SECTION C

STATEMENT OF WORK

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PREFACE

The Contractor shall provide Program Integration and Control (PI&C) products and services in support of the continued development and operation of the International Space Station (ISS) whose purpose is to conduct physical, engineering, and life sciences research for the benefit of life on Earth and to advance exploration of our solar system and enable commerce in Space. Thorough knowledge and expertise of the ISS will be necessary to perform this contract. The Contractor is to provide products and services in support of the following functional areas:

- Program Management;
- Business Management;
- Configuration Management (CM)/ Data Management and Integration (DMI);
- Program Information Technology;
- International Integration;
- Human Spaceflight Collaboration;
- Systems Analysis and Integration;
- Engineering and Technical Services;
- Visiting Vehicle Integration and
- Safety and Mission Assurance

The Performance Standards include: the requirements as described in the Statement of Work, Task Orders, metrics described in DRD PIC-PM-02, and will be statused monthly as part of the Program Management Review(s).

The objective of this contract is to assist the National Aeronautics and Space Administration (NASA) in the management of the ISS Program by utilizing effective performance approaches and adequate resources to accomplish PI&C requirements in the most cost-efficient manner.

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1.0 MANAGEMENT INTEGRATION AND CONTROL

The Program Integration and Control (PI&C) Contractor shall provide all necessary program, business management, engineering, technical, administrative skills to accomplish the objectives and outcomes described within this contract. The Contractor shall perform the services and deliver the products described in this Statement of Work (SOW), contract terms and conditions, applicable documents, Data Requirements Descriptions (DRDs), and other plans and sections contained within this contract. These products and services will be in direct support of the International Space Station (ISS) Program to manage and integrate the implementing organizations (National Aeronautics and Space Administration [NASA] Center institutions, other Contractors, and International Partners/Participants [IP/Ps]) and ISS Program customers. This includes the continued development, maintenance, and implementation of top-level Research and Development (R&D) requirements, which flow to the implementing organizations to enable the continued operation and utilization of the ISS R&D facility.

1.1 PROGRAM MANAGEMENT

1.1.1 Program Management and Administration

(a) The Contractor shall perform Program management and administration, including risk management, in order to develop and deliver the required ISS Program products and services as defined for this contract.

(b) The Contractor shall develop and maintain Program management systems, as outlined below, for the planning, organization, control, and reporting of all activities required by this contract.

These products and services will include the development and operation of systems necessary for providing assessments and analysis for the overall R&D, integration, status (e.g., cost, technical, and schedules for the ISS Program) and for providing inputs to the ISS Program for overall strategic planning, policy and risk management of the ISS Program and its R&D of experiments and projects to facilitate the ISS Program in accomplishing its mission.

These systems will assure accomplishment of all outcomes and deliverable products required by this contract.

1.1.1.1 Planning and Reviews

1.1.1.1.1 PI&C Plans

(a) The Contractor shall develop, maintain, and implement the Government approved PI&C Management Plan in accordance with DRD PIC-PM-01.

(b) The Contractor shall provide a PI&C Closeout Plan in accordance with DRD PIC-PR-02.

1.1.1.1.2 Performance Management Reviews (PMRs)

(a) The Contractor shall conduct monthly Performance Management Reviews (PMRs) with NASA.

(b) The Contractor shall provide, in the PMRs, insight into the Contractors', subcontractors', and vendors' overall technical, schedule and price/cost performance and status to the ISS Program.

(c) The Contractor shall present at the PMRs metrics that effectively indicate the level of success in the execution of contract requirements and the status of the Contractor's achievement against the performance standards contained within this Statement of Work or elsewhere in this contract.

(d) The Contractor shall depict in PMR presentations a correlation of the metrics to the requirements, and measurements of Contractor management responsiveness to the performance indicated by the metrics.

(e) The Contractor shall depict in PMR presentations performance measurement, accomplishments, issues and corrective actions, contract financial performance-to-plan status, including rates and any other data necessary to status the ISS Program.

(f) The Contractor shall provide Integrated Management Review Products (IMRPs) in accordance with DRD PIC-PM-02 for the work performed on this contract, and present the data in the PMR.

1.1.1.1.3 Management Information System (MIS) Data Requirements

MIS is a web-based data repository designed to keep ISS Program management and personnel aware of the most current ISS Program technical, financial, workforce, schedules, and operational information, including issues and risks. MIS links ISS Program core business issues and goals with the technical aspects of the Program. To accomplish this, ISS Program managers will utilize (from the Contractor) selected financial planning technical costs, workforce data, Program schedules, Program metrics and other status information. This selected information exists in the various DRDs which are requested by the contract. As required, other data and supporting formats should be developed by the Contractor with concurrence from ISS Program Business Management Office.

1.1.1.1.4 PI&C Certification of Flight Readiness

The Contractor shall develop, update and implement a PI&C Certification of Flight Readiness (CoFR) Plan per DRD PIC-PM-03 in accordance with SSP 50108, Certification of Flight Readiness Process Document. The Contractor shall develop and implement an auditable

approach to verify and ensure that flight preparation responsibilities and requirements are met and all issues dispositioned.

1.1.2 Internal/External Program Review Support

(a) The Contractor shall develop briefing materials and analyses for ISS Program presentations and meetings with various internal and external review groups. These groups include the Aerospace Safety Advisory Panel (ASAP), Space Station Utilization Advisory Subcommittee (SSUAS), Stafford/Anfimov committee, Inspector General/Government Accountability Office (IG/GAO), Space Flight Advisory Committee (SFAC), ISS Management and Cost Evaluation/NASA Advisory Council (IMCE/NAC), Independent Implementation Review (IIR), and Cost Assessments Teams.

(b) The Contractor shall prepare and present various topics, such as ISS Program technical, cost, and schedule status, specific safety or risk issues, and responses to external inquiries.

1.2 BUSINESS MANAGEMENT

1.2.1 RESERVED

1.2.2 RESERVED

1.2.3 Resource Management

As part of the Program management for this contract, including risk management, the Contractor shall support the Resource Management Office in Program Planning and Control (PP&C) of budget funding, contract changes tracking and analysis and reserves management. The Contractor shall perform the following tasks:

1.2.3.1 Financial Management

(a) The Contractor shall develop, implement, maintain, and update a contract financial system which tracks resources by contract Work Breakdown Structure (WBS) including, but not limited to, fully burdened labor and other direct cost, (e.g. materials, travel, and subcontracts).

(b) The Contractor's financial planning system shall support the Government budget process (e.g. Program Planning Budgeting and Execution [PPBE] budget calls), and support special requests for budget impacts. NASA will, in accordance with the budget or special request guidelines and reporting format, specify the format and content of the Contractor's inputs and supporting rationale.

(c) The Contractor shall provide financial reporting in accordance with DRD PIC-PC-01.

1.2.3.2 RESERVED

1.2.3.3 Special Reporting

The Contractor shall develop and provide Workforce Reports in accordance with DRD PIC-PC-03.

1.2.3.4 PI&C Contract Work Breakdown Structure (WBS)

The Contractor shall develop and provide a contract PI&C WBS and Dictionary in accordance with DRD PIC-PC-04. The WBS and Dictionary shall indicate the mapping of the Contractor WBS to the contract SOW WBS and SSP 50659, ISS Program Work Breakdown Structure, at the lowest levels of the ISS Program WBS.

1.2.4 ISS Program Budget Requirements and Assessments

1.2.4.1 ISS Program Budget Database Maintenance and Tracking Contract

The Contractor shall utilize the Space Program Integrated Contract Environment (SPICE) and the Integrated Enterprise Management Program (IEMP) databases to accomplish the following:

(a) The Contractor shall maintain the ISS Program budget database to include tracking of all approved changes.

(b) The Contractor shall answer queries from Contracting Officer (CO), NASA Program Planning and Control (PP&C) managers and resource analysts and provide various financial and workforce reports.

(c) The Contractor shall track all approved purchase requests for the ISS Program Office.

(d) The Contractor shall track funding requirements for the ISS Program Office.

(e) The Contractor shall track monthly cost actuals for the ISS contracts as needed in the IFM database.

(f) The Contractor shall provide data analysis, monthly cost status, and presentations.

1.2.4.2 ISS Program Reserves/Changes Management Database

The Contractor shall use the SPICE and the Integrated Risk Management Application (IRMA) databases to accomplish the following:

(a) The Contractor shall maintain the data in the ISS Program Reserves/Changes Management database to include tracking of all changes.

(b) The Contractor shall answer queries and provide reports.

(c) The Contractor shall provide ad-hoc product support to the Resources Management Office.

(d) The Contractor shall answer queries from NASA PP&C managers and resource analysts and provide reports.

1.2.4.3 Assessments

The contract shall support the Assessments, Cost Estimating and Scheduling (ACES) Office in assessing the ISS Program budget, cost, schedule and technical baseline to provide early warning for possible impacts to the ISS Program cost. The Contractor shall identify, evaluate, analyze, track, and report planning and assessment issues, and risks along with providing recommendations to the ISS Program managers. The Contractor shall coordinate content and formats of all assessments and analyses with the ISS Program prior to delivery of all final products.

(a) The Contractor shall integrate data from the ISS Program cost performance reports, including risks, to assess ISS Program performance. These assessments will be used by the ISS Program ACES Office for the development of overall Program analyses and status.

(b) The Contractor shall identify, evaluate, and report risk issues in a monthly early warning report to the ISS Program Manager. This report provides detailed status of the ISS Program performance against the ISS Program plan and impact of cost, schedule, and technical variances against the plan; and shall recommend actions to abate potential ISS Program impacts.

(c) Prior to the ISS Program Quarterly Review, the Contractor shall identify, evaluate, and report a preview assessment of the ISS Program status and technical health to the ACES office based on the assessment of the most current technical, cost, and schedule reports.

(d) Upon completion of the Quarterly Review, the Contractor shall provide an updated evaluation of the ISS Program status and technical health, based on the results of the data provided and presented as part of the quarterly Program Management Review.

(e) The Contractor shall perform ad-hoc analyses and assessments including, but not limited to, parametric cost estimates, schedule, cost, requirements, and workforce correlations and analyses, life cycle cost (LCC) estimates, and trade studies.

(f) The Contractor shall perform and integrate ad hoc parametric cost estimates, including but not limited to the preparation and documentation of individual cost estimates, the

reconciliation of cost estimates with technical evaluation of Contractor proposals, and the integration of component estimates to produce consolidated estimates and associated reports.

(g) The Contractor shall maintain analytic models associated with the development of parametric cost estimates and related assessments.

(h) The Contractor shall track and identify ISS Program threats for the ACES Office in support of the Program Risk Advisory Board and the monthly Early Warning Reports. The Contractor shall support the ACES office in the generation and development of reports from IRMA which shall provide a probabilistic estimate of the budget threats and a summary of the budget cost impact in current and out years. A Quantitative Risk Assessment tool shall be used to generate the estimate.

1.2.5 Program Scheduling

The Contractor shall provide overall ISS Program schedule management and analysis/assessment to support the continued development and operation of the ISS. The Contractor shall perform schedule analyses/assessment and report findings of those assessments at various levels of the ISS Program. Operation of a scheduling system that supports overall ISS Program objectives and requirements is also within the scope of the Contractor.

1.2.5.1 Schedule Management

(a) The Contractor shall develop and provide PI&C schedules and schedule analysis/assessments for the ISS Program (DRD PIC-PC-06).

(b) The Contractor shall prepare and report program schedule metrics.

(c) The Contractor shall provide reporting and schedule analysis. (DRD PIC-PC-06)

1.2.5.1.1 Program Schedule Management

The Contractor shall integrate schedule information from ISS, IP, ISS Program Contractors and ISS Cost Accounting Manager (CAM) performing organizations into a single ISS Program Integrated Program Flight Schedule.

(a) The Contractor shall provide schedule development and analysis/assessments for all flights and Program level activities.

(b) The Contractor shall provide schedule updates and status reports to ISS Program management.

(c) The Contractor shall maintain and update schedules and Program management information on the ISS Program Web site for the Integrated Program Flight Schedule, ISS Program and schedules for the ONE NASA Management Information System (MIS) (DRD PIC-PC-06).

1.2.5.1.2 Integrated Program Schedules Panel (IPSP) Support

(a) The Contractor shall support the weekly NASA led IPSP meeting.

(b) The Contractor shall support the IPSP by providing deliverables that provide for issue identification, schedule status and assessments and special agenda topics. The Contractor shall provide these deliverables to the IPSP in support of the ISS Program as determined by customer.

1.2.5.1.3 Program Level Schedule Data Management

The Contractor shall lead the ISS Program schedule data acquisition effort from all ISS Program participants in order to acquire the data necessary to support the continued development, evolution, and monthly maintenance of the Integrated Program Flight Schedule and lower level CAM Project schedules. The Contractor shall attend various ISS Program meetings to obtain information that support the effort described in schedule management.

1.2.5.2 Scheduling Systems Support

(a) The Contractor shall operate a scheduling system identified in Addendum 4, Table 1, in support of the ISS Program.

(b) The Contractor shall, with NASA guidance, review or audit other ISS Program Contractors' schedules to ensure compliance with current general Project Management conventions and requirements (e.g. Project Management Institute guidelines) and for indications of positive performance compared to plans. The Contractor shall work through the IPSP to resolve schedule or process issues identified.

1.2.5.3 Schedule Assessments

The Contractor shall perform top level and lower level schedule analyses and assessments for ISS Program organizations, projects, IP Elements, Visiting Vehicles.

(a) The Contractor shall provide a schedule assessment for each Unites States On-Orbit Segment (USOS) flight planned to the ISS. These assessments shall include an independent assessment of the overall flight readiness such as payloads, orbital replacement units (ORU), flight support equipment, and carriers.

(b) The Contractor shall perform risk based schedule assessments for Change Requests, development projects, critical items schedules, and special projects in support of the ISS Program Manager utilizing current Project Management tools and simulation techniques. Management reports shall be developed to support ISS Program decision making.

(c) The Contractor shall monitor and report status of development projects, critical items schedules, and special projects in support of the ISS Program Manager utilizing current Project Management tools and simulation techniques.

1.2.5.4 CAM Schedule Support

(a) The Contractor shall gather schedule updates and provide status reports to ISS Project Engineers/Managers.

(b) The Contractor shall create hardware delivery matrices, delivery schedules and trend charts, as required to show indication of project performance.

1.2.5.5 ISS Program Planning Calendar / Certification of Flight Readiness (CoFR) Review Meeting Matrix

The Contractor shall maintain the ISS Program Planning Calendar and CoFR Meeting Matrix.

(a) The Contractor shall participate in meetings to coordinate Program Calendar updates. The Contractor shall maintain the ISS Program Planning Calendar on the ISS Program Web site and provide updates twice weekly. The Contractor shall also produce copies and deliver them to the customer in support of Program office organizational staff meetings and the Integrated Program Schedule Panel (DRD PIC-PC-06).

(b) The Contractor shall provide maintenance of the CoFR Meeting Matrix by participating in meetings and providing updates and electronic status to Program participants of the CoFR matrix for baselines and working versions (DRD PIC-PC-06).

1.2.5.6 Special Schedule Trade Studies

At the written direction of NASA, the Contractor shall perform Special Schedule Trade Studies or create ad hoc schedules in support of the ISS Program.

1.2.5.7 Propose Alternate Report Formats

The Contractor shall develop and propose alternate report formats, if necessary, for NASA review and concurrence.

1.3 CONFIGURATION MANAGEMENT (CM) / DATA MANAGEMENT AND INTEGRATION (DMI)

1.3.1 Configuration Management

The Contractor shall develop, implement, and administer configuration management operations across the ISS Program as specified in this contract and in accordance with SSP 41170, Configuration Management (CM) Requirements; SSP 50010, Standards for ISS Program Documentation; SSP 50172, Data Management Handbook; and SSP 50123, Configuration Management Handbook. Additionally, the Contractor shall be responsible for contract specific CM functions as described in each of the functional CM areas described below.

1.3.1.1 Management and Administration

The Contractor shall provide for continued establishment and maintenance of the ISS Program CM policies, procedures and requirements, including maintaining an infrastructure for the continued development and baselining of hardware and software. The Contractor shall provide book coordination functions for SSP 41170, SSP 50010, SSP 50123, and SSP 50172, which contain the ISS Program CM/Data Management and Integration (DMI) requirements, policies, standards, and procedures. The Contractor shall maintain SSP 50706, Change Engineer Handbook; SSP 50744, Data Impoundment Processing Procedures; SSP 50421, Program Planning and Control Office CoFR Implementation Plan; SSP 50764, Modification Kit Process; and other ISS Program Configuration Management/Data Management documents.

1.3.1.1.1 The Contractor shall develop and implement a CM Plan in accordance with DRD PIC-CM-01.

1.3.1.1.2 The Contractor shall support Technical Interchange Meetings (TIMs) and ISS Program Milestone Reviews by providing inputs regarding CM.

1.3.1.1.2.1 The Contractor shall participate in the International Configuration Management Telecons (ICMTs) and:

(a) Schedule conference rooms;

(b) Notify attendees;

(c) Request interpretation/translation services;

(d) Schedule and set-up equipment;

(e) Prepare agendas;

(f) Prepare meeting material;

(g) Prepare minutes; and

(h) Track action items.

1.3.1.1.2.2 The contractor shall participate in the annual ICMT Face-to-Face meetings with the IP/Ps providing the same administrative functions described above in paragraph 1.3.1.1.2.1.

1.3.1.1.2.3 The Contractor shall participate in the ISS Program Milestone Reviews and:

(a) Schedule conference rooms;

(b) Notify attendees;

(c) Request interpretation/translation services;

(d) Schedule and set-up equipment;

(e) Prepare agendas;

(f) Prepare meeting material;

(g) Prepare minutes; and

(h) Track action items.

1.3.1.1.3 The Contractor shall develop, maintain, and deliver desk instructions including but not limited to the following areas, in accordance with SSP 50123 and SSP 50172:

- Change Processing
- Configuration Status Accounting
- Audit and Verification
- Engineering Release Unit
- CM Receipt Desk
- Meeting Support
- Board Secretariats
- Change Integrators
- Document Quality Assurance
- Directive Desk
- Program Data Integration Team (PDIT) Help Desk
- Other Programs' Change Request (CR) reviews.

1.3.1.2 Configuration Status Accounting and Verification

The Contractor shall maintain Configuration Status Accounting requirements in accordance with SSP 41170 and assure the requirements and processes are implemented across the ISS Program.

The PI&C Contractor shall perform the following Configuration Status Accounting functions across the ISS Program:

1.3.1.2.1 Participate in ISS hardware and software Functional Configuration Audits (FCA) and Physical Configuration Audits (PCA) by acting as the co-chair of the PCA CM panel as defined in D684-10097-01, Guidelines and Procedures for the conduct of Functional Configuration Audit (FCA) / Physical Configuration Audit (PCA). The Contractor shall:

(a) Determine the acceptability of the panel review items;

(b) Support the audit Chairperson(s) in developing recommended solutions to actions/issues;

(c) Prepare panel summary and minutes, and submit for inclusion in the audit minutes;

(d) Review draft minutes of the audit and sign applicable certification sheets, as appropriate;

(e) Ensure all necessary documentation is compiled and presented in an understandable manner to the customer;

(f) Coordinate panel activities and review/document progress daily;

(g) Determine if the use of sub-panels is necessary due to size/complexity of the Configuration End Item (CEI)/Configuration Item (CI) and/or Computer Software Configuration Item (CSCI); and

(h) Ensure audit action item/issue forms are available for auditors to document issues identified during the audit.

1.3.1.2.2 The Contractor shall participate in ISS Program acceptance reviews and readiness reviews to ensure CM issues are addressed and dispositioned. The Contractor shall:

(a) Identify all open work for the CI and/or CSCI have been closed;

(b) Verify that no unapproved activity has occurred to change the configuration since the PCA was performed;

(c) Provide all preplanned, assigned, unplanned or deferred work associated with the item subject to the acceptance review to be presented in summary at the review; and

(d) Identify any issues or concerns derived from work transfer or deferral and presented to the ISS Program Manager.

1.3.1.2.3 On-Orbit Configuration Working Group (OCWG)

The Contractor shall ensure the application of On-Orbit Configuration Status Accounting requirements and systems result in hardware and software product baselines in accordance with SSP 41170.

The Contractor shall provide support to the OCWG ensuring timely tracking, reporting, analysis, and disposition of on-orbit discrepancies between the as-built and the as-designed hardware configuration.

The Contractor shall provide technical coordination to the OCWG and:

(a) Attend OCWG as a member and facilitate the OCWG as required;

(1) Provide technical assessment of all new, closed and current Configuration Discrepancy Reports (CDRs) according to MGT-OH-018, On-Orbit CDR Resolution Process,

(2) Facilitate the meeting if NASA Chair is not available.

(b) Organize the OCWG Meeting;

(1) Support NASA chair to schedule OCWG meetings,

(2) Establish agendas and schedule meetings based on CDR activity,

(i) Send meeting notice/secure meeting room/set-up conference call-in.

(3) Document and track action items;

(4) Write and publish minutes for the OCWG,

(i) Summarize the essence of discussions surrounding decisions and actions.

(c) Maintain and track all CDR activity in the OCWG Master CDR List;

(d) Review Master CDR List weekly;

(1) To identify stalled CDRs or possible issues,

(2) To ensure that the CM Contractor(s) are providing a current status of on-orbit configuration discrepancies.

(e) Establish and facilitate bi-weekly (or as required) Contractor pre-coordination reviews to evaluate CDR activity;

(f) Coordinate OCWG support for CDRs with high risk or safety impact to the ISS Program by establishing a special topic OCWG or adding it to the agenda of the appropriate Program forum (i.e. System Problem Resolution Team [SPRT], Systems Working Group [SWG], Vehicle Control Board [VCB], etc);

(g) Establish and maintain OCWG website includes current information regarding on-orbit configuration discrepancies;

(h) Maintain the OCWG charter and the OCWG Work Instruction (MGT-OH-018).

1.3.1.2.4 Audit and validate the data residing in the Program status accounting systems (e.g., Space Station Accounting and Verification [SSAV], Configuration Status Management Operations System [COSMOS] and Electronic Document Management System [EDMS]) to ensure accuracy and completeness.

1.3.1.2.5 Validate the ISS Program baseline including the review and evaluation of changes to ensure proper baseline maintenance. The Contractor shall verify that the product and product information are properly updated per Program approved changes.

1.3.1.3 Configuration Control

The PI&C Contractor shall perform the following Configuration Control activities across the ISS Program:

1.3.1.3.1 Ensure execution of the change process in accordance with SSP 50123 and individual ISS Program Contractor CM plans. The Contractor shall:

(a) Ensure changes are thoroughly coordinated prior to submittal;

(b) Reviewed and evaluated;

(c) Implemented by an approved ISS Program Change Directive;

(d) Provide a single focal point for IP/P communication. Contractor shall:

(1) Assist in tracking, status and closure of IP/P changes,

(2) Assist in managing IP/P actions, telecons, and IP/P CM TIMs;

(e) Provide a thorough review of all directive packages to ensure quality packages prior to submittal for NASA CM signature per SSP 50123 and OH-WI-017, International Space Station Configuration Management (CM) Directive Work Instruction.

1.3.1.3.2 Maintain all CM blank forms/templates required for change processing and maintain a quality control function to provide uniform change paper across the Program.

1.3.1.3.3 Provide CM Secretariats for all ISS Program Control Boards and Panels. CM Secretariat functions are to be performed in accordance with ISS Program PPD-522, Space Station Control Board/Panel Operations Policy, and SSP 50123. Board/panel participation shall include:

(a) Participate as a board/panel member;

(b) Provide CM direction to the board chair;

(c) Coordinate with the board chair and CM meeting support personnel on all Space Station Change Notices (SSCNs) processed through the board;

(d) Track and report on all open SSCNs under the board responsibility;

(e) Ensure that complete directive packages are available at the board for concurrence/approval;

(f) Provide technical review and concurrence of the board minutes; and

(g) Notify the Change Integrator in writing of the directive approval status following the board meeting.

1.3.1.3.4 Provide meeting logistics, administration, agendas, action item management, minutes, and archival of all presentation material and decisional paper for all ISS Program Configuration Control Boards and Panels, Bi-lateral and Tri-lateral Program Boards, Acceptance Reviews, IP Assessment Reviews, and ISS Program reviews. In addition, the Contractor shall provide the following administrative functions:

(a) Scheduling conference rooms;

(b) Notifying attendees;

(c) Requesting interpretation and translation services;

(d) Requesting local transportation services for Foreign Nationals, when necessary;

(e) Scheduling and set-up of equipment;

(f) Preparation of meeting materials;

(g) Provide Quality Records Management for Flight Certifications per NPR 1441.1;

(h) Provide Quality Records Management for ISS Boards and panels;

(i) Provide reports and metrics; and

(j) Provide administrative functions for decision documents.

1.3.1.3.5 PP&C CoFR Panel Reviews and Stage Operations Readiness Reviews per SSP 50108 and SSP 50421. The Contractor shall:

(a) Provide charts identifying open work for each flight;

(b) Provide status at lower boards/panels for each flight;

(c) Capture and track CoFR actions and CoFR exceptions to closure for each flight;

(d) Track open paper for each flight; and

(e) Maintain the PP&C CoFR schedule.

1.3.1.3.6 Conduct a Program Change Screening Board (CSB), as described in SSP 50123, to screen all new change requests. The Contractor shall:

(a) Review all new/revised Change Requests (CRs) submitted to the ISS Program system;

(b) Confirm Contractor unit responsible to lead processing of the change;

(c) Verify that all CR information is complete;

(d) Ensure that all affected NASA organizations and Contractors are given the opportunity to evaluate;

(e) Verify evaluation schedules, assessing the urgency of the CR; and

(f) Verify the appropriate board/panel and the board/panel dates.

1.3.1.3.7 The PI&C Contractor shall perform the following Configuration Control activities for changes specific to the PI&C contract:

1.3.1.3.7.1 Process changes specific to the PI&C contract in accordance with SSP 50123. Review and evaluate ISS Program changes originating from outside the PI&C contract to determine if those changes have potential impacts to the PI&C contract.

1.3.1.3.7.2 Maintain and process Program Directives (Management Directives, Joint Program Directives, and Partner Program Directives) in accordance with procedures established in SSP 50123. The Contractor shall:

(a) Prepare redlines to directive,

(b) Initiate CR and release for evaluation to the ISS Program,

(c) Incorporate comments,

(d) Prepare directive for ISS Program signature, and

(e) Release directives in EDMS.

1.3.1.3.7.3 Coordinate the ISS Program review of the Space Shuttle Program and Constellation Program changes. The Contractor shall prepare a consolidated response for the CRs back to the Space Shuttle Program and Constellation Program in writing.

1.3.1.3.7.4 The Contractor shall participate in special projects requiring lifecycle CM knowledge. Activities will include project planning, documentation changes, expedited CM process development and facilitation of new ISS Program requirements development to support expedited processing and ensure traceability of data is available for certification of flight readiness.

1.3.1.3.8 Input, maintain, and validate the COSMOS database to assign CR numbers, track/status changes, and provide accurate information, reports, and monthly metrics.

1.3.1.3.8.1 Process all ISS Change Directive packages in addition to the PI&C changes processed under 1.3.1.3.7.1. Contractor shall:

(a) Obtain, track and status directive packages.

(b) Obtain directive signatures.

(c) Distribute, track and status directive actions to closure.

(d) Change Request/Directive data entry.

1.3.2 Program Data Management and Integration

1.3.2.1 The Contractor shall maintain and implement an SAE AS9100, Quality Systems - Aerospace - Model for Quality Assurance in Design, Development, Production, Installation, and Servicing, compliant data management system in accordance with SSP 50010, SSP 50172 and

SSP 41170, and assure the requirements and processes are implemented across the Program. The Contractor shall:

1.3.2.1.1 Update and maintain the electronic ISS Program Documentation Tree.

1.3.2.1.2 Update and maintain the ISS Program technical documentation baseline in EDMS and COSMOS.

1.3.2.1.3 Maintain the ISS Program Master List of work instructions, processes, and procedures in accordance with SAE AS9100. Upload and post ISS Program work instructions to EDMS.

The Contractor shall provide the following administrative functions:

(a) Assign work instruction numbers;

(b) Upload work instructions to the authorized Program repository;

(c) Update the ISS Program Master List; and

(d) Notify author and Quality Management (OX) of updates/releases.

1.3.2.1.4 Provide Data Requirement (DR) receipt, tracking, monitoring, reporting, validation, evaluation, distribution, status, and storage of ISS Program contracts deliverables and IP/P data deliverables incoming to the ISS Program as identified in the following Bilateral Data Exchange Agreements, Lists and Schedules (BDEALS) and Bilateral Hardware and Software Exchange Agreements, List, and Schedules (BHSEALS) documents: SSP 50124, NASA/CSA BDEALS; SSP 50126, NASA/NASDA BDEALS; SSP 50127, NASA/ESA BDEALS; SSP 50137, NASA/RSA BDEALS; SSP 50407, NASA/ESA BDEALS for Cupola 1; SSP 50611, NASA/ESA BDEALS for ATV; SSP 50614, NASA/NASDA BDEALS for HTV; SSP 50352, NASA/AEB BDEALS.

1.3.2.1.5 The Contractor shall manage and operate the International Partner Library (Integrated Office Management System [IOMS] or equivalent) to track IP/P Program data. The contents of the library shall include, but not limited to the following: translated Russian documents; BDEALS data; NAS15-10110 Contract deliverables; Government Furnished Data (GFD) deliverables; IP/P protocols; IP/P safety data packages; hazard reports; drawings; film; videos; photos; faxes; and letters. The Contractor shall be able to access and provide requested materials/information within two business days.

The Contractor shall perform the following Data Management activities in accordance with SSP 41170, SSP 50010 and SSP 50172 specific to the PI&C contract:

1.3.2.1.6 Provide an Engineering Release Unit (ERU) in accordance with SSP 50123 and SSP 50172 for release of ISS Program baseline documentation.

1.3.2.1.7 Operate a Configuration Management Receipt Desk (CMRD) in accordance with SSP 50123 and SSP 50172.

1.3.2.1.8 Provide Document Quality Assurance (DQA) in accordance with SSP 50010 and SSP 50172 for all ISS Program controlled documentation identified under this contract and NASA owned documents not specified under other existing ISS Program contracts.

1.3.2.1.9 Maintain and deliver SSP 50177, Government Furnished Data (GFD) Description Document. The Contractor shall notify other existing ISS Program Contractors for delivery of United States (U.S.) and IP/P GFD in accordance with SSP 50177.

1.3.2.2 Program Technical Data Access

The Contractor shall integrate and maintain the Orbital Replacement Unit (ORU) data and Flight support Equipment (FSE) data (provided by ISS Vehicle Office/Logistics and Maintenance and the hardware providers) in the Orbital Replacement Unit Data Directory (ORUDD) or equivalent. The ORUDD provides a user-friendly single access point for retrieving technical data regarding ORUs and FSEs.

1.3.2.2.1 Centralized Program Data Requirements

The Contractor shall respond to requests for resolving data workflow process issues that cross ISS Program contractual interfaces and impacts to work performance. Responding to, and resolving requests for issues with data workflow processes shall include:

(a) Identification and documentation of the issue or problem;

(b) Investigation, analysis and documentation of the data workflow processes involved and the associated interfaces;

(c) Development of a resolution plan and schedule;

(d) Facilitation of the implementation of the proposed resolution;

(e) A three-month follow-up to verify resolution is working and provide rework as identified; and

(f) Provision of closeout documentation addressing sub-paragraphs (a) thru (e).

1.3.2.2.1.1 Certification of Flight Readiness Support

The Contractor shall participate in special projects requiring lifecycle Data Management (DM) knowledge. Activities will include project planning, documentation changes, expedited DM process development and facilitation of new ISS Program requirements development to support expedited processing and ensure traceability of data is available for certification of flight readiness.

1.3.2.2.2 Data Management Process Improvements

The Contractor shall assess the state of technology and the Program's data requirements, processes and infrastructure, and propose new process improvement concepts for the Government's consideration. In this assessment, the Contractor shall solicit inputs from customers/users. These proposed concepts may be driven by one or more of the following reasons:

(a) New customer requirements,

(b) Improving performance, efficiency or effectiveness of ISS Program's data requirements and/or processes,

(c) New agency or center policies,

(d) Conforming to current standards and formats,

(e) Reducing operating costs.

1.3.2.2.3 Book Coordination

The Contractor shall provide book coordination functions to include preparation, distribution and processing Document Change Notices (DCNs), Notice of Document Changes (NDCs) and revisions in accordance with SSP 41170 and SSP 50010 for the following documents:

(a) BDEALS/BHSEALS:

(1) SSP 50124, NASA/CSA Bilateral Data Exchange Agreements, Lists, and Schedules,

(2) SSP 50126, NASA/NASDA Bilateral Data Exchange Agreements, Lists, and Schedules,

(3) SSP 50127, NASA/ESA Bilateral Data Exchange Agreements, Lists, and Schedules,

(4) SSP 50137, NASA/RSA Bilateral Data Exchange Agreements, Lists, and Schedules,

(5) SSP 50407, NASA/ESA Bilateral Data Exchange Agreements, Lists, and Schedules for Cupola 1,

(6) SSP 50614, NASA/ESA Bilateral Data Exchange Agreements, Lists, and Schedules for ATV,

(7) SSP 50352, NASA/AEB Bilateral Data Exchange Agreements, Lists, and Schedules,

(b) SSP 50622-03, Operations Data Set Blank Book, and

(c) SSP 50839, ISS Program Operations Description (IPOD).

1.3.2.2.4 Support to ISS Program Data Users

The Contractor shall ensure data which impacts the management and operations of the ISS Program is integrated, valid and accessible to all ISS participants.

The Contractor shall coordinate with all ISS Program organizations and IP/Ps having ISS Program data to resolve immediate ISS Program problems and work towards the long term goal of integrated, valid, and accessible ISS Program data.

The Contractor shall locate data, identify, and resolve data discrepancies, and document data processes associated with ensuring accessibility to available technical ISS Program data for all Program data users.

1.3.2.2.5 Review of Change Request for Data

The Contractor shall assess and concur on ISS Program CRs that contain requests for data in order to ensure no duplication and that delivery of the data is specified to an authorized Program repository.

1.4 PROGRAM INFORMATION TECHNOLOGY (IT)

The Contractor shall provide the IT infrastructure for use by ISS Program participants to support the mission of the ISS Program. Other Contractors within the ISS Program will provide the IT support necessary to perform the requirements as stated in their respective contracts. The other Contractors may request to utilize the ISS Program IT infrastructure provided by the PI&C contract when common products and services provide for increased supportability, commonality, or efficiencies. The Contractor shall provide the IT infrastructure necessary to meet the requirements, as defined in this contract, in accordance with SSP 50013, ISS Information Systems Plan.

Institutional desktop and workstation support for on-site personnel will be provided by NASA, through an Information Resources Directorate (IRD) or Agency IT services contract, in accordance with NFS 1852.245-77 and Mission Focus Review (MFR) 137. Through an IRD or Agency Contractor, NASA will provide the ISS Program with standard office desktop workstation hardware and a standard software load for the provided hardware. Through an IRD or Agency Contractor, NASA will be responsible for support and asset management of all IRD-provided hardware and software.

The Contractor shall obtain system administrator access as necessary from the IRD Contractor to support ISS Program-specific hardware and software requirements on IRD-provided desktops and workstations. The Contractor shall coordinate any depot maintenance of IRD-provided hardware with the IRD Contractor.

1.4.1 IT Management and Administration

Any of the existing ISS Program IT tools defined in Addendum 2, Table 1 are available as GFD which will be utilized by the Contractor to fulfill contract requirements.

1.4.1.1 The Contractor shall report all IT delivered or direct charged to this contract by developing, maintaining and implementing the ISS Program Information Technology (IT)

Capital Investment Plan and associated reports in accordance with SSP 50222, ISS Program Capital Investment Process (CIP).

1.4.1.2 The Contractor shall develop, maintain and implement an IT Management Plan in accordance with DRD PIC-IT-01 for reportable IT. The IT Management Plan shall, at a minimum, address the following functions: system management and operations, project management, configuration management, IT security, technology infusion, procurement, work authorization, and metrics.

1.4.1.3 If the Contractor implements a Public Key Infrastructure (PKI) system, the Contractor system shall be interoperable with the NASA PKI system.

1.4.1.4 The Contractor shall develop and implement IT project plans in accordance with DRD PIC-IT-02 for the following activities:

- Implementation of new hardware and software capabilities,
- Conducting studies, market surveys, and system tests, and
- Developing and supporting proposed system hardware relocation plans as required.

1.4.1.5 Any new projects shall be documented in a business case, using the NASA Office of the Chief Information Officer (OCIO) Strategic Investment Business Case (SIBC) format, and submitted to NASA for approval in accordance with DRD PIC-IT-02.

1.4.1.6 The Contractor shall maintain an IT Performance Management and Capacity Plan in support of performance planning, analysis (e.g., log review, trend analysis, and system utilization), and design activities for new or modified systems capabilities; or for providing system and component-level capacity planning and monitoring to ensure adequate capacity and performance margins. The plan shall be prepared on an annual basis and include the following where applicable:

(a) By system, a summary of systems performance, including charts depicting observations for the current and previous 3 quarters, and a trend line reflecting anticipated performance for the coming 4 quarters. Performance will be quantified in terms of large and small transactions, as well as end-to-end transaction performance as measured from the end-user workstation to the host or data system.

(b) By system, a summary of resource utilization, including Computer Processing Unit (CPU), Disk, Memory, related Equipment (e.g., backup tape systems, off-line/near-line storage systems, physical storage space), and network bandwidth where applicable, with charts depicting observations for the current and previous 3 quarters and a trend line reflecting anticipated improvements or degradation during the coming 4 quarters.

(c) A discussion of the analysis and findings for any systems that have experienced significant performance anomalies or an increase or decrease in resource utilization relative to the previous month’s baseline.

(d) Recommendations for improving any outstanding performance issues or capacity shortfalls.

(e) Recommendations for systems reconfiguration or consolidation that reduce operating costs or improve resource availability.

1.4.1.7 The Contractor shall develop and implement an IT Technology Infusion Plan to propose new technology and service concepts for the Government's consideration. The plan will give the government the ability to view the Contractor(s) innovative ideas for solving the technical challenges outlined within this SOW and will address proposed skill mix and "resource requirements."

1.4.1.7.1 Concept for IT Technology Infusion Plan

(a) The Contractor shall assess the state of technology and the Program's requirements, business processes and infrastructure, and propose new technology and service concepts for the Government's consideration. In this assessment the Contractor shall solicit inputs from customers/users. These proposed concepts may be driven by one or more of the following reasons:

- New customer requirements;
- Improving performance, efficiency or effectiveness of ISS Program Office business operations and/or business processes;
- Upgrades to other systems that affect the primary systems functional capabilities, e.g., upgrades to a web browser not compatible with primary systems;
- New product releases;
- Complying with safety requirements;
- New agency or center policies;
- Conforming to current standards and formats;
- Reducing operating costs;
- Limited system enhancements to produce higher quality products;
- System components become obsolete or non-repairable.

(b) The Contractor shall obtain approval for proposed concepts and associated estimated costs prior to initiating a full technology infusion effort.

(c) If the plan is approved by the Government, then an approved IT Project Plan, to be developed in accordance with DRD PIC-IT-02, shall accomplish the implementation.

1.4.1.7.2 Content for IT Technology Infusion Plan

The plans shall address at a minimum and as applicable:

- List price pages (catalog price),
- Description of proposed technology, including integration test results to date,
- Contractor product identification number,
- Model number,
- GSA and commercial catalog unit number, if available,
- Hardware and Software items to be replaced by the new technology product,
- Changes/impacts to ISS Program customers/users and other ISS Program IT providers, and to NASA and Center(s) IT architectures and standards,
- Changes to Agency or Center specific Strategic Plans,
- Implementation plan and schedule,
- System performance improvements as a benefit to the Government,
- Known and anticipated impact on ISS Program and non-ISS Program Contractors,
- Proposed adjustment to transition charges,
- Impacts on Contractor performance, and
- Estimated return on investment.

1.4.2 IT Systems Management and Operations

The Contractor shall ensure that all Contractor-managed IT systems are performing efficiently within their defined life cycles in accordance with NASA requirements, including Safety, IT Security and schedules, as well as industry best practices and applicable standards.

(a) The Contractor shall provide the ISS Program customer community with full life cycle system support for ISS Program IT systems, applications (e.g., web, mainframe, workstation, client/server, utility), platform systems, services, equipment, etc., as defined in Addendum 3 and Addendum 4, Table 1, Table 2, and Table 3. The full life cycle includes planning, requirements definition, design, programming, prototyping, testing, documentation, deployment, training, sustaining engineering, and operations.

(b) The Contractor shall propose a life cycle methodology that encompasses all life cycle phases for IT systems and applications. The proposed methodology shall enable the provisioning of IT systems with the best performance and quality in a cost effective manner.

(c) The Contractor shall address IT security in each phase of the life cycle.

(d) The Contractor shall implement IT system performance standards in accordance with the requirements set forth in Addendum 3.

(e) The Contractor shall function as the property custodian for the Government property assigned to this contract, identified in Addendum 4, Table 3.

1.4.2.1 IT Life Cycle Management

The Contractor shall manage designated production systems, development and integration systems, ongoing and new projects, and functions and activities required to provide products and services to the ISS Program customer community. The Contractor shall adhere to policies and standards, and support information exchange and decision making forums. In support of this effort, the Contractor shall provide the following activities:

1.4.2.1.1 The Contractor shall review Government-provided policies, architectures, standards, and procedures affecting this contract and recommend appropriate modifications and implementation strategies.

1.4.2.1.2 The Contractor shall provide a representative to attend recurring Government-sponsored meetings, such as the Information Resources Directorate Configuration Board, the Chief Information Officer's Network Access Control Board and the ISS IT Working Group.

1.4.2.1.3 The Contractor shall manage the acquisition of commercial off-the-shelf (COTS) software, hardware, and associated maintenance agreements as approved by the Government. The Contractor shall provide all consumables used in operating the systems associated with this contract.

1.4.2.1.4 The Contractor shall use and manage Government Furnished Equipment (GFE), including software and hardware, in the performance of this contract.

1.4.2.1.5 The Contractor shall develop, implement, and maintain IT Standard Operating Procedures in order to sustain products and services defined in this contract. These procedures shall provide guidance for interfacing with other organizations and specific tasks required in the process of meeting customer requirements, and shall instruct technicians, production personnel, and other users in the proper setup and operations of systems. These procedures are not intended to document the details of how the tasks or interfaces are to be accomplished. These procedures shall:

(a) Describe each system in terms of the requirements it fulfills, the equipment comprising the system, and any interconnection to other systems;

(b) Reference system engineering drawing numbers;

(c) Reference manufacturers' operations manuals;

(d) Give specific details on setup configurations related to the intended equipment functions;

(e) Give step-by-step system check instructions that, when performed, verify the system is functioning as designed;

(f) Give step-by-step instructions on how to operate the system equipment to achieve every stated purpose of the system, including references to manufacturers' manuals when appropriate;

(g) List the required customer interfacing tasks;

(h) List other procedures applicable to performing a specific system operation;

(i) Cross reference any corresponding Standard Operating Procedures (SOP);

(j) Reference preventive maintenance procedures; and

(k) Use the ISS Document Management System to store and configuration manage the SOP documents.

1.4.2.1.6 The Contractor shall develop, implement, and maintain an IT Configuration Management Plan as defined below in order to maintain hardware and software specifications and baseline control of IT systems.

1.4.2.1.6.1 Concept for IT Configuration Management Plan

(a) The Contractor shall establish, implement, and comply with a stringent process of configuration management for all systems defined under this contract.

(b) The Contractor shall not change, modify, or relocate Government equipment or systems without prior approval unless otherwise stated in the configuration management plan.

(c) The Contractor shall provide, revise, and maintain a complete set of engineering and exhibit drawings, hardware and software configurations, and specifications and associated change documentation for all IT systems defined in this contract.

(d) Where baseline configuration information does not exist, the Contractor shall define the baseline.

(e) The Contractor shall provide current configuration documentation for all systems under this contract within 6 months after contract phase-in.

1.4.2.1.6.2 Content of IT Configuration Management Plan

The IT Configuration Management Plan shall contain the process to be implemented for control of both engineering (design) configuration, and operational configuration. The IT Configuration Management Plan shall include the following:

(a) Define how configuration control will be recorded and documented,

(b) Identify the specific part of the organization responsible for maintaining the configuration control records,

(c) Identify the documentation and data systems required to provide configuration control for both hardware and software,

(d) Identify the specific equipment, systems, and operational interfaces which are subject to configuration control,

(e) Describe the procedures to be used to coordinate, define, test, monitor, and control all technical and operational interfaces,

(f) Identify individuals responsible for writing and for approving configuration control procedures, and

(g) Define how NASA will be involved with final decisions in the change process.

1.4.2.1.7 The Contractor shall develop IT configuration reports that contain information and status on all equipment and software, which are maintained by and/or operated by the Contractor. The information fields required for each category of equipment or software in the system shall include information on the category's description, location, user, manufacturer, external connections to other systems, maintenance support, and other fields normally contained in an IT configuration management system.

1.4.2.1.8 IT Sustaining Engineering and Operation

The Contractor shall provide sustaining engineering, including preventive maintenance, and operations for IT systems. At a minimum, support will include the following activities.

1.4.2.1.8.1 The Contractor shall provide sustaining engineering for multimedia, computer, and network systems defined in Addendum 3 and Addendum 4, Table 1, Table 2, and Table 3. Sustaining engineering for applications shall include developing limited new capabilities, bug fixes, and coordination and testing support in response to new operating system and program product. For hardware systems and stand-alone equipment, sustaining engineering includes preventive and remedial maintenance, ordering of replacement parts, sparing, end-of life (EOL), and system software and firmware updates and patches.

1.4.2.1.8.2 The Contractor shall manage third party maintenance and license agreements.

1.4.2.1.8.3 IT sustaining engineering shall minimize disruption to system availability during normal working hours. The Contractor shall coordinate and schedule changes that require production outages with the customer in advance of the outage. In the event the outage is an emergency, the Contractor shall immediately notify, via telephone and e-mail, the ISS Program IT Lead and shall provide continuous status of the progress and expected time of availability.

1.4.2.1.8.4 The Contractor shall establish and conduct a preventive maintenance and operational readiness program as defined below to ensure that all identified systems are functioning within required specifications.

1.4.2.1.8.4.1 Remedial Maintenance

The Contractor shall repair or replace failed equipment and restore it to operating condition. The repair and restoration may involve the temporary replacement of the equipment with a like item to allow continuation of the provided service. When failed equipment cannot be removed, the repairs shall be accomplished in a way that minimizes disruption of other operational activities. When repair of a specific item of equipment is not cost effective (when repair costs exceed one third of replacement costs), with the concurrence of the ISS Program IT Lead, the Contractor shall replace the equipment. For equipment used to meet mission requirements, immediately after being notified that equipment is out of service the Contractor shall initiate repair and notify the ISS Program IT Lead via e-mail.

1.4.2.1.8.4.2 Maintenance Agreements and License Management

The Contractor shall create, maintain, and implement plans and schedules for maintenance agreement and license management. For Government-funded renewals, the Contractor shall inform the ISS Program IT Lead via e-mail a minimum of 90 days prior to expiration of agreements.

1.4.2.1.8.4.3 COTS Upgrades and Maintenance

The Contractor shall ensure defects in COTS products are fixed and version upgrades to COTS software are obtained. The Contractor shall coordinate with the Government and application vendors. The Contractor shall assess and implement each new patch or update to be applied for all supported platforms within 90 days of vendor release of the updates or patches. The Contractor shall request a waiver if they find that a release or patch is incompatible with the current institutional environment, would impact data integrity or system stability, or would otherwise cause undue disruption to the user community. The Contractor shall evaluate and update critical security patches within 24 hours of the patches being released by the vendor.

1.4.2.1.8.5 The Contractor shall operate and provide system administration for all systems identified in Addendum 3. System administration processes and procedures shall adhere to

NASA and Johnson Space Center (JSC) policies and procedures. The Contractor shall ensure that system administration support is provided within schedule guidelines. Operation and system administration shall include:

- ID administration and folder setup for access,
- Data transmission among systems,
- Creation/deletion of network printer queues,
- System backups,
- Virus scans,
- Vulnerability scans,
- Problem identification and resolution, and
- Technology upgrades.

1.4.2.1.8.5.1 The Contractor shall provide Return to Service for IT systems as identified in Addendum 3.

1.4.2.1.8.5.2 The Systems Administration functions (excluding facility, network outages, IT incident investigations, and maintenance service not under control of the Contractor) shall be performed to minimize disruption to system availability, with the exception of scheduled outages.

1.4.2.1.8.5.3 The Contractor's system administrators shall ensure that backup, restore, archival, continuous monitoring, continuity of operations and contingency operations are performed as per the System Security Plan and associated documentation.

1.4.2.2 IT Security Support

1.4.2.2.1 The Contractor shall assume responsibility for maintaining existing IT System Security Plans for on-site ISS IT systems. The Contractor shall advise ISS Program customers and users on IT security policies and implement approved security and networking solutions.

1.4.2.2.2 The Contractor shall monitor production capabilities and respond to requests for IT security support by providing consultation and direct technical assistance to assist customers with the development of requirements for secure firewall and networking solutions.

1.4.2.2.3 Response to IT Security Issues and Incidents

(a) The Contractor shall report all IT security issues, security incidents, problems and resolutions to the ISS Program Organization Computer Security Official (OCSO) and ISS Program IT Lead. The Contractor shall provide real-time incident status reports as required, beginning within twenty-four (24) hours after a security incident has been discovered. The

Contractor shall provide a final status report within twenty-four (24) hours after the conclusion of any incident investigation.

(b) The Contractor shall process security-related incidents, including identifying network attacks (denial of service, viruses, worms, etc.), identifying and analyzing cases of misuse of IT resources, securing computing resources as required, and providing 24-hour response to computer security incidents and notification of appropriate personnel.

(c) The Contractor shall provide analysis of security incidents relating to misuse of IT resources or incorrectly configured systems, securing computing resources as required or working with system owners to properly reconfigure affected systems.

1.4.2.2.4 Certification and Accreditation Packages and Related Documentation

Major re-certifications of IT Systems requiring Certification and Accreditation (C&A) occur every three years, and the Contractor must prepare for and support this activity to ensure successful system re-certification. The next major re-certification for the ISS Production Facility system is anticipated to occur in June 2010.

The Contractor shall update and maintain existing C&A packages in accordance with DRD PIC-IT-03. In addition, the Contractor shall develop, update and maintain C&A packages for any offsite facilities that contain or process NASA data in accordance with DRD PIC-IT-03 Section 8(II).

1.4.2.3 Work Authorization and User Support

1.4.2.3.1 The Contractor shall gather, organize, and disseminate IT information to the customer community in formats appropriate to the information. Subject matter content will vary but will always focus on keeping the ISS Program community informed in a timely and accurate manner, providing them ready knowledge of products and services available, the mechanisms for acquiring those services, and information intended to help the customer. Services also entail reviewing and coordinating responses to e-mail traffic received in centralized electronic mailboxes intended for customer communication. The Contractor shall manage user accounts for access to ISS applications including additions, modifications, expiration, and deletion as defined in SSP 50013.

1.4.2.3.2 User Requirements/Analysis

(a) The Contractor shall perform data gathering, entry, and analysis of requests to ensure that the customer requirement for products and services is documented and processed.

(b) As approved by the ISS Program IT Office, the Contractor shall document and coordinate implementation of IT requirements requested by institutional and international IT service providers.

(c) The Contractor shall serve as the primary point of contact for ISS Program IT services required to support end users.

1.4.2.3.3 ISS Program Loan Pool

(a) The Contractor shall serve as the primary point of contact for ISS Program loan pool services required to support end users.

(b) The Contractor shall develop and maintain user guides/desktop instructions for services that require user self-installation.

(c) The Contractor shall develop and maintain procedures for appropriate property management of the ISS Program loan pool products for check-in/check-out and regular inventorying.

(d) The Contractor shall report property losses on a per-incident basis and as soon as possible following an incident.

(e) The Contractor shall develop, implement, and maintain a standard laptop software load consistent with the approved JSC laptop load and any related policies and practices for the loan pool laptops.

(f) The Contractor shall augment standard load configuration in order to support specific user requirements. Activities typically include configuration for tunneling, data transfers, and loading requested software.

1.4.2.3.4 The Contractor shall receive work authorizations via Information Resources Directorate Customer Service System Service Requests (SRs) and ISS Program Action Service Requests (ASRs), loan pool requests, and external access requests in addition to the IT project plans. The Contractor shall ensure that its internal work management and tracking systems interface seamlessly with the Information Resources Directorate Customer Service System for the purpose of receiving work authorizations and providing order status and tracking information.

1.4.2.3.5 The Contractor shall track, resolve, and report on problems associated with systems, products, and services. Problem resolution includes accepting transferred calls from the various JSC Help Desks or ISS Program Help Desks for systems under this contract and reporting resolutions back to the appropriate Help Desk or end user, as appropriate. The Contractor shall develop and maintain an on-line web-based Application Service Request Database (ASDB).

1.4.2.3.6 The Contractor shall provide desktop support services for ISS Program IT and IT services not supported by other institutional providers. Desktop support are those services which support the users' desktop environment; such as, but not limited to, loading/configuring local and network software, drivers, printers, peripherals, and data migration.

1.4.2.3.7 The Contractor shall conduct customer satisfaction surveys on all IT Operations SRs and ASRs servicing end users.

1.4.2.3.8 The Contractor shall provide assistance in space utilization, coordination / facilitation, and planning for ISS Program physical space requirements at JSC. This includes assessing requests, coordinating with the requestor(s), making recommendation, facilitating request through the implementing organization, tracking requirements through closure, and reporting.

1.4.2.3.9 The Contractor shall manage interconnection access between ISS IP/Ps and ISS Program resources. The Contractor shall work with JSC sponsors to process requests from ISS IP/Ps for access to ISS Program servers and applications. The Contractor shall coordinate processing of Access Control Plan (ACP) requests, IRD Service Requests (SRs) for JSC accounts, Identification (ID) management requests and other center/agency required forms for ISS IP/Ps.

1.4.2.3.10 The Contractor shall provide liaison support between the ISS Program and ISS IP/Ps. The Contractor shall coordinate with the ISS Program External Relations Office and the JSC Legal Office as required to facilitate the completion of ISS International Agreements.

1.4.2.3.11 The Contractor shall facilitate and support meetings to resolve application and network connectivity technical issues between IP/Ps and ISS Program systems.

1.5 INTERNATIONAL INTEGRATION

1.5.1 RESERVED

1.5.2 RESERVED

1.5.3 IP Elements Integration Management

The Contractor shall perform the tasks identified below to the support of IP Element Integration Management. For the purposes of this contract, “IP Elements” are defined as:
H-II Transfer Vehicle (HTV), Automated Transfer Vehicle (ATV), Mobile Servicing System (MSS), Special Purpose Dexterous Manipulator (SPDM), Unpressurized Docking Module (UDM), Service Module (SM), Docking Compartment (DC), Soyuz, Multipurpose Logistics Module (MLM), Docking Compartment Module (DCM), Progress, and visiting vehicles.

The NASA IP Element Integration Manager (EIM) provides overall management and oversight of the tasks that are necessary to integrate the IP Element into the ISS. The primary goal of IP Element Integration is to confirm the IP Element meets its ISS Program requirements (e.g., system- and segment-level specifications, Interface Requirements Documents [IRDs], Interface Control Documents [ICDs]) and is ready for flight. The NASA IP EIM also ensures that NASA

meets applicable ISS requirements in support of the integration of the IP Element and complies with bilateral agreements.

The Mission Integration, Cargo Integration, and Vehicle sustaining engineering teams provide the technical expertise and resources required to execute the tasks associated with IP Element integration (e.g., subsystem-level technical review of IP Element designs) and support the NASA IP EIM in performing the tasks necessary to integrate the IP Element and deliver on-orbit to the ISS.

1.5.3.1 Systems Engineering and Integration of IP Elements

1.5.3.1.1 Engineering Integration and Communication

(a) The Contractor shall interface with the Program Data Integration Team to provide the book coordination function; to facilitate the technical development, coordination with IPs, management approval, and implementation of the following IP BDEALS documents: SSP 50124, NASA/CSA Bilateral Data Exchange Agreements, Lists and Schedules (BDEALS); SSP 50137, NASA/RSA BDEALS; SSP 50611, NASA/ESA BDEALS for ATV; and SSP 50614, NASA/JAXA BDEALS for HTV. The data submittals provided by the IPs via these BDEALS documents will be made available as GFD to the Contractor as defined in Addendum 2, Table 2.

(b) The Contractor shall interface with the Mission Integration Team to provide the book coordination function; to facilitate the technical development, coordination with IPs, management approval, and implementation of the following IP BHSEALS documents: SSP 50136, NASA/RSA Bilateral Hardware and Software Agreements, List and Schedules (BHSEALS); SSP 50220, NASA/CSA Bilateral Hardware and Software Exchange Agreements, Lists and Schedules (BHSEALS); SSP 50615, NASA/NASDA BHSEALS for the H II Transfer Vehicle (HTV).

(c) The Contractor shall distribute Element technical, programmatic and operations data for review by ISS Program teams identified in the IP Element Integration Team Lists.

(d) The Contractor shall collect assessments and comments to the distributed Element data in (c) to ensure application of engineering and programmatic expertise in all aspects of the integration process including evaluation and definition of: bilateral documentation, interfaces, requirements changes, exchanges of data and hardware/software, development and testing, and special information requests.

(e) The Contractor shall facilitate ISS Program Teams communications with IPs and their Contractors.

(f) The Contractor shall maintain cognizance and technical knowledge of Element design, associated issues, and planning and schedule status.

(g) The Contractor shall provide responses to communications and data requests from IP and ISS Program Teams in accordance with teams' schedules.

(h) The Contractor shall coordinate shipment of items to and from the IPs with the ISS Program Shipping Coordinator in the Mission Integration Team.

1.5.3.1.2 Issue Resolution

The Contractor shall coordinate issue resolution with the IP Element Integration Teams as follows:

(a) Collect information for issue definition and document integration and compatibility issues and actions.

(b) Provide inputs to teams, and track issue resolution and action items closure for all phases of IP Element integration activities through on-orbit activation and checkout.

(c) Develop proposals, assess risks and recommend schedule for technical issues resolution.

(d) Chair technical forums, telecons and meetings required for issue resolution.

(e) Provide regular technical status inputs to action items database for open actions;

(f) Provide regular technical status inputs to Schedule Management Team;

(g) Provide regular technical status inputs to NASA IP EIM; and

(h) Provide regular technical status inputs to other teams, boards and panels in support of the NASA IP EIM.

1.5.3.1.3 Change Engineering

The Contractor shall initiate CRs to maintain and update the ISS design and requirements baseline for IP Elements. The Contractor shall perform Change Engineering functions for IP-related CRs and other activities necessary to maintain and update the ISS design and requirements baseline for IP Elements.

1.5.3.1.4 IP Elements Acceptance and CoFR

The Contractor shall support development, coordination and maintenance of the IP CoFR implementation plans. The Contractor shall review and provide inputs to Assessment Review Plans for all IP Elements. The Contractor shall coordinate and implement the Acceptance Review Plans and Assessment Review Plans with IPs and within the ISS Program.

1.5.3.2 IP Milestone Reviews

1.5.3.2.1 Milestone Review Planning and Coordination

The Contractor shall plan and track the ISS Program teams' participation in the IP design, qualification, certification, and pre-shipment reviews to ensure compliance with ISS Program requirements and policies. The Contractor shall develop ISS Program support plans for IP Milestone Reviews in accordance with DRD PIC-II-01. The Contractor shall obtain concurrences for scheduling and support of the milestone reviews from ISS Program disciplines, teams and organizations and present for NASA approval. The Contractor shall track the implementation of the approved ISS Program Support Plan.

1.5.3.2.2 IP Milestone Review Participation

The Contractor shall participate in all stages of the Milestone Review, including:

(a) Development of the Milestone Review Plan to be bilaterally concurred by NASA and the IP and post-review action closure.

(b) Review of IP Design, Qualification and Certification Review data packages for compliance with ISS Program requirements and policies defined in IP Elements Specifications, IRDs/ICDs and other applicable bilateral and multilateral documentation.

(c) Identification and documentation of non-compliance issues.

1.5.3.3 ISS and Mission Integration

1.5.3.3.1 Participation in ISS Program Reviews

The Contractor shall participate in the ISS Program Milestone and Launch Package reviews identified in SSP 50200-02, Station Program Implementation Plan Volume 2: Program Planning and Manifesting, and SSP 50489, ISS Mission Integration Template, by providing inputs to reviews and planning documentation. The Contractor shall coordinate implementation of NASA Element Team functions in support of these reviews.

1.5.3.3.2 Launch Package and Increment Teams Support

The Contractor shall provide consolidated Element Team inputs to mission requirements, increment definition requirements, and manifest requirements for IP Element flights. The Contractor shall review the IP Element applicable flight and increment documentation (e.g. Increment Definition and Requirements Documents [IDRDs], manifest) and coordinate with the Launch Package Manager (LPM) and Increment Manager (IM) Teams to ensure incorporation of these requirements. The Contractor shall participate in LPM and IM teams negotiations of the

requirements with the IP. For data that supports the IDRD development, the Contractor shall provide inputs to the Mission Integration Team via Requirements Request Forms as defined in SSP 50622-02, Mission Integration Data Sets Blank Book. For data that supports the IP flight manifest development, the Contractor shall provide inputs to the Mission Integration team via Manifest Requests as defined in SSP 50622-02.

1.5.3.3.3 Element Ground Processing Coordination

The Contractor shall coordinate with Kennedy Space Center (KSC) and IP regarding IP Element hardware processing in the Space Station Processing Facility (SSPF), to provide programmatic coordination including review of integrated IP Element schedules, status of hardware processing, status of action items, and development and coordination of meeting agendas. After handover of the IP Element hardware to Shuttle Integration, the Contractor shall support the Launch Package Management Teams to coordinate Element related processing issues.

1.5.3.3.4 Element Flight Operations Support

The Contractor shall coordinate with ISS Program and IP Operations Teams, the planning and implementation of IP Elements flight operations, which includes participation in ISS Program Stage Integration Reviews (SIRs) and review of the IP Element operations documentation, such as operational timelines, procedures and flight rules.

1.5.3.3.5 Mission Support

1.5.3.3.5.1 Increment Management Center (IMC) Support

The Contractor shall staff the ISS Increment Management Center console during IP Elements assembly flights, flights involving Canadian Space Agency (CSA) robotics missions, and first-time IP visiting vehicle flights (e.g. HTV and ATV) to provide a single point of contact for Element Team coordination and resolution of mission related issues on a real time basis. The Contractor shall meet the process requirements identified in the ISS Management Center Operations Handbook (IMCOH).

1.5.3.3.5.2 Mission Evaluation Room (MER) Support

The Contractor shall staff an ISS Mission Evaluation Room (MER) console during IP assembly flights, involving CSA robotics missions, and first-time IP visiting vehicle flights (e.g. HTV and ATV) to provide a single point of contact for Element Team coordination and resolution of mission related issues on a real time basis. The Contractor shall also staff an ISS MER console on an as-needed basis after the initial IP assembly flights and first-time IP visiting vehicle flights to facilitate Element Team coordination in resolving in-flight anomalies associated with the IP Element. The Contractor shall meet the process requirements identified in OB-MER-006, ISS MER Handbook.

1.6 HUMAN SPACE FLIGHT COLLABORATION

The Contractor shall accomplish all work necessary to accommodate commercial customers to the ISS. The work will be the same or similar scope already required elsewhere in this contract SOW but will be performed in support of a NASA Reimbursable Space Act Agreement or a NASA contract.

2.0 ISS SYSTEMS ENGINEERING, ANALYSIS, AND INTEGRATION

2.1 RESERVED

2.2 SYSTEMS ANALYSIS AND INTEGRATION

The Contractor shall provide the ISS Program with long term strategic planning for the development and operation of the ISS. The Contractor shall provide the ISS Program with Program level requirement and interface development, integration, documentation and analysis. The Contractor shall provide multi-level increment strategic, tactical and real-time operations planning. The Contractor shall manage system and segment level integration of the ISS.

The Contractor shall perform the tasks below in accomplishing ISS systems analysis and integration. The Contractor shall use the coordinate systems defined in SSP 30219, Space Station Reference Coordinate Systems, for analysis, products, or data that is produced for ISS Program and requires the use of coordinate systems.

2.2.1 Program Requirements and Interfaces

2.2.1.1 ISS Specifications and ICDs Maintenance and IRDs

(a) The Contractor shall provide book coordination functions for ISS specifications, ICDs, and IRDs identified in Addendum 6 in accordance with DRDs PIC-SI-01, PIC-SI-02, and PIC-SI-03. The Contractor shall provide book coordination functions for SSP 30459, ISS Interface Control Plan, SSP 50135, ISS Interface Control Plan – NASA/RSA, and SSP 41174, ISS Interface Control Working Group (ICWG) Operating Procedures.

(b) The Contractor shall maintain the contents of the Master File for all specifications and ICDs/ IRDs.

(c) The Contractor shall maintain tracking logs of specifications, CRs and ICD/IRD revisions and history.

(d) The Contractor shall perform requirements traceability for SSP 41000, System Specification for the International Space Station; SSP 41160, ESA Segment Specification for Columbus; SSP 41162, Segment Specification for the United States On-Orbit Segment; SSP 41165, Segment Specification For The Japanese Experiment Module; SSP 50273, HTV Segment Specification; SSP 50312, CAM Segment Specification; SSP 50333, Cupola Segment Specification; and SSP 50439, ESA Segment Specification For The Automated Transfer Vehicle (ATV) in accordance with DRD PIC-SI-04 utilizing the Requirements Traceability Management (RTM) application identified in Addendum 4, Table 1.

(e) The Contractor shall identify and track non-incorporated CRs to all retired, or no longer actively maintained, ISS specifications and ICDs.

(f) The Contractor shall review and evaluate ISS Program changes to determine if those changes impact the documents supported in paragraph 2.2.1.1(a). When impacted, appropriate change description text shall be provided to the CM function.

2.2.1.2 Coordination and Review of ISS Specifications, ICDs, and IRDs

(a) The Contractor shall provide technical review of specifications, ICDs, and IRDs identified in Addendum 6 during ISS Program Milestone Reviews to ensure the requirements reflect the current ISS Program baseline.

(b) The Contractor shall provide technical review and coordination of Preliminary Interface Revision Notices (PIRNs) for the documents identified in Addendum 6 and Document Change Notices (DCNs) for SSP 41150, IRD SSMB To Columbus APM; SSP 41151, IRD SSMB To JEM; SSP 41151-Appendix D, IRD SSMB To JEM, Appendix D; and SSP 41152, IRD ISPR ICD in accordance with SSP 30459, SSP 50135, and SSP 41174.

2.2.1.3 Interface Control Working Group (ICWG)

The Contractor shall perform the following ICWG technical administrative functions in accordance with SSP 41174, SSP 30459, and SSP 50135.

2.2.1.3.1 The Contractor shall maintain and update Hardware Interfaces Tracking System (HITS) database (or equivalent) identified in Addendum 2, Table 1 to develop PIRN status reports as follows:

(a) The Contractor shall track and provide “ICD metrics” reports to include issue resolution plans on a quarterly basis.

(b) The Contractor shall track and provide reports identifying “To Be Determined (TBDs)” on a quarterly basis.

(c) The Contractor shall track and provide “Open Issues” reports on a quarterly basis.

2.2.1.3.2 The Contractor shall prepare, distribute, maintain and track Interface Memorandums to document official correspondence.

2.2.1.3.3 PIRN and DCN Development and Maintenance

The Contractor shall process and maintain ICD PIRNs and IRD DCNs as follows:

(a) The Contractor shall prepare, distribute, process, maintain, and track PIRNs for the documents identified in Addendum 6 to update ICDs.

(b) The Contractor shall prepare, distribute, process, maintain, and track DCNs for SSP 41150, SSP 41151, SSP 41151-Appendix D, and SSP 41152 to update IRDs.

2.2.2 System Performance Analysis and Integration

The Contractor shall provide recommendations to the ISS Program management on the strategic implications of the ISS Program launch schedules, manifests, and ISS on-orbit operations, and assist in NASA's development of strategic requirements. To meet the full scope of this requirement, the Contractor shall provide systems engineering and integration support for development of the ISS Program strategic planning as described below, and shall report the results in accordance with DRD PIC-SI-05.

2.2.2.1 Mission Analysis and Integration

2.2.2.1.1 Attitude Requirements

(a) The Contractor shall develop, coordinate and obtain ISS Program approval of the flight attitude requirements for the ISS operations. These requirements balance the needs of power, thermal, propellant, Guidance, Navigation, and Control (GN&C) momentum management capability, micro-gravity, natural and induced environmental factors, communications, visiting vehicle, and other factors. The GFD tools Channelized Energy Balance Tool (CEBT) and Integrated Energy Balance Tool (IEBT) are available to support this function.

(b) The Contractor shall input and maintain approved attitude requirements in SSP 50699-03, The Space Station Certification Baseline Document.

2.2.2.1.2 Altitude Strategy

The Contractor shall develop and coordinate the ISS altitude strategy. The altitude strategy will include:

- Analysis for inadvertent entry risk,
- Projected on-orbit lifetime,
- ISS propellant availability,
- ISS propellant delivery requirements and capabilities,

- Micro-gravity environment,
- Natural and induced environmental factors (including crew radiation exposure) as analyzed by NASA institutional resources and by the Vehicle Sustaining Engineering Team, and
- Launch vehicle performance.

Such analysis will also verify that ISS performs within hardware certifications, through consultation with the Vehicle Sustaining Engineering Team and the Cargo Mission Team.

The ISS Altitude Strategy is documented in SSP 50110, Multi-Increment Manifest Document, and SSP 50112, Operations Summary Document (OSD), and is implemented through the individual IDRD for each increment. If strategic conditions change after the baselining of the OSD, the Contractor shall update the OSD and provide the applicable ISS Altitude Strategy data to the Mission Integration Team via Requirement Request Forms as defined in SSP 50622-02, Section 4.0. The GFD tools Strategic Planning Evaluation And Resource Model Analysis (SPEARMAN), Station Reboost Analysis Program (STRAP) and Total Propellant Summary (TPS) are available to support this function. The work process and data exchanges by which altitude and propellant are forecast are maintained within the Vehicle Integrated Performance and Resources (VIPER) Interface Document (VID) Volume 1: Altitude and Propellant: a routinely-updated bilateral process agreement with IP Russia that is maintained within the PI&C contract.

2.2.2.1.3 The Contractor shall integrate the rendezvous, proximity, and other special operations requirements and constraints (e.g., contamination issues from liquid or gas venting) related to attitudes and system configurations for joint operations between the ISS and all ISS Visiting Vehicles, including but not limited to the Russian Progress and Soyuz, U.S. Space Shuttle, European Space Agency's (ESA's) ATV, Japan Aerospace Exploration Agency's (JAXA's) HTV, the Crew Exploration Vehicle (CEV), the Commercial Orbital Transfer Services (COTS) vehicles and the ISS Commercial Resupply Vehicles. "Integrate" is defined as the coordination (between visiting vehicle providers and the ISS Program) of requirements for attitudes for docking, undocking, and special operations, array and radiator positioning, resultant power balances, visiting vehicle power demands from the ISS, operations restrictions for contamination and structural loads, and other similar issues.

2.2.2.1.3.1 Comply with U.S. requirements for information security to assess analyses and data incorporating the classified capabilities of the U.S. national technical means, wherever necessary to complete the assigned special operations assessments.

2.2.2.1.4 The Contractor shall provide predictions for the ISS solar beta angle, based on the ISS altitude strategy and atmospheric variations bounded by the Marshall Space Flight Center (MSFC) 5% and 95% atmospheres. In addition, the Contractor shall

develop and maintain the BASEPLATE report (as defined in 2.2.2.1.6) using the atmospheric variation bounded by the Russian Planning Atmosphere.

2.2.2.1.5 The Contractor shall develop, track, and maintain the strategic and track, and maintain the tactical allocation of Vehicle technical resources, including establishment of Program technical reserves of propellant, water, oxygen, and nitrogen. The process by which consumables are forecast is maintained within the VIPER Interface Document (VID) Volume 2: Consumables: a routinely-updated multilateral process agreement with IP Russia, ESA, and JAXA that is maintained within the PI&C contract.

2.2.2.1.5.1 Taking into account the strategic needs of the ISS Program and the predicted flight sequence, the Contractor shall coordinate projected water delivery and usage rates with ISS Program suppliers and users of water, including the Vehicle Sustaining Engineering Team and the ISS Payloads Integration Team.

2.2.2.1.6 The Contractor shall maintain and utilize detailed Beta, Attitude, Significant Events PLAnning TEmplate (BASEPLATE) or equivalent. The BASEPLATE shall show the day-to-day timeline of all flights to the ISS vehicle, Shuttle missions and Increment EVAs (calling out Russian Segment and U.S. Segment assembly, maintenance and science EVAs), launch and landing days (flight duration), dock and undock days (docked mission duration), robotics, Increment definition, crew rotation, and ISS vehicle major reconfigurations, including ISS assembly and visiting vehicle relocations. This product will assess the viability of the flight sequence plan and is developed in parallel with the baseline flight plan for the tactical and strategic timeframe. The Contractor shall maintain the BASEPLATE for the baseline ISS Program plan and perform trade studies of assembly sequence options under consideration. The Contractor shall deliver the detailed BASEPLATE electronically and in color printed format.

2.2.2.1.7 Applications and Data Systems

The Contractor shall maintain the applications identified below to support strategic planning and in response to differences or anomalies between the expected performance data and on-orbit performance data as provided by the Vehicle Sustaining Engineering Team.

- Station Reboost Analysis Program (STRAP),
- Total Propellant Summary (TPS),
- Station Channelized Electrical Power Transfer and Energy Resources (SCEPTER),
- External Configuration Tracking Tool (ExCATT),
- Traffic Resource Analysis Model (TRAM) or any upgraded traffic modeling tool,
- Beta, Attitude, Significant Events PLAnning TEmplate (BASEPLATE), and
- SIR Issue Tracking (SIT) database.

2.2.2.2 Mission Requirements and Support

2.2.2.2.1 The Contractor shall provide strategic mission requirements, concepts, constraints, and resource allocations to the ISS Mission Integration Team and NASA Mission Operations Directorate (MOD) to support development of mission planning, flight rules, and training.

2.2.2.2.2 Review of Operations Products

(a) The Contractor shall review (via ongoing technical interactions and reviews of CRs) the ISS operations plans and procedures to ensure that all ISS Program strategic technical constraints are satisfied, such as equipment operating and non-operating thermal limits, time phased power generation and demands, fault tolerance and recovery capability, structural loads, control authority of the attitude control systems, and mechanical interferences.

(b) The Contractor shall review crew procedures that are related to systems activation or rechannelization, or to environment interactions including (but not limited to) plasma, plumes, contamination, or meteoroid debris to ensure that all strategic technical constraints are satisfied.

(c) The Contractor shall review flight rules CRs to ensure that all strategic technical constraints are satisfied.

2.2.2.2.3 Stage Integration Reviews (SIRs)

The Contractor shall report to ISS Program management the issues and closure plans identified during SIRs.

2.2.2.2.4 The Contractor shall provide technical support as needed to MOD and to the ISS Program through assessment of strategic ISS Program (including IP/P) impacts during resolution of significant in-flight anomalies. Such support includes provision of technical assessments that individual specialists within the Contractor's employ may be able to provide to the MER, working with the Vehicle Sustaining Engineering Team on a temporary basis to resolve mission or life-critical issues.

2.2.2.3 System Analysis and Integration

The Contractor shall provide manage the technical assumptions to support mission analysis and integration. The Contractor shall provide overall system and segment level analysis and integration of the ISS and associated interfaces, as described below, including: the USOS, IP/Ps, Government Furnished Equipment (GFE) and ISS ground systems. This includes the ISS external interfaces, such as the ISS/National Space

Transportation System (NSTS), other visiting vehicles, and the ISS/Payloads interfaces (does not penetrate beyond the interface to the Space Shuttle for the payloads).

2.2.2.3.1 The Contractor shall facilitate and coordinate the development of ISS operational procedures that ensure each external component's thermal survivability from launch to its activation on the ISS.

2.2.2.3.2 The Contractor shall provide recommendations to ISS Program management for approval in the development and prioritization of tasks performed by NASA institutional resources for the following analyses, as warranted by changing conditions or assumptions:

- Shuttle/ISS induced loads, and
- Plume heating analyses.

2.2.2.3.3 The Contractor shall develop and provide strategic assessments of ISS Thermal System Performance (TSP) throughout assembly phases and other significant ISS operations.

2.2.2.3.4 The Contractor shall develop and provide heat load allocations for the ISS Program end-user community, based upon active heat rejection margin analysis.

2.2.2.3.5 The Contractor shall develop and provide power allocations for the ISS Program end-user community, based upon Integrated Energy Balance margin analysis. The process by which energy balance is forecast is maintained within the VIPER Interface Document (VID) Volume 3: Energy Balance: a routinely-updated bilateral agreement with IP Russia that is maintained within the PI&C contract.

2.2.2.3.6 The Contractor shall provide systems integration support for assembly, off-nominal situations, and strategic operations that involve the Electrical Power Subsystem.

2.2.3 Strategic Planning, Assembly and Configuration Engineering

The Strategic Planning and Configuration Engineering function provides the ISS Program with long term flight and external configuration planning including the ISS Strategic Flight Program (SFP), crew rotation plans, ISS external configuration, drawings, and Computer Aided Design (CAD) models for launch and on-orbit configurations.

2.2.3.1 Strategic Planning and Integration

The NASA Strategic Planning and Integration Team function is responsible for the evaluation and integration of the total set of programmatic, schedule, technical, and cost factors impacting the SFP; documenting the resulting SFP requirements and constraints;

and developing a flight plan in consideration of the aforementioned factors. The strategic flight planning activity includes all tasks associated with the definition of a viable SFP.

The Contractor shall maintain a technical knowledge of the requirements, capabilities, and constraints and their interrelationships necessary to develop the SFP. The requirements, constraints, and allocations include:

- Up-mass and down-mass requirements and strategic mass and volume allocations for propellant, crew support (food, water, air, etc.), research, and maintenance;
- Capabilities and scheduling constraints of visiting vehicles that berth robotically or dock to the ISS vehicle;
- Top-level manifesting requirements and constraints of pressurized and unpressurized cargo carriers;
- Crew rotation requirements and constraints;
- Cargo element assembly and manifest requirements and constraints;
- Flight and increment Extravehicular Activity (EVA) content, quantity, and scheduling constraints;
- Other operational requirements and constraints such as robotics, viewing, clearances, etc.; and
- On-orbit vehicle assembly flows and the associated on-orbit hardware configuration for flight, intermediate, and stage configurations.

The detailed tasks necessary to implement the functions described above are defined below.

2.2.3.1.1 The Contractor shall develop and maintain the Integrated Flight Schedule (IFS) showing the baseline (per SSP 54100, IDRD Flight Program, and SSP 50110) and planned (as documented in open SSP 54100 and SSP 50110 ISS Program CRs) launch, dock, undock and landing dates for all tactical and strategic flights to the ISS vehicle. This product documents the increment definition, durations and the baseline directive numbers. The Contractor shall maintain and update the Reference Flight Plan Overview. This product, a combination of the tactical (as defined by SSP 54100) and strategic baselined SFP (as defined by SSP 50110) that provides an integrated ISS Program schedule. This product also shows the proposed updates to all flights, which are contained, in open ISS Program CRs under review.

2.2.3.1.2 The Contractor shall develop and maintain the ISS Program Crew Rotation Plan Assessments in accordance with SSP 50261-01, Generic Groundrules, Requirements, and Constraints Part I: Strategic and Tactical Planning. The Crew Rotation Plan Assessments trade the documented crew rotation requirements against mission manifest and operational impacts.

2.2.3.1.3 The Contractor shall utilize BASEPLATE or equivalent.

2.2.3.1.4 The Contractor shall develop and maintain a summary Flight Program Figure that is an overview of the detailed BASEPLATE. The Flight Program Figure shall be capable of incorporation into Microsoft Word and PowerPoint.

2.2.3.1.5 Strategic Flight Program (SFP) Development

(a) The Contractor shall collect requirements and constraints and develop a SFP implementing the requirements for ISS Program approval. The Contractor shall identify issues and requirement conflicts and develop options for ISS Program resolution.

(b) SSP 50110 is the document that baselines the SFP. For Multi-Increment Manifest (MIM) development, the Contractor shall collect inputs, develop the revised document, conduct document reviews, resolve technical issues and actions, prepare the ISS Program CR and board presentations, and prepare the final document for approval. The MIM baselines the strategic assembly sequence, docking port utilization, crew rotation plan, flight schedule, top-level launch and return manifest, sub-element number, altitude, ISS carrier attach system and carrier utilization plan, and launch vehicle.

(c) The Contractor shall revise and maintain the SFP Overview. This is the strategic flight plan that is sometimes developed prior to the Mission Integration and Operations for development of IDRDs and Flight Integration products.

2.2.3.1.6 The Contractor shall integrate the inputs and provide the ISS Program approved Flight and Increment Overview Guidelines to the MOD for development of Flight Overviews to support SFP development.

2.2.3.1.7 The Contractor shall assess proposed tactical and strategic mission updates and identify issues and/or impacts to the SFP.

2.2.3.1.8 The Contractor shall integrate and coordinate the strategic ISS Program/Space Shuttle Program (SSP) flight inputs and provide these flight inputs to the SSP.

2.2.3.1.9 The Contractor shall represent the Strategic Planning and Integration Team as a technical expert at boards and panels.

2.2.3.1.10 The Contractor shall provide technical inputs and review assessments for other ISS Program documents or reviews such as:

- SSP 50112, Operations Summary Document

- SSP 50261-01, Generic Groundrules, Requirements, and Constraints Part 1: Strategic and Tactical Planning
- SSP 540XX, Increment Definition and Requirements Documents (IDRDs);
- SSP 50200-01, Station Program Implementation Plan, Volume 1: Station Program Management Plan, and SSP 50200-02, Station Program Implementation Plan Volume 2: Program Planning and Manifesting;
- SSP 54100, IDRD Flight Program (FP);
- Flight Specific Data Files (Payload Development Retrieval System [PDRS]/EVA and Rendezvous) for Flight Operations Review (FOR); and
- Post-Increment Evaluation Reports (PIERs).

2.2.3.1.11 The Contractor shall coordinate and resolve issues and actions that impact the SFP manifest, configuration, and flight sequence that do not occur during the MIM development timeframe. The Contractor shall perform ISS strategic studies by identifying issues and developing the technical strategic plans, resolution plans, and conducting necessary trade studies and analyses required for formulating recommended solutions to complex multidiscipline and programmatic issues.

2.2.3.1.12 The Contractor shall maintain and update SSP 50112 and provide inputs to the specific IDRD to establish strategic allocations of resources for operations planning. The Contractor shall provide updates to the Mission Integration Team for inclusion in the appropriate IDRD via Requirements Request Forms as defined in SSP 50622-02, Section 4.0. Details of the contents of this task are outlined in SOW subordinate paragraphs.

2.2.3.1.13 The Contractor shall develop and provide launch vehicle ascent and descent strategic mass and volume allocations to the ISS Program end-user community.

2.2.3.1.14 The Contractor shall perform the ISS strategic resupply/logistics (traffic model) analyses, which are the integrated feasibility assessments to ensure strategic resupply, payload, and return cargo requirements using the planned international fleet of vehicles.

2.2.3.1.15 Applications and Data Systems

The Contractor shall maintain the applications and data systems identified below in response to differences or anomalies between the expected performance data and on-orbit performance data as provided by the Vehicle Sustaining Engineering Team.

- Strategic Planning Evaluation And Resource Model Analysis (SPEARMAN)
- Traffic Model Spreadsheets
- Action Item Tracking Database
- CR Tracking Database

2.2.3.1.16 The Contractor shall maintain the Strategic Flight Plan website to record and communicate Strategic Planning and Integration activities to the NASA community.

2.2.3.2 External Configuration Analysis Modeling and Mass Properties

The NASA External Configuration Team function is responsible for managing the definition and documentation of the integrated strategic and tactical external vehicle configuration plans and assessing any changes to the baseline. This responsibility includes working with the Vehicle Sustaining Engineering Team to develop on-orbit stage docking configurations, develop the ISS System Top-Level Assembly drawings for each stage of the ISS vehicle, and prepare, maintain, and submit mass properties drawings.

2.2.3.2.1 The Contractor shall maintain a technical understanding of the on-orbit vehicle assembly flows and the associated on-orbit hardware configuration for flight, intermediate, and stage configurations. The Contractor shall also maintain a technical understanding of the assembly and configuration constraints necessary to manage the strategic, tactical, and real-time external vehicle configuration.

2.2.3.2.2 The Contractor shall assess, integrate, and coordinate requirements associated to the ISS external vehicle's configuration, including evaluating change requests that impact the external configuration for flight, intermediate, and/or stage configurations.

2.2.3.2.3 The Contractor shall maintain and update the Assembly Matrix. The Contractor shall collect inputs, develop the revised matrix, conduct matrix reviews, resolve technical issues and actions, prepare the ISS Program CR, prepare board presentations, and prepare the final matrix for approval.

The Multi-Increment Manifest provides the Strategic Flight Plan and manifest. SSP 54100 contains the tactical Flight Plan.

2.2.3.2.4 The Contractor shall maintain and update SSP 30219, which documents the ISS reference coordinate systems for major elements and robotically handled items. The Contractor shall collect inputs, develop the revised document, conduct document reviews, resolve technical issues and actions, prepare the ISS Program CR and board presentations, and prepare the final document for approval.

2.2.3.2.5 CAD Model Development Support

(a) The Contractor shall support the CAD Model User Technical Interchange Meetings (TIMs) and the Measurement TIMs hosted by the ISS USOS Sustaining Engineering Contract. These TIMs determine which element and cargo element components in the 3D CAD models, in the launch and on-orbit configurations, are validated to

drawings and determine the required as-built measurements. The Contractor shall provide inputs necessary to get validated and as-built CAD models.

(b) The Contractor shall ensure that the external physical configuration data needed by the ISS Program/SSP users is provided by interfacing with the Vehicle Sustaining Engineering Team to gather physical configuration data from detailed CAD models.

2.2.3.2.6 The Contractor shall develop and gain concurrence of external configuration protocols with the IP and any other affected teams.

2.2.3.2.7 The Contractor shall develop and review the mission-specific ISS/SSP On-Orbit ICD, Section 3, Physical Configuration, for each Shuttle flight. The ISS Program/SSP ICD documents the ISS and Shuttle data from the Orbiter rendezvous through the Orbiter departure. The blank book format is contained in NSTS-21000-IDD-ISS, Shuttle Orbiter/International Space Station Interface Definition Document, Section S.3. The Contractor shall update the Section S.3 blank book to incorporate the mission specific configuration data and figures.

2.2.3.2.8 The Contractor shall develop and distribute the Vehicle Configuration Joint Technical Working Group (JTWG) mission-specific vehicle configuration data source letters to the ISS Program/SSP community. These letters are produced at the L-9/10 months, in support of the SSP Cargo Integration Review (CIR), and L-4 months.

2.2.3.2.9 The Contractor shall track the location of external configuration items. The Contractor shall track the current and planned locations, as well as the historical hardware movement of needed configuration items such as external Logistics and Maintenance ORUs (spares stowed on orbit), EVA equipment/hardware, visiting vehicles, attach point utilization, standard and non-standard external stowage, utilization, and internal items that stowed externally. The Contractor shall perform 3D CAD model analysis to determine stowage of new or relocated external configuration items and determine any impact to follow-on assembly or flight activities. The Contractor shall utilize the ExCATT, or equivalent, and provide web-based reports accessible by the ISS Program.

2.2.3.2.10 The Contractor shall develop revisions of JSC 26557 Volumes 1 and 2, On-orbit Assembly Modeling and Mass Properties Data Book (Blue Book), in accordance with DRD PIC-SI-04.

2.2.3.2.11 The Contractor shall convert launch and return mass properties provided by the Vehicle Sustaining Engineering Team to on-orbit mass properties for the development of JSC 26557 Volumes 1 and 2, Blue Book. The Contractor shall review the Vehicle Sustaining Engineering Team L-30 day delivery of pre-flight on-orbit ISS Program mass properties prior to every ISS flight docking, undocking and redocking. The Contractor shall coordinate and resolve issues due to mass properties differences between the L-30 day data delivery and JSC 26557.

2.2.3.2.12 The Contractor shall perform ISS clearance, external stowage and mass properties analysis using approved 3D CAD models. The Contractor shall perform clearance analysis for docking vehicles assessing the clearance of dynamic docking envelopes and verifying docking requirements.

2.2.3.2.13 The Contractor shall develop and deliver simplified 3D CAD models to the IPs in Pro-E and STEP formats. These models shall be delivered to other parties such as universities, NASA centers, and other commercial interests, as required. The files shall be delivered in the user's format using the Contractor's 3D CAD tool capability.

2.2.3.2.14 The Contractor shall provide electronic dimensioned and non-dimensioned hidden line or shaded drawings to support the development of ISS Program documentation. These drawings shall be provided in TIFF, GIF, and/or PICT formats.

2.2.3.2.15 The Contractor shall provide launch vehicle ascent and descent weight assessments to support manifest assessments in the strategic timeframe.

2.2.3.2.16 The Contractor shall participate in the OM2 Working Group.

The Contractor shall provide technical inputs and review for ISS Program documents or reviews.

The Contractor shall provide technical support as needed to MOD and to the ISS Program through assessment of strategic ISS Program (including IP/P) impacts during resolution of significant in-flight anomalies. Such support includes provision of technical assessments that individual specialists within the Contractor's employ may be able to provide to the MER, working with the Vehicle Sustaining Engineering Team on a temporary basis to resolve mission or life-critical issues.

2.2.3.2.17 The Contractor shall maintain the External Configuration Analysis Modeling and Mass Properties website to record and communicate External Configuration Analysis Modeling and Mass Properties to the NASA community.

2.2.3.3 Internal Volume Configuration (IVC)

2.2.3.3.1 The Contractor shall update and maintain SSP 50261-01, paragraph 3.12, Interior Volume Configuration. The Contractor shall provide criteria for evaluating and prioritizing ISS internal volume demands in accordance with these requirements. Such criteria are put into practice in cooperation with the Internal Volume Configuration Working Group (IVCWG), Mission Integration Team, and IP/Ps and in accordance with SSP 50005, ISS Flight Crew Integration Standards. Examples of such volume criteria include minimum Intravehicular Activity (IVA) translation path clearance, worksite operational volumes, emergency module safing and crew health stabilization

requirements, access to routine maintenance locations, and the clearance around air duct openings and utility outlets when selecting nominal on-orbit locations for ISS cargo.

2.2.3.3.2 The Contractor shall update and maintain the planned ISS IVA topology in SSP 50564, ISS Interior Volume Configuration Document, to include Vehicle, payloads, systems, racks and select GFE items. The Contractor shall coordinate and provide modified topologies, as required, to allow for IVC studies due to changes to the ISS assembly sequence or changes to the ISS configuration.

2.2.3.3.3 The Contractor shall develop and maintain a unified and validated 3D CAD model of the ISS interior, in accordance with DRD PIC-SI-05, to support graphic analysis of the ISS interior configuration at every stage documented in SSP 50564.

2.2.3.3.4 The Contractor shall graphically analyze the acceptability of the ISS planned configurations based on the documented pass/fail criteria identified in SSP 50261-01. The Contractor shall document the results, including any exception closures, and review with the IVCWG and the ISS Program. The Contractor shall provide and maintain an IVC stage analysis verification plan via coordination of the ISS graphic analysis with the IP/P community, the Mission Integration Team and the IVCWG.

2.2.3.3.5 The Contractor shall develop situation unique analyses, as required, to provide inputs to ISS Program planning and issue resolution.

2.2.3.3.6 The Contractor shall maintain the IVCWG website to record and communicate IVC activities to the NASA community.

2.2.3.3.7 The Contractor shall participate in hardware design reviews to ensure identification and resolution of potential issues regarding design features that, if not resolved, would result in SSP 50261-01 IVC exceptions. This activity includes review of hardware design drawings, volume envelopes, and assessment of protrusions into the crew and/or other hardware operational volumes as defined in SSP 50261-01.

2.2.3.3.8 The Contractor shall participate in the OM2 Working Group.

2.2.3.3.9 The Contractor shall provide technical inputs and review for Payload Protrusion PIRNS and other ISS Program documents or reviews.

2.2.3.3.10 The Contractor shall provide management and technical support to ISS Program to maintain an ISS IVA physical environment integration function. This includes chairing the IVCWG and documenting the IVC Program processes.

3.0 SPACECRAFT

3.1 ISS SPACECRAFT MANAGEMENT

3.1.1 Vehicle Technical Integration

The Contractor shall perform Engineering and Technical Services and Technical Integration Support to the offices within the ISS Program.

3.1.1.1 Meeting Support

The Contractor shall coordinate and schedule meetings and telecons for the ISS Program Offices. The Contractor shall coordinate meeting logistics, including:

(a) Scheduling conference rooms,

(b) Notifying attendees,

(c) Requesting interpretation and translation services,

(d) Requesting local transportation services for Russian Foreign Nationals, when necessary,

(e) Scheduling and set-up of equipment, and

(f) Preparation of meeting materials.

3.1.1.2 The Contractor shall develop and distribute meeting agendas and minutes. The Contractor shall submit the meeting minutes to the meeting chair for approval within 2 business days following the meeting.

3.1.1.3 The Contractor shall maintain and track action items for each meeting and meeting series. The Contractor shall capture any assigned actions items and the associated actionees and notify the actionees. The Contractor shall document action closure and provide status and disposition of actions.

3.1.1.4 The Contractor shall develop and maintain Points of Contact (POC) lists, distribution lists and team calendars of events. The Contractor shall distribute event notifications, and other pertinent information.

3.1.1.5 CoFR Process Support

The Contractor shall provide CoFR support for all vehicles to include:

(a) Development and maintenance of CoFR flight products.

(b) GFE verification review/paper closure.

(c) Participation in all certification reviews. Includes both meeting support and presentation of status.

(d) Flight integration support including manifest review and integration of products necessary to support CoFR signature.

3.1.1.6 Program Review Support

(a) The Contractor shall track and report open paper/actions in support of configuration audits, acceptance reviews, and other major ISS Program milestones. The Contractor shall collect all open actions, open Verification Closure Notices (VCNs), and open issues for each assigned element/end-item and provide a summary report of open items and their status for each review to support the ISS Program Office engineering acceptance of the end item.

(b) The Contractor shall coordinate review of data packages, coordinate action item development and acquisition from the ISS Program teams, and coordinate and track action item dispositions and closures. The Contractor shall provide open action status during reviews. The Contractor shall track action item status and closure. The Contractor shall prepare in-brief and out-brief presentations for ISS Program management.

3.1.1.7 Coordinate Office CR Evaluations

The Contractor shall serve as points of contact for CR processes and evaluations and manage the Office-specific CR review process including tracking of evaluations, comments and issues. The Contractor shall facilitate processing of CRs originating from, or evaluated by, the Office. The Contractor shall:

(a) Identify appropriate Office evaluators and distribute the evaluation packages for internal review,

(b) Contact evaluators to obtain status of their review and inform them of overdue evaluations,

(c) Consolidate completed evaluations, comments, and issues and submit to the Office signatory for approval, and

(d) Forward approved evaluation packages to the CM Receipt Desk.

3.1.1.8 Office Metrics

The Contractor shall gather specified data, as required, and develop integrated office metrics package, in support of both internal and external reporting.

3.1.1.9 Office Web Content

The Contractor shall develop and maintain web page content for specified ISS Program teams and offices. The Contractor shall provide website administration, website design, and post new information to the websites. The Contractor shall develop and provide web pages in accordance with the requirements and guidelines defined in Section 1.4, Information Technology.

3.1.1.10 Engineering Services, Issue Resolution, Engineering Evaluation and Integration

The Contractor shall provide technical capabilities as requested to:

(a) Recommend approval and acceptance of integration, operations, and system performance plans, procedures, analyses, tests, and reports;

(b) Review documents, procedures, plans, and reports for discrepancies;

(c) Provide assessments of the products to ensure they are in accordance with the Program baseline;

(d) Perform impact assessments of ISS CRs against the Program baseline; and

(e) Recommend solutions to technical issues.

3.1.1.11 Systems Engineering and Test and Verification (T&V) Support

The Contractor shall provide Systems Engineering and T&V support to include:

(a) Integration and verification planning.

(b) Joint test planning and implementation, in conjunction with systems teams.

(c) Requirement verification.

(d) Coordination of interfacing hardware and fit checks.

(e) Book and documentation/data management.

(1) Book management – Maintain, as required, SSP 50033, NASA/CSA Bilateral Integration and Verification Plan (BIVP); SSP 50034, NASA/ESA BIVP; SSP 50035, NASA/NASDA BIVP; SSP 50101, NASA/RSA BIVP; SSP 50281, Node 2 BIVP; SSP 50334, ESA/RSA BIVP; SSP 50406, NASA/ESA BIVP for Cupola. Develop and maintain SSP 50420, NASA/NASDA BIVP for HTV.

(2) Documentation/data management – Perform data capture of Visiting Vehicles documentation to ensure ISS cognizance of vehicle baselines.

(f) Cargo/hardware integration support including process development.

(g) Integrated system level planning including integrated scheduling, risk assessments, and common processes.

The Contractor shall perform Operational Maintenance Requirements and Specification (OMRS) functions including:

(a) Maintenance of the NSTS 08171, OMRS File 10 database [DRD PIC-VT-01, Operations and Maintenance Requirements and Specifications Database (OMRSD)], including software updates required to ensure the system operates properly.

(b) Change processing for requirements in NSTS 08171, OMRS. Ensure NSTS 08171, File 2 Volume 2 requirements are in place to support for launch vehicles ICDs/IRDs.

(c) Track requirement and change paper closure.

3.1.1.12 Project Management Support

The Contractor shall support the development of hardware and software systems by providing project management support to ensure that ISS Program needs are met; these needs include technical, cost, and schedule requirements. The Contractor shall ensure that assigned projects are developed in accordance with ISS Program processes. The Contractor shall produce project documentation as requested. The Contractor shall evaluate and track development issues and schedule issues from project inception through initial flight of the hardware/software system. The Contractor shall work closure of technical and schedule issues with the hardware/software providers. The Contractor shall coordinate processes and lead issue resolutions between the provider organizations, launch integration organizations, and the ISS Program. The Contractor shall identify threats to key milestone completions and corresponding ISS Program impacts. The Contractor shall prepare a weekly status report of technical issues and schedule compliance. The Contractor shall assist with risk management, including the coordination of budget, schedule, metrics, risks associated with individual development projects, and the rollup and trend analysis associated with the set of all development projects.

3.1.1.13 Hardware Delivery Support

The Contractor shall support NASA in the acceptance of hardware purchased through the Vehicle Sustaining Engineering Team and hardware purchased under other contracts for the External Carriers Office. Tasks shall include providing concurrence for certification and DD250 prior to shipment of hardware to the flight preparation facility (typically KSC), monitoring and participating in schedule and manufacturing reviews related to the delivery schedule of hardware, and participating in design and requirement reviews to ensure that hardware needs to support ISS carriers are properly identified. The Contractor shall maintain a database to track all hardware deliverables between the ISS Program and its Contractors that support ISS carriers. The Contractor shall review ISS Program CRs involving ISS carriers to ensure that equipment requirements are properly identified and meet ISS Program requirements.

The Contractor shall coordinate deliveries of GFE, including hardware supplied by the JSC EVA Projects Office, and ensure that deliveries meet manufacturing, assembly, and test schedules. The Contractor shall implement requests and justify needs for EVA hardware deliveries to support ISS carriers.

3.1.1.14 Book Coordination Support

The Contractor shall provide Book Coordinator functions to support the NASA Book Managers in the development and maintenance of assigned documentation. This support includes:

(a) Coordinating inputs and tracking communications from the IP/Ps regarding the documents.

(b) Coordinating and conducting meetings to evaluate the changes, documenting and distributing the minutes and actions, and tracking action closures.

(c) Developing and making presentations to the appropriate control board/panel as required to obtain approvals for document release.

3.1.1.15 Special Studies

The Contractor shall conduct special studies within the scope of the PI&C SOW as requested. The scope of the study, products, and schedule will be defined in an Indefinite Delivery/Indefinite Quantity (IDIQ) task order.

3.2 VISITING VEHICLE

The Contractor shall accomplish all work necessary to accommodate commercial customers to the ISS Program. The contactor shall ensure development of hardware and software systems by providing project management support to ensure that ISS Program needs are met; these needs include technical, cost, and schedule requirements. The contactor shall plan and coordinate ISS Program participation in the COTS design qualification and certification reviews. The Contractor shall ensure that assigned tasks are developed and worked within ISS Program processes. The Contractor shall evaluate and track development issues and schedule issues from project inception. The Contractor shall work closure of technical and schedule issues with hardware and software providers. This work will be performed in support of a NASA Reimbursable Space Act Agreement or another NASA Contract.

4.0 RESERVED

5.0 RESERVED

6.0 SAFETY AND MISSION ASSURANCE (S&MA)

The Agency Safety Initiative establishes the NASA safety hierarchy, which is the order NASA will use to prioritize its safety efforts. The safety hierarchy is as follows:

(a) Safety for the public - NASA absolutely must protect the public from harm.

(b) Safety for astronauts and pilots - NASA has to protect them as they expose themselves to risk in high hazard flight regimes.

(c) Safety for NASA workforce - NASA is responsible for providing a safe and healthful workplace.

(d) Safety for high-value equipment and property - NASA is a steward of the public's trust.

By focusing on the safety of NASA's mission and operations, NASA will improve quality and decrease cost and schedule.

6.1 S&MA MANAGEMENT AND ADMINISTRATION

6.1.1 Mission Assurance and Risk Management (MA&RM) Plan

The Contractor shall develop, maintain, and implement the Mission Assurance and Risk Management (MA&RM) Plan in accordance with DRD PIC-SA-01.

6.1.2 Quality Management System

The Contractor shall establish and maintain a Quality Management System (QMS) that complies with SAE AS9100. Third party certification/registration is not required. If the Contractor is SAE AS9100 registered and subsequently changes registrars, loses registration status, or is put on notice of losing registration status, the Contractor shall notify the NASA Contracting Officer within three (3) days of receiving such notice from the registrar.

The Contractor shall maintain the ISS Program S&MA quality records system in accordance with SSP 41173, Space Station Quality Assurance Requirements, and SAE AS9100.

6.1.3 Audit/Surveillance

The Contractor shall provide access to data, personnel, and facilities for Government audit/surveillance of the Contractor's plans, procedures, and processes when deemed necessary by the Government. The Contractor shall provide written responses to audit/surveillance findings that are delivered to and accepted by the Government.

6.1.4 Safety and Health

The Contractor shall develop and implement a process to identify how personnel and property will be protected from injury or harm and ensure the safety of all working conditions throughout the performance of the contract. The process shall provide for hazardous operation surveillance, hazardous procedure review, and risk assessments associated with deviations from procedures or safety and health requirements. The Contractor shall comply with NASA-Installation safety and health requirements and related processes when performing Contractor work onsite at NASA installations. The Contractor shall develop, implement and maintain a Safety and Health (S&H) Plan in accordance with DRD PIC-SA-02. Upon approval, the S&H Plan shall be incorporated into the contract as Attachment J-3. The Contractor shall document the assessments in monthly safety and health metrics in accordance with DRD PIC-SA-03 and perform an annual Safety and Health Self-Evaluation in accordance with DRD PIC-SA-04.

6.1.4.1 Mishap Investigating and Reporting

(a) The Contractor shall investigate and report mishaps, in accordance with NPR 8621.1, NASA Procedural Requirements for Mishap Reporting, Investigating, and Record Keeping, and NPR 8715.3, NASA General Safety Program Requirements. All investigation reports shall include a human factors assessment, root cause analysis and any remedial/corrective actions performed. These reports shall encompass mishaps occurring during the contracted period as follows:

(1) All mission failures and type A and B mishaps resulting in injury to Contractor personnel or equipment damage occurring onsite at NASA facilities and offsite at Contractor facilities.

(2) Type C mishaps resulting in equipment damage onsite at NASA facilities and offsite at Contractor facilities.

(3) Type C mishaps resulting in injury to Contractor personnel located onsite at NASA facilities.

(4) Incidents and close calls occurring onsite at NASA facilities.

(b) The Contractor shall develop and implement a call tree with Government contacts for the reporting of a mishap, near-miss incident, equipment problem or a system going out of specification. The Contractor shall use the call tree to report incidents and problems within four hours of the occurrence. Type C injury mishaps occurring offsite at Contractor facilities shall be reported in a monthly summary of such injuries.

(c) The Contractor shall enter mishap reporting and provide summary data as instructed on the JSC Safety Homepage http://www6.jsc.nasa.gov/safety/ and per JPR 1700.1, JSC Safety and Health Handbook.

6.1.5 Lessons Learned

The Contractor shall participate in the Lessons Learned in accordance with NPR 7120.5, NASA Program and Project Management Processes and Requirements, and JPR 2310.1, JSC Organizational Learning Program. The Contractor shall enter the lessons learned into the Government provided Lessons Learned per DRD PIC-SA-08.

6.2 S&MA INTEGRATION

6.2.1 Technical Integration

(a) The Contractor shall perform S&MA technical integration of IP Elements, visiting vehicles, cargo, and payloads. This includes participation in Safety Reviews, Milestone Reviews and TIMs. Technical integration includes participating in the identification and resolution of technical issues affecting S&MA, receiving and distributing S&MA data between NASA and IPs, tracking of open issues and actions resulting from the Milestone Reviews and TIMs that impact the safety, reliability, and quality assurance aspects for each flight and supplying the data to the Mission Integration Team.

(b) The Contractor shall periodically status S&MA issues and open action items for the IP Elements, visiting vehicles, cargo and payloads to ISS Program boards and panels.

The Contractor shall coordinate reporting and ensure dispositioning of applicable S&MA issues by the IP/P).

(c) The contractor shall support NASA in the implementation of bilateral agreements.

(d) The Contractor shall evaluate ISS Program and assigned Shuttle CRs, participate in the development of requirements and processes and support working groups, and telecons.

(e) The contractor shall provide CoFR related support to the SMAP, S&MA Readiness Review (SMARR), and applicable ISS Program boards to include presentation development, administrative support, and status integration.

6.2.2 International Partner/ Visiting Vehicle Integration

The Contractor shall prepare agendas, minutes and protocols, letters of invitation, and work logistics in support of the Joint American/Russian Safety Working Group (JARSWG) telecoms, TIMs, and meetings. The Contractor shall provide Safety and Mission Assurance (S&MA) support to the ISS IP and Visiting Vehicle (VV) communities. The Contractor shall coordinate ISS IP/VV S&MA processes in support of TIMs, telecons, and major reviews by reviewing team inputs, resolving discrepancies, and representing the organization locally and overseas. The Contractor shall provide support in closure of requirements, open issues/Review Item Discrepancies (RIDs). The Contractor shall review of CRs, and Safety Analysis Reports (SARs). The Contractor shall work jointly with the SAIC Safety Review Panel (SRP) Organization for the review and update of ISS IP/VV SARs. The Contractor shall perform S&MA assessments and evaluations of the IP/VV Elements systems and hardware design, safety data analysis, integration, requirements and processes development, anomaly/failure investigation, procedures and operations to ensure the safe operation of ISS. Additionally, the Contractor shall coordinate interpretation and translation support for Bilateral Mission Assurance and Multilateral Safety meetings and faxes.

6.2.3 Document Maintenance

The Contractor shall provide book coordination functions for the following ISS Program S&MA documents:

- SSP 50062, NASA/CSA Bilateral Safety and Mission Assurance Requirements
- SSP 50145, NASA/NASDA Bilateral Safety and Product Assurance Requirements
- SSP 50146, NASA/RSA Bilateral Safety and Mission Assurance Process Requirements for ISS
- SSP 50182, NASA/ASI Bilateral Safety and Product Assurance Requirements

- SSP 50191, NASA/ESA Bilateral Safety and Product Assurance Requirements
- SSP 50346, NASA/ASI Nodes Bilateral Safety and Product Assurance Requirements

6.3 PROGRAM RISK MANAGEMENT

6.3.1 Management of Risk Process

The Contractor shall maintain the risk management process and the ISS Risk Database in accordance with SSP 50175, ISS Risk Management Plan; JPD 306, Establishment of the Program Risk Management System (PRMS); and NPR 8000.4, Risk Management Procedural Requirements. This includes ensuring the integration of all data and data integrity of the Risk Management Database and associated linkage with the MIS. The Contractor shall identify S&MA risks and provide input to the risk process utilizing the ISS Risk Database in accordance with SSP 50175 and JPD 306 as well as coordinate risks with NASA counterparts.

The Contractor shall provide the necessary training and tools to the appropriate employees to affectively identify threats and possible risks to successful completion of the mission.

The Contractor shall facilitate any ISS Program S&MA corrective action/preventative action responses in accordance with JPD 328, ISS Corrective Action Plan/Preventive Action Process, including coordinating responses and entering updates into the JSC Quality Process Improvement Database. The process requires the identification and mitigation of adverse trends, potential events, or significant anomalies that may adversely affect multiple programs, projects, or divisions.

The Contractor shall coordinate risks in support of risk advisory boards in accordance with JPD 306 and SSP 50175.

6.3.2 Probabilistic Risk Assessment (PRA)

The Contractor shall perform the PRA modeling and trade studies in accordance with NPR 8705.5, Probabilistic Risk Assessment (PRA) Procedures for NASA Programs and Projects. Modeling and trade studies may include the ISS and any visiting vehicle, including those that are in a conceptual design phase. The Contractor shall use Systems Analysis Programs for Hands-on Integrated Reliability Evaluations (SAPHIRE) PRA modeling/development application identified in Addendum 4, Table 2.

The Contractor shall perform trade and sensitivity analyses using the Probabilistic Risk Assessment and make recommendations as appropriate. Trade studies and analyses will

include (i) background on problem, (ii) assumptions and constraints, (iii) scope of analysis, (iv) methodology, (v) detailed analysis, (vi) results, and conclusion.

6.3.3 Document Maintenance

The Contractor shall provide book coordination functions for the following ISS Program S&MA documents:

- JPD 306, Establishment of the Program Risk Management System (PRMS)
- SSP 50175, ISS Risk Management Plan

6.4 ISS SAFETY PROGRAM

In support of the CoFR, the Contractor shall develop safety assessments in accordance with SSP 30309, Safety and Risk Assessment Requirements Document, and hazard reports in accordance with Hazard Reports and System Description (DRD PIC-SA-07). Safety assessments and hazard reports shall include actual and/or planned cable, hose and duct drag-through; IVA hardware and/or cargo stowage; and internal volume configuration.

The Contractor shall obtain Program approval in accordance with SSP 30599, Safety Review Process. This requires supporting the appropriate Safety Review Panels, ISS boards and panels, teleconferences and working groups.

6.5 RESERVED

6.6 QUALITY ASSURANCE

6.6.1 Problem Reporting System Maintenance

The Contractor shall maintain the ISS Program Problem Reporting and Corrective Actions (PRACA) process and database in accordance with SSP 30524 and SSP 30223. This activity includes the coordination of the PRACA process with the problem resolution teams to facilitate issue resolution.

6.6.2 Reserved

6.6.3 Document Maintenance

The Contractor shall provide book coordination functions for the following ISS Program S&MA documents:

- JPD 328, ISS Corrective Action Plan/Preventive Action Process
- JPD 315, Limited Life Item (LLI) Tracking and Control
- SSP 30223, Problem Reporting and Corrective Action (PRACA) for Space Station Program
- SSP 30524, Problem Reporting and Corrective Action (PRACA) – Data System (PDS) Requirements Definition Document (RDD) for ISS Program
- SSP 30695, Acceptance Data Package Requirements Specification
- SSP 41173, Space Station Quality Assurance Requirements
- SSP 50190, ISS Program Contingency Action Plan
- SSP 50200-01-ANX E, Station Program Implementation Plan Volume 1, Station Program Management Plan, Annex E: S&MA/Program Risk Plan; ISS Risk Management Plan
- SSP 50287, Hardware/Software Acceptance Process

6.7 OPERATIONS SAFETY

The Contractor shall perform Operations Safety requirements in support of IP/Ps and ISS Safety Program as follows:

6.7.1 Documentation Verification

For all flights, the Contractor shall perform flight and/or stage specific integrated safety assessments for Mission Integration in accordance with ISS safety requirements of SSP 50261-01 and -02; SSP 50021, Safety Requirements Document; and SSP 30309, Safety Analysis and Risk Assessment Requirements Document; and Flight Rules. In addition to the requirements of paragraph 6.4, the safety assessments shall also focus on manifest priorities and documentation (hazard toxicity and safety certification), increments, mission templates and planning periods.

6.7.2 Mission Integration and Operations Planning

The Contractor shall provide technical expertise in the development of S&MA requirements, operations, and mission plans for integrated ISS Program increments, flights, stages and generic planning.

The Contractor shall participate by providing technical expertise and S&MA representation in the strategic and tactical planning activities and ensure that safety, mission success and potential risks are included in the development of planning periods, increments, flights, and/or stage requirements (see Table 6.7.H-1 Additional Resource Documents). The Contractor shall provide representation at the appropriate ISS Program level boards, panels, and working groups which address generic requirements for strategic and tactical planning.

The Contractor shall provide representation and participation during the programmatic planning and development of ISS Program generic requirements for the overall tactical and strategic plan development.

TABLE 6.7.H-1 ADDITIONAL RESOURCE DOCUMENTS

#	Document #	Document Title
1	SSP 50200-xx	SPIP documents (specifically documents Volume 1, 2, and 8)
2	SSP 50489	Mission Integration Templates
3	SSP 50261-01	Generic Groundrules, Requirements, and Constraints Part 1: Strategic and Tactical Planning
4	SSP 50261-02	Generic Groundrules and Constraints Part 2: Execute Planning
5	SSP 50021	Safety Requirements Document
6	SSP 50005	ISS Flight Crew Integration Standard (NASA-STD-3000/T)
7	SSP 41000 Series	System Specifications for the ISS
8	SSP 50562	ISS Program Off-Nominal Situation Plan
9	SSP 54100	IDRD Flight Program
10	SSP 50448	Station Development Test Objectives

6.7.3 RESERVED

6.7.4 Launch Package Management Team Representative

The Contractor shall serve as a technical member of the LPM Team, actively participate on LPM Team to ensure Flight IDRDs and sub-products (annexes, etc.) are developed to include safety requirements and priorities; identify safety issues and closure recommendations; negotiate with the ISS Program community; perform special assessments, and perform integration of safety-related issues.

6.7.5 ISS Program CRs

The Contractor shall coordinate and facilitate S&MA CRs as assigned. The Contractor shall evaluate CRs for S&MA impacts, complete the needed evaluation forms and make any needed presentation material and presentations, if required, to the various boards, panels and teams.

The Contractor shall review Mission Integration and Operations' plans, On-Orbit Stowage Capabilities and Requirements (OSCARs), manifests and flight planning change requests and participate in CR meetings as needed.

6.7.6 Document Maintenance

The Contractor shall provide book coordination functions which include preparation, distribution, and processing for the following ISS Program S&MA documents:

- SSP 30234, Failure Modes and Effects Analysis and Critical Items List (FMEA/CIL) Requirements for Space Station
- SSP 30309, Safety Analysis and Risk Assessment Requirements Document
- SSP 30599, Safety Review Process
- SSP 50021, Safety Requirements Document
- SSP 50038, Computer-Based Control System Safety Requirements
- SSP 50145, NASA/NASDA Bilateral S&MA Requirements
- SSP 50231, Safety and Mission Assurance Certification of Flight Readiness Implementation Plan