-1)*
- Appendix 16 *Legacy Flight Hardware*

The contractor shall input and track property applicable to FAR 52.245-1 in the contractor's property management system.

The contractor shall input and maintain records for NASA-tagged property in the NASA Property Management System (N-Prop) (e.g., high-value material and equipment).

The contractor shall manage equipment in compliance with NPR 4200.1 *NASA Equipment Management Procedural Requirements* and NPR 4200.2 *Equipment Management Manual for Property Custodians*.
The contractor shall identify excess assets and coordinate with the Center to initiate redistribution, utilization and excess functions in accordance with:
- NPR 4300.1 *NASA Personal Property Disposal Procedural Requirements*

- NPR 4310.1 *Identification and Disposition of NASA Artifacts*
- KDP-KSC-P-3716 *KSC Personal Property Transfer/Excess Process*
- 41 CFR 101 *Federal Property Management Regulations*
- 41 CFR 102 *Federal Management Regulations*.

For ISS assets, the contractor shall also utilize:
- JPD 357, *Delegation of Scrap and Downgrade Cost-Approval and Signature Authority*
- SSP 41170, *Configuration Management Requirements*

The contractor shall coordinate the removal of excess property with the institution contractor to the NASA Recycle, Reutilization, and Marketing Facility (RRMF) per the Property Disposal Officer (PDO) schedule.

The contractor shall perform a hazardous materials assessment on each item identified for redistribution, utilization and excess for which an assessment has not already been performed. If an item is identified as excess and contains hazardous components, the contractor shall coordinate with the PDO and minimize the amount of hazardous material by separation, removal and disposal of hazardous components prior to transport to NASA RRMF.

The contractor, working with the KSC Export Control Office, shall determine and record Destruction, Demilitarization, and Export Control requirements within the property record.  The contractor shall perform appropriate destruction or other demilitarization action in accordance with DoD 4160.21-M-1 *Defense Demilitarization Manual* prior to excess unless directed otherwise by the PDO.

The contractor shall coordinate with the NASA Real Property Officer (RPO) for the management of NASA-accountable real property in accordance with NPR 8800.15 *Real Estate Management Program.*

For ISS, the contractor shall manage the Government property identified in Appendix 4, which remains accountable to the ISS vehicle sustaining contract.  The contractor's property system shall accommodate ISS Post Production Support property.  The contractor shall report incidents, issues, loss, damage, or destruction of ISS property in their possession or in the possession of their subcontractors, to the delegated Government Property Administrator at KSC and to the ISS vehicle sustaining contractor when such property is accountable to the ISS vehicle sustaining contract.

For ISS, the contractor shall support disposition of property identified in Appendix 4. Disposition will consist of preparation and transportation of property as directed by the Government.

## 7.5.3  Vehicle Management

The contractor shall perform vehicle management functions in accordance with:

- NPR 6200.1 *NASA Transportation and General Traffic Management*
- NPD 6000.1 *Transportation Management*
- KNPR 6000.1 *Transportation Support System Manual*
- *NASA Official Fleet Management Handbook*
- Executive Order (EO) 13423 *Strengthening Federal, Environmental, Energy, and Transportation Management*
- EO 13514 *Federal Leadership in Environmental, Energy, and Economic Performance*

The contractor shall furnish and maintain general purpose vehicles in support of contract requirements. General Services Administration (GSA) schedules may be utilized at the discretion of the contractor to satisfy the requirements for motor vehicles.

The contractor shall maximize the use of KSC on-site service and fueling stations for fueling general purpose vehicles and Government-furnished vehicles.  The contractor shall maximize the use of alternative fuels as the primary fuel in flexible-fuel vehicles and bi-fuel vehicles.

The contractor shall ensure that all drivers have proper state licenses, with applicable endorsements, for equipment being operated.  The contractor shall furnish GSA a copy of their third party automobile insurance policy if acquiring GSA motor vehicles.

The contractor shall input the required fleet data into the Federal Automotive Statistical Tool (FAST) for GSA or government-owned vehicles annually, as scheduled by the NASA Agency Transportation Manager.

The contractor shall develop, implement and maintain *Motor Vehicle Utilization Plan and Reports* (DR 7.5-2).

# 8   Spaceport Services

The contractor shall provide Spaceport Services including advanced planning and special studies; flight hardware processing, launch, landing, and recovery; ground systems services; and processing support services.  The contractor shall provide management and administration in support of each task order as required.

## 8.1   Advanced Planning and Special Studies

The contractor shall support advanced planning and special studies.  Advanced planning and special studies include planning, development, modeling, simulation, assessment and analysis of:

- Processing strategies, concepts of operations, scheduling and timelines
- Design for operability, reliability, maintainability and supportability
- Mechanical and fluids systems, and hazardous commodities (e.g., hypergolic, cryogenic, and other propellants)
- Electrical and control systems (e.g., command and control systems, field control devices)
- Future flight systems processing
    - off-line and integrated operations and testing
    - integration of multiple elements
    - cargo processing
    - launch, recovery, retrieval and contingency operations
    - parallel processing synergies and studies
- Future ground systems
    - operations, maintenance, and modification
    - industrial control systems and data system architectures
    - resource utilization
- Integrated logistics support, level-of-repair, maintenance tasks, spare parts, supply chain studies, transportation plans, life-cycle costs
- Manifesting of vehicle, spacecraft, cargo, experiments and research

The contractor shall perform other planning and studies as required by the Government.

## 8.2   Processing Services

The contractor shall provide vehicle, spacecraft and payload processing services including offline processing, integrated processing and launch, and landing and recovery operations.

*Offline Processing*

The contractor shall provide flight hardware transportation, receiving and inspection, assembly, processing, servicing, repair, anomaly resolution and host role services.  The contractor shall provide servicing and de-servicing of commodities.  The contractor shall provide services to schedule and perform the offline activities for vehicles, spacecraft, payload, experiments and cargo elements including assembly, buildup, integration, fit checks, stowage, test, servicing,

closeouts, maintenance, fairing installation, handling and de-integration.  The contractor shall support flight crew activities.

The contractor shall perform launch vehicle component (e.g., core and upper stages, booster motors, engines, interstages) processing.  Example tasks include:
- Receive, inspect, transport and store components
- Service, prepare and assemble components for integration
- Conduct interface and checkout tests
- Prepare and transport components to the integration facility

The contractor shall perform payload and/or spacecraft processing in a payload processing facility.  Example tasks include:
- Receive spacecraft, payload, adapter and fairings
- Spacecraft fueling and servicing
- Establish connections
- Establish commodity purges
- Perform integrated payload or spacecraft testing
- Conduct interface and checkout tests
- Encapsulate payload or spacecraft
- Prepare and transport payload or spacecraft to an integration facility

The contractor shall perform fueling simulations and fuel servicing and de-servicing operations for customer spacecraft located at KSC or offsite.  Examples of operations include loading and offloading test fluids and propellants and associated pressurants.  At KSC or the local vicinity, the contractor shall coordinate with the Center for the field flushing, decontamination, cleaning and drying of ground systems and customer hardware, and the storage and disposal of hazardous commodities.  For other locations, the contractor shall coordinate with the applicable facility contractor to obtain such services.  The contractor shall validate and re-certify assigned ground systems with each payload customer's requirements prior to each use.

The contractor shall provide services to develop, implement and maintain work instructions, drawings and other documentation necessary to support flight hardware processing requirements.

The contractor shall utilize simulators and checkout systems for processing support activities (e.g., flight emulator or simulator to support customer testing).

*Integrated Processing and Launch Operations*

The contractor shall process and integrate launch vehicle and spacecraft components, systems and elements.  The contractor shall provide integrated vehicle and spacecraft transportation, fit-check, testing, checkout, closeout and anomaly resolution activities.

The contractor shall perform installation, stow and destow operations.  The contractor shall install time-critical experiments, equipment, payloads and cargo.

The contractor shall establish, configure and verify interfaces between the respective launch control center, the launch site and the vehicle and spacecraft.

The contractor shall perform launch planning and preparation activities.  Example activities include:  requirement satisfaction tracking; simulations and training; verification that personnel, procedures and flight and ground systems are ready to support launch; development, maintenance and distribution of launch countdown schedules and procedures; and resolution of launch constraints.

The contractor shall perform launch processing, launch operations and post-launch safing and securing.  Examples of processing and launch activities include:  configuring pyrotechnics; final walk-downs of flight elements, ground systems, and launch site facilities; propellant loading; flight crew ingress; cabin close-out; launch; and launch recycle activities.

The contractor shall develop contingency plans, provide training for contingencies and perform contingency operations.  Examples of contingency events include off-nominal conditions, hardware failure, launch scrubs, launch delays, safing and crew evacuations.

The contractor shall develop ground system imagery and tracking requirements.  The contractor shall support debris transport engineering analysis.  The contractor shall identify and analyze debris sources and develop a launch debris mitigation process.

The contractor shall provide post-launch analyses to validate engineering pre-launch prediction tools and methodologies and provide visibility into ground processing for resolution of in-flight anomalies and vehicle and spacecraft performance outside of nominal flight.  The contractor shall participate in the resolution of in-flight anomalies.

*Landing and Recovery Operations*

The contractor shall plan and develop procedures for landing and recovery operations.  The contractor shall perform resource staging; landing and recovery operations at the recovery sites; transportation; and post-mission safing and de-servicing operations.  The contractor shall develop contingency procedures for recovery and retrieval scenarios.  The contractor shall support landing and recovery training exercises for nominal and contingency operations.

## 8.3   Ground Systems Services

The contractor shall perform ground system services.  Examples include:
- Developing and implementing ground systems projects (e.g., designated GSDO, CoF, LA and survivability projects)

- Planning, developing, scheduling and performing operations, maintenance, sustaining and analysis on customer-specified ground systems (e.g., ground support equipment, checkout systems)
- Performing ground systems safing and dispositioning when the system is no longer required
- Preserving ground systems (e.g., preventive maintenance, long-term storage)

## 8.4    Processing Support Services

The contractor shall perform processing support services.  Examples include:
- Logistics services for flight and ground assets (e.g., procurement, life-cycle material management and preserving flight systems and material, maintaining pedigree)
- Depot-level repair, refurbishment and manufacturing shop support
- Training development and implementation for processing and launch activities
- Safety and mission assurance services (e.g., inspection, operations safety, assurance, probabilistic risk assessments development)
- Flight and ground assets preparation for display (e.g., safing of high-energy systems, decontamination, demilitarization, transportation support)
- Access to IT applications and systems (including highly-specialized systems) used in support of ground processing and launch activities, with controls to ensure appropriate customer access to data
- Configuration management and requirements verification management
- Operational expertise for development, verification, validation and processing of flight and ground systems
- Flight-certified thermal protection system material manufacture and production
- Relocation of existing equipment and services
- General office administrative support, food preparation and basic attendant services for the Astronaut Crew Quarters at KSC

## 8.5    Management Administration

The contractor shall provide program, business and contract management to perform Spaceport Services.  The contractor shall provide the appropriate level of security and obtain clearances for implementing customer requirements.