Updated thru S/A 2073

Vehicle Sustaining Engineering ContractStatement of Work

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I. INTRODUCTION

This Statement of Work (SOW) has two objectives:

1. Provides the ISS Vehicle Segment Sustaining Engineering, End-to-End subsystem management, and Post Production Support. Vehicle Segment Sustaining Engineering will be performed under Section 1.0, 3.0, and 8.0 of this SOW and consists of the following:

   - Sustaining of the USOS.
   - Sustaining of common hardware and software provided by NASA as Government Furnished Equipment (GFE) to the International Partner/Participants (IP/Ps), including Node 3, and payloads.
   - Integration of the IP/Ps elements, including Node 3 and PMM, with the USOS.
   - Integration of the commercial resupply vehicles (SpaceX and Orbital)
   - Payload integration.
   - Sustaining Engineering of unpressurized flight support equipment (FSE) and analytical integration of unpressurized cargo.

2. Defines the discrete tasks to be performed by the contractor that are not included in the sustaining engineering statement of work. This work is defined in sections 5.0 and 6.0. General requirements for new hardware are defined in section 7.0.

   The ISS Vehicle Segment Sustaining Engineering contractor shall accomplish the objectives and outcomes described within this contract. The contractor shall perform the services and deliver the products described in this SOW, contract terms and conditions, applicable documents, Data Requirements Descriptions (DRDs), and other plans and sections contained within this contract.

   These activities shall facilitate the ISS Program mission to "safely build, operate and utilize a continuously inhabited orbital research facility through an international partnership of government, industry and academia."

II. RESERVED

III. SCOPE OF WORK

1.0 MANAGEMENT INTEGRATION AND CONTROL

1.1 PROGRAM MANAGEMENT

1.1.1 PROGRAM MANAGEMENT AND ADMINISTRATION

The contractor shall conduct program management, including risk management, in order to develop and deliver the required ISS Program products and services as defined for this contract. Provide and maintain program management systems, as outlined below, for the planning, organization, control and reporting of all activities required by this contract. The program management systems shall assure accomplishment of all outcomes and deliverable products required by this contract.

1.1.1.1 The contractor shall develop, maintain and implement a Management Plan in accordance with DRD F-PM-01. The plan shall describe the contractor's management structure that fully and optimally integrates all related plans and systems, including those of major subcontractors and vendors. The plan shall address the contractor's management of all systems, functions and data requirements described in this SOW.

1.1.1.2 The contractor shall conduct Performance Management Reviews (PMR) for NASA, and provide integrated management review products in accordance with DRD F-PM-02 for the work performed on this contract. The reviews shall provide the ISS Program insight into the contractor's, subcontractors', and vendors' overall technical, schedule and cost performance. Metrics that 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 shall be presented at the PMR.

1.1.1.3 Management Information System (MIS) is a web-based data repository designed to keep the ISS Program management and personnel aware of the most current ISS Program technical, financial, workforce, schedules and operational information, including issues and risks. The MIS links ISS Program core business issues and goals with the technical aspects of the Program. To accomplish this, the ISS Program managers will utilize selected contractor data from financial planning, costs, workforce data, program schedules, program metrics and other status and performance information. This selected information exists in the various DRD's, which are required by the contract. The contractor shall coordinate with NASA to make DRD deliverables compatible for MIS use and linkage.

1.1.2 INTERNAL/EXTERNAL PROGRAM REVIEWS

The contractor shall develop briefing materials and analyses for the ISS Program presentations and meetings with internal and external review groups. These groups may include, but are not limited to, the Aerospace Safety Advisory Panel (ASAP), Space Station Utilization Advisory Subcommittee (SSUAS), Stafford/Anfimov, Inspector General (IG), General Accounting Office (GAO), Space Flight Advisory Committee (SFAC), ISS Management and Cost Evaluation/NASA Advisory Council

(IMCE/NAC), Independent Implementation Review (IIR) and Cost Assessment Teams. The contractor shall prepare and present various topics such as ISS Program cost, schedule and technical status, specific safety or risk issues and responses to external inquiries.

1.1.3 SPACE FLIGHT AWARENESS

The contractor shall participate in the NASA Space Flight Awareness Program to ensure proper emphasis is placed on safety of flight contributions by employees and to recognize these individuals with Space Flight Awareness awards.

1.2 BUSINESS MANAGEMENT

1.2.1 MANAGEMENT AND BUSINESS ADMINISTRATION

The contractor shall provide overall contract management and administration for this contract.

1.2.1.1 The contractor shall perform all business and administrative functions and integrate these functions across all areas of performance. The contractor's on-going business analysis shall support the ISS Program business process.

1.2.2 RESERVED

1.2.3 RESOURCES MANAGEMENT

As part of the overall program management for this contract, including risk management, the contractor shall perform the following resources management tasks.

1.2.3.1 The contractor shall develop and maintain a contract financial system which discretely tracks resources by fund source and contract Work Breakdown Structure (WBS) and elements of cost including labor, overhead, other direct costs, (e.g. travel and subcontracts) and indirect costs. The contractor's financial planning system shall support the Government budget process (e.g., Program Planning, Budgeting, and Execution (PPBE) budget calls), and to support special requests for budget impacts. The ISS Program 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. The contractor shall provide financial reporting in accordance with DRD PC27.

1.2.3.2 RESERVED

1.2.3.3 Develop and provide workforce reports in accordance with DRD F-PC-03 to show organization, geographical breakdown and off-site vs. on-site workforce data.

1.2.3.4 Develop and provide a contract WBS, a WBS dictionary, and a program WBS map in accordance with DRD F-PC-04. The contract WBS shall serve as the framework for contract planning, budgeting, cost reporting, Flight Planning Review reporting, schedule resource loading, and schedule status reporting to the ISS Program. The WBS map shall show mapping of the Contractor WBS to the ISS Program WBS, at the lowest level of the ISS Program WBS. Elements of work provided by major subcontractors, as defined in PC27, shall also be identified in the contract WBS.

1.2.4 RESERVED

1.2.5 SCHEDULING

1.2.5.1 The contractor shall develop and maintain schedules in accordance with DRD PC06. Resource-loaded schedules that provide performance tracking to the Tier III team-level using industry accepted scheduling software shall be provided for major projects ($5M or greater) in accordance with DRD PC06. These Tier III schedules shall identify activities to manage changes to Level I and Level II program milestones with interdependencies to ISSP participants, other contractors or NASA organizations.

1.2.5.2 The contractor shall integrate this contract's schedule milestone requirements with affected ISS Program providers, and resolve issues with data providers.

1.2.5.3 The contractor shall identify potential schedule impacts and notify affected interfacing organizations to ensure timely Program awareness and resolution.

1.3 CONFIGURATION MANAGEMENT/DATA INTEGRATION

1.3.1 CONFIGURATION MANAGEMENT (CM) (S/A 1433)

The contractor shall implement and administer CM operations as specified in this contract and in accordance with the ISS Program CM Requirements (SSP 41170), Documentation Standards & Guidelines (SSP 50010), the CM Handbook (SSP 50123), and the Data Management Handbook (SSP 50172). 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 develop and manage the ISS Program CM/Documentation Management (DM) requirements on the contract in accordance with the

contractor's CM Plan (DRD F-CM-01). The contractor shall develop status and maintain CM metrics that effectively indicate the quantity, type, and status of the work.

1.3.1.2 CONFIGURATION AND STATUS ACCOUNTING AND VERIFICATION

The contractor shall assure that the application of Configuration Status Accounting requirements and systems result in and maintain required Vehicle Segment Sustaining Engineering hardware and software product baselines in accordance with SSP 41170, CM Requirements.

1.3.1.2.1 CONFIGURATION HARDWARE/SOFTWARE STATUS ACCOUNTING

The contractor shall implement, input, and up-date the Configuration Hardware and Software Status Accounting system pursuant to SSP 41170. This includes processes and provisions for reports and access to Configuration Status Accounting data. The contractor shall ensure that historical configuration data is retained per SSP 41170. The contractor shall reconcile the Configuration Status Accounting data with operational procedures, drawings, modifications and manifests.

1.3.1.2.2 The contractor shall provide mission support for configuration analyses of hardware and software, installations and anomaly resolution.

1.3.1.2.3 The contractor shall participate in audits of compliance with CM requirements and processes by providing access to personnel, facilities and data.

1.3.1.3 CONFIGURATION CONTROL/CHANGE MANAGEMENT

1.3.1.3.1 The contractor shall process changes specific to the Vehicle Segment Sustaining Engineering contract in accordance with SSP 50123. The contract shall review and evaluate Program changes originating from outside this contract to determine if those changes have potential impacts to this contract, in accordance with SSP 50123.

1.3.1.3.2 Input, maintain and validate the Configuration Status Management Operations System (COSMOS) database to assign Change Request (CR) numbers, track/status changes, provide accurate information, reports and monthly metrics.

1.3.1.4 DATA MANAGEMENT (S/A 1433)

The contractor shall perform the following Data Management activities specific to this contract, in accordance with SSP 50010, SSP 41170, and SSP 50172. The contractor shall:

1.3.1.4.1 Provide an Engineering Release Unit.

1.3.1.4.2 Operate a Configuration Management Receipt Desk.

1.3.1.4.3 Provide DQA for all NASA controlled Program documentation identified under this contract.

1.3.1.5 SOFTWARE CONFIGURATION MANAGEMENT

1.3.1.5.1 The contractor shall implement the Software CM Handbook, D684-10293-01 for Software configuration management and maintain this document to ensure it reflects current Program approved processes.

1.3.1.5.2 The contractor shall provide configuration control of Integrated Flight Load builds and the Software Development and Integration Lab to ensure configuration fidelity is maintained.

1.3.1.5.3 The contractor shall provide configuration status accounting of flight software uploads to ensure On-Orbit software configuration is maintained.

1.4 PROGRAM INFORMATION TECHNOLOGY (IT)

The ISS contract strategy decentralizes the implementation of IT except where program integration and control is necessary for appropriate program management and communication. The Mission and Program Integration (MAPI) contractor will provide common IT infrastructure architecture for use by the ISS participants to support the mission of the ISS Program. The other contracts within the ISS contract strategy are encouraged to provide the IT necessary to perform the requirements as defined in their respective contracts, since their contract intent is to not specifically contract for generalized IT products and services. The contractor may choose to utilize the ISS Program IT infrastructure provided by the MAPI contractor when common products and services provide for increased supportability, promotes commonality, or cost efficiencies.

Any of the existing ISS Program IT tools provided as Government Furnished Data are available for utilization by the contractor to fulfill the requirements of this contract. Any modifications to GFD tools shall be sustained employing a methodology which demonstrates consistency with the Software Engineering Institute, Level 3 Capability Maturity Model, or other comparable industry standards. The Capability Maturity Model certification is not required. The contractor shall provide the IT necessary to meet the contract requirements in accordance with SSP 50013, ISS Information System Plan.

The contractor shall develop and maintain unique ISS IT software tools and applications to support the continued development and operation of the ISS and to support existing Research & Development (R&D) and sustaining engineering activities.

All IT delivered or directly costed to this contract is subject to IT capital planning processes (including strategic and tactical planning) in accordance with the IT Planning Requirements Document and the IT Security Plan.

1.4.1 IT MANAGEMENT

1.4.1.1 The contractor shall develop and implement an IT Capital Investment Process in accordance with the ISS IT Capital Investment Process, SSP-50222.

1.4.1.2 The contractor shall develop and implement an IT Security Plan in accordance with NFS 1852.204-76.

1.4.1.3 The contractor shall implement an architecture that enables bi-directional digital data sharing with government representatives.

1.5 INTERNATIONAL INTEGRATION

1.5.1 RESERVED

1.5.2 EXPORT CONTROL

The contractor shall provide export control functions for all hardware, software and data requiring export in the execution of contract responsibilities. The contractor shall establish export control procedures that are compliant with applicable Department of Commerce and Department of State regulations and perform self-audits of their established export control procedures per DRD F-EC-01.

1.6 NASA REIMBURSABLE SPACE ACT AGREEMENTS

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.

2.0 USOS ACCEPTANCE - COMPLETED MARCH 2010

3.0 VEHICLE SUSTAINING ENGINEERING

3.1 RESERVED

3.2 COMMON REQUIREMENTS

This section contains requirements that are applicable to Vehicle Sustaining, Subsystem Management, EVA Integration, Propulsion Integration, S&MA, and IVA Integration.

3.2.1 The following requirements are applicable to sections 3.3, 3.4, 3.6, 3.7, and 3.8 of this Statement of Work.

3.2.1.1 ISS BOARDS, PANELS AND WORKING GROUPS

The contractor shall provide data, analyses and input to status and decision making at the ISS Program Boards, Panels and Working Groups as identified in SSP50200-01 and Annex L of the same document to accomplish the sustaining engineering, post production support, subsystem management and integration responsibilities defined herein.

3.2.1.2 HARDWARE/SOFTWARE PERFORMANCE ANALYSIS

The contractor shall monitor, analyze and document the Vehicle Segment hardware reliability and performance and software performance as well as end-to-end Subsystem operational performance across the full ISS system to determine actual vs. expected performance, anomalous behavior, and required updates to repair and maintenance plans, check out plans and operational procedures. The contractor shall coordinate identified issues which may impact IP/P, Commercial Visiting Vehicles (SpaceX and Orbital), payload, or GFE hardware, software, or operations with the appropriate providers. (S/A 1614)

3.2.1.3 ANOMALY RESOLUTION

The contractor shall identify, investigate, resolve and document flight and ground hardware and software anomalies for all hardware and software sustained by this contract. The contractor shall also provide tests, analyses, and engineering data to support anomaly resolution of IP/P, Commercial Visiting Vehicles (SpaceX and Orbital), payload, or GFE hardware as necessary to implement the requirements of this contract. Applicable anomalies shall be documented per the Problem Reporting And Corrective Action (hardware) SSP 30223 and Process Version and Control System software, including utilization of the NASA approved Station Program Notes (SPNs) process for software problem report disposition. (S/A 1614)

3.2.1.4 RESERVED

3.2.1.5 STUDIES, TESTS AND ANALYSES

The contractor shall perform studies, tests and analyses to resolve issues, to develop flight and stage assessments, to integrate IP/P, Commercial Visiting Vehicles (SpaceX and Orbital), GFE and payload hardware/software and to develop planning requirements. (S/A 1614)

3.2.1.6 CERTIFICATE OF FLIGHT READINESS (CoFR)

The contractor shall provide a statement of flight readiness of all hardware and software sustained under this contract, also, all analyses and modeling performed under this contract for each flight, and each software uplink as part of the Certificate of Flight Readiness (CoFR) process in accordance with SSP 50108. The contractor shall develop and implement to a CoFR endorsement plan in accordance with DRD F-MI-01. The payload integration section of the CoFR will be implemented as documented in SSP 52054 and DRD F-MA-12.

3.2.1.7 FLIGHT OPERATIONS

3.2.1.7.1 MISSION EVALUATION (S/A 1614)(S/A 1660)(S/A 1812, SSCN 12842)(S/A 1869)

The contractor shall monitor the on-orbit vehicle and payload facilities (as listed in Appendix A) performance during ISS operations to ensure safe and efficient vehicle and payload facilities operation and mission success, resolve anomalies, monitor and document the actual vs. expected performance of the vehicle and payload facilities and performance trends. The contractor shall provide data and analyses as necessary to perform this task for all hardware/software sustained for integration of IP/P, Commercial Visiting Vehicles (SpaceX and Orbital), payload facilities or GFE hardware performed under this contract. The contractor shall provide on-call 24 hour support for all subsystems and payload facilities and provide dedicated Mission Evaluation Room (MER) support to major on-orbit activities (EVAs, major repair activities, major anomaly situations, etc.) and the following activities:

- Robotic operations: MT translation or operations involving SSRMS or SPDM and other vehicle hardware
- ISS Debris Avoidance Maneuver (DAM) via Russian Segment (RS) thrusters
- "Red" Conjunction without DAM
- Unmanned VV, Russian Segment (Progress, ATV) docking and undocking
- Unmanned VV, US robotic berthing and unberthing
- Manned VV docking and undocking
- Russian Segment EVA

3.2.1.7.2 MISSION EVALUATION MANAGEMENT

The contractor shall provide technical leadership to manage the evaluation of the on-orbit vehicle and related activities. These activities include assessing anomaly time criticality, reporting to the

ISS Mission Management Team, assignment of priorities for resources to resolve anomalies, responding to requests for data from the Flight Control Team, and the ISS Program Management Center and anomaly documentation and resolution. The contractor shall provide on-call 24 hour MER Manager support and provide dedicated Mission Evaluation Room (MER) Manager support to major on-orbit activities (EVAs, major repair activities, major anomaly situations, etc.) and the following activities:

- Robotic operations: MT translation or operations involving SSRMS or SPDM and other vehicle hardware
- ISS Debris Avoidance Maneuver (DAM) via Russian Segment (RS) thrusters
- Red" Conjunction without DAM
- Unmanned VV, Russian Segment (Progress, ATV) docking and undocking
- Unmanned VV, US robotic berthing and unberthing
- Manned VV docking and undocking
- Russian Segment EVA
- Mission Evaluation Support to payloads
- ISS Contingency MER Support for a Big 12 Failure

3.2.1.7.3 HARDWARE HISTORY RETRIEVAL SYSTEM

The contractor shall maintain the ISS Program Hardware History Retrieval System to provide a repository of data required by the ISS for anomaly resolution.

3.2.1.7.4 MISSION EVALUATION SUPPORT to PAYLOADS (S/A 1812, SSCN 12842) (S/A 1869)

The contractor shall provide engineering input to anomaly resolution activities for non-vehicle system hardware and/or software anomaly resolution including multi-use payload hardware owned by the ISS Program (EXPRESS Racks, Microgravity Sciences Glovebox, MELFI, etc) and complex hardware (such as Alpha Magnetic Spectormeter (AMS)). This support shall help the payload developer/owner resolve their anomaly.

3.2.1.7.5 ISS CONTINGENCY MER SUPPORT (S/A 1812, SSCN 12842) (S/A 1869)

The contractor shall provide certified MER console support surge capability for real-time support following an ISS Contingency ("Big 12 Failure").

3.2.1.7.6 RUSSIAN SEGMENT SUPPORT TEAM (RSST) LOGISTICS SERVICES

The contractor shall provide logistics services, travel and transportation support for the RSST technical representatives supporting the conduct of real-time and simulated U.S. – Russian space station operations. (Effective October 1, 2012.)

3.2.1.8 OPERATIONS DOCUMENTATION

3.2.1.8.1 The contractor shall provide source data for the development or modification of malfunction procedures, flight rules and system drawings.

3.2.1.8.2 The contractor shall review, evaluate and provide concurrence on operations documentation, including Station Operations Data File (SODF), Flight Data File (FDF), Flight Rules, Assembly Operations Handbook, systems drawings and briefs. This includes review, evaluation and concurrence of products for the Flight Operations Reviews (FOR).

3.2.1.9 ANALYTICAL TOOLS/MODELS

The contractor shall maintain analytical models and tools required to execute the requirements of this contract to reflect the current state of the hardware/software and On-Orbit vehicle. GFE tools and models required to be maintained are listed in Appendix F, Analytical Models & Tools.

3.2.1.10 INTEGRATION OF USOS WITH IP/Ps, PAYLOADS, COMMERCIAL VEHICLES AND GFE

The Contractor shall integrate GFE, Commercial Visiting Vehicles (SpaceX and Orbital), Payload, and IP/P, including Node 3 and PMM, hardware and software with the USOS to ensure the Vehicle meets requirements per SSP 41000 and SSP 41162 per Depth of Penetration definition in Appendix K. (S/A 1614) (S/A 1677)

3.2.1.11 ENGINEERING ANALYSIS

3.2.1.11.1 The contractor shall provide analytical integration of the USOS and evaluation of the ISS System and its interfaces, including model development and integrated analyses with IP/P and VV math models, for mission planning and anomaly resolution. Such analytical integration includes participation in strategic phase A/B studies of the impacts to the existing hardware, which would result

from architectural changes, enhancements or contingency scenarios of the ISS under evaluation by NASA.

3.2.1.11.2 The contractor shall provide as-flown flight performance telemetry data to support the development and maintenance of specific models, especially plume heating and effects, channelized power generation, and channelized heat rejection, which are maintained under the direction of NASA through institutional resources or through the MAPI Contract.

3.2.1.11.3 VERIFICATION AND CLOSURE OF REQUIREMENTS

3.2.1.11.3.1 The Contractor shall verify and close all open requirements in the ISS System Specification, SSP 41000 and ISS Segment Specification, SSP 41162, through assembly complete in accordance with DRDs VE20 and VE24 to complete verification closure of all ISS requirements. The Contractor shall provide final assessment of requirements remaining open at the end of Stage 15A. (This paragraph is only applicable to flights ULF-5, ULF-6 and 3R post 9/2010).

3.2.1.11.3.2 After assembly complete, the Contractor shall provide verification data to the MAPI contractor for all open requirements in SSP 41000 and SSP 41162 traceable to hardware/software sustained herein. The data shall be consistent with the requirements of DRDs VE-20, VE23 and VE-24. (This paragraph is only applicable to flights ULF-5, ULF-6 and 3R post 9/2010).

3.2.1.11.3.3 After assembly complete the contractor shall verify and close all stage requirements per F-VE-15 (this paragraph is effective 10/1/2010). (S/A 1660)

3.2.1.12 BILATERAL HARDWARE AND SOFTWARE EXCHANGE AGREEMENTS AND BILATERAL DATA EXCHANGE AGREEEMENTS

3.2.1.12.1 The contractor shall implement the hardware and software exchange agreements with the IP/P per the baseline Bilateral Data Exchange Agreements and the baseline Bilateral Hardware Software Exchange Agreements List and Schedules (BDEALs and BHSEALS) to ensure integration of IP/P elements with Vehicle Segment.

3.2.1.12.2 The contractor shall provide inputs and review BDEALs and BHSEALS that have not been baselined to ensure data and hardware/software exchange requirements of this contract are met.

3.2.2 The following requirements are applicable to sections 3.3, 3.4, 3.5, 3.6, and 3.7 of this Statement of Work.

3.2.2.1 ENGINEERING FLIGHT PLANNING REQUIREMENTS

The contractor shall provide inputs to the Planning Period Increment Definition Requirement Documents (IDRDs) in order to submit flight and stage requirements/tasks necessary to maintain and assemble all hardware/software sustained by this contract to provide integration of IP/P, payload or GFE hardware performed under this contract.

3.2.2.2 HARDWARE AND SOFTWARE ENHANCEMENTS

The contractor shall propose to NASA, via the Program's change process, hardware and software enhancements or modifications identified during the nominal performance of this contract to maintain, and expand the performance of, or reduce operational costs for the vehicle. The contractor shall provide requirements definition of any approved enhancements identified.

3.2.2.3 VEHICLE CERTIFICATION AND OPERATIONAL DATA

3.2.2.3.1 RESERVED

3.2.2.3.2 The contractor shall maintain the Space Station Operational Data Book (SSODB) and Vehicle Certification Baseline for all USOS Subsystems, Specialty Engineering areas, and EVA to ensure the data is current with the state of the vehicle hardware and software for the ISS Program.

3.2.2.3.3 The contractor shall assess changes to the SSODB data and submit associated updates to maintenance and flight products (e.g., flight rules and crew procedures) to ensure the Vehicle is operated within acceptable limits.

3.2.2.3.4 The contractor shall develop and deliver ORU Certification Baseline documents per DRD F-PM-10. (S/A 1265)

3.2.2.3.5 The contractor shall develop and delier ISS Certification Baseline for Lifetime Extension document per DRD F-PM-10. (S/A 1737 – SSCN 12745)

3.3 VEHICLE SEGMENT SUSTAINING

The contractor shall provide sustaining engineering for the ISS, Vehicle Segment to:

- Ensure a safe and operational vehicle for execution of ISS research and development activities (Utilization Plan).
- Prevent loss of life or vehicle.
- Manage the engineering baseline.
- Assess and document the detailed performance of the Vehicle segment hardware and software per the following requirements.

Sustaining engineering is applicable to hardware and software installed or destined for installation on the orbiting vehicle or in ground facilities, including support equipment (see appendix A, B, C).

3.3.1 VEHICLE SEGMENT SUSTAINING ENGINEERING MANAGEMENT AND INTEGRATION

3.3.1.1 A SUSTAINING INTEGRATION (S/A 1259)

The contractor shall integrate sustaining activities with the ISS Program, Space Shuttle Program, International Partners and participants, including Node 3, PMM, Commercial Visiting Vehicles (SpaceX and Orbital), Payloads (including research) and other NASA organization as required to execute the contract. (S/A 1614) (1677)

3.3.1.1 B COMPLETE

3.3.1.2 The contractor shall provide sustaining engineering to all sites and organizations (including the IP/P) that have designated hardware/software listed in Appendices A, B, and in the Government On-Line Data (GOLD) database. The contractor shall sustain the flight hardware, software and NASA facilities and GSE as listed in Appendix A, B, C.

3.3.2 TECHNICAL REQUIREMENTS

3.3.2.1 PROGRAM DOCUMENTATION

The contractor shall maintain and provide the book coordination function for the ISS Program documentation listed in Appendix E to ensure applicable requirements and processes are current."

3.3.2.2 ENGINEERING FOR POST PRODUCTION SUPPORT

The contractor shall provide engineering for ORU repair and maintenance, material review, production of design engineering for minor modifications, ORU repair transition from Original Equipment Manufacturer (OEM) to depots or new facilities and On-Orbit maintenance planning and procedural development to ensure ORUs meet system functionality requirements.

3.3.2.3 ON-ORBIT CONFIGURATION DEFINITION

The contractor shall identify the On-Orbit subsystem configuration required for vehicle hardware sustained under this contract to execute the On-Orbit tasks and resolve anomalies. The contractor shall resolve vehicle configuration discrepancies.

3.3.2.4 LAUNCH AND PROCESSING SITE INTEGRATION/DE-INTEGRATION

The contractor shall provide data (to include procedures and constraints), analyses, special test/servicing or factory equipment, and decision making inputs to the launch and processing sites' integration/de-integration activities to perform modification kit installation, element closeout, preflight and postflight processing and servicing, pad and launch operations, hardware assembly, test, issue resolution and software loading and test.

3.3.2.5 FLIGHT TRAINERS, CREW TRAINING AND OPERATIONS PROCEDURES VERIFICATION

3.3.2.5.1 ANOMALY RESOLUTION

The contractor shall investigate and resolve Vehicle Segment hardware and software anomalies found during trainer development integration and updates, crew training, or procedure verification with the Space Station Training Facility (SSTF), Part Task Trainer (PTT), Russian Segment Trainer (RST) and other ISS simulators and mockups to isolate and correct issues attributed to hardware and software sustained by the contractor.

3.3.2.5.2 COMPLETE

3.3.2.5.3 COMPLETE

3.3.2.6 RESERVED

3.3.2.7 3D CAD MODELS

3.3.2.7.1 The contractor shall take delivery of all validated 3-D solid CAD models from the hardware developers and hardware integrators and

maintain a library of models on a NASA server for access by all Program users, including the IP/Ps and the research community. It is the responsibility of the hardware provider to provide validated models. The contractor shall check the models against released 2-dimensional drawings to ensure accuracy. The contractor shall incorporate as built measurement data into the CAD model and provide a final CAD model prior to launch. This central repository shall be the reliable sole source for CAD models for the analysis teams, so there will be a consistent set of data. The contractor shall use the CAD formats for delivery and delivery schedule per DRD F-VE-02.

3.3.2.7.2 The contractor shall translate models into formats as defined in DRD F-VE-02 in the format that the CAD users require for their workstations.

3.3.2.7.3 The contractor shall provide integrated models of the exterior of USOS cargo elements for hardware that is integrated onto the element at KSC and provide integrated stage models of the exterior of hardware that is installed/de-installed/moved on-orbit (e.g. antennas, handrails, slide wires, targets, etc.). These integrated models will be used for clearance assessments, robotic analyses, etc.

3.3.2.7.4 The contractor shall maintain the capability to develop 3-D CAD models of hardware other than USOS. When hardware providers do not have 3-D CAD capability, the contractor shall transform 2-D released engineering drawings and produce 3-D CAD models for ORUs and Assemblies.

3.3.2.7.5 The contractor shall maintain the Stage Model Interface Location Spreadsheet on the NASA CAD web page. This spread sheet documents the major sub-element interface points located in the ISS On-Orbit assembly model with respect to the Space Station Coordinate System. This data is required for assembly analyses. Other reference points are also requested by users (e.g. keel pins, trunnions, etc.).

3.3.2.7.6 The contractor shall maintain ISS hardware and coordinate data as required by the ISS Program. This link, http://iss-www.jsc.nasa.gov/ss/issapt/cadweb/, on the NASA CAD web page contains coordinate locations for hardware items (e.g. vents, grapple fixtures, camera ports, etc.) taken from the validated CAD models.

3.3.2.7.7 The contractor shall extract physical configuration data from CAD models as required by the ISS Program users.

3.3.2.8 STAGE/ON-ORBIT INSTALLATION DRAWINGS

3.3.2.8.1 The contractor shall obtain top assembly parts lists for each Vehicle element, GFE hardware, commercial resupply vehicles (SpaceX and Orbital) hardware and IP/P hardware from the hardware developers. For the current stage, the contractor shall produce the integrated On-orbit Stage Configuration Drawing Parts List (which is a released parts list for each stage) and submit to the VMDB per DRD PC25. The stage drawing will be used by CM as released documentation of the build up of the product structure and by the Mission Operations Directorate (MOD) for procedure development and verification. (S/A 1614)

3.3.2.8.2 The contractor shall provide On-Orbit Stage Configuration Drawings, showing stage complete configuration of Contractor provided USOS end items with On-Orbit installed and removed items accounted for within the drawing in accordance with American Society of Mechanical Engineers Y14.100, Y14.35, and Y14.24 and submit to the VMDB per DRD PC25. These drawings provide engineering design definition to assembly launch configuration hardware into the on-orbit vehicle, which eventually meet SSP 41000.

3.3.2.9 VEHICLE INTEGRATION DATA

3.3.2.9.1 The contractor shall prepare, maintain and submit engineering drawings in accordance with DRD F-VE-09.

3.3.2.9.2 The contractor shall prepare, maintain, and submit the Vehicle safety and engineering data needed for the ISS Vehicle integration and operation. Scope, content and functionality shall be in accordance with DRD VE32.

3.3.2.9.3 The contractor shall prepare, maintain, and submit launch configuration drawings for manifested flight hardware in accordance with DRD F-VE-14.

3.3.2.10 MASS PROPERTY DATA

The contractor shall develop pre-flight and post-flight On-Orbit ISS Program mass properties prior to every ISS flight docking, undocking and re-docking. The contractor shall coordinate and provide mass properties to the Russians as per protocol agreement.

3.3.2.11 LAUNCH VEHICLE HARDWARE ASSESSMENTS (SSCN 13011- SA 1796)

The contractor shall perform loads and dynamics reviews and analyses in accordance with SSP 50835, Rev. B, "ISS Pressurized Volume Hardware Common Interface Requirements Documents," for manifested hardware items.

3.3.3 COORDINATE SYSTEM

The contractor shall transmit data that requires coordinate system definition (e.g., mass properties, 3D CAD models, etc.) in accordance with SSP 30219, Space Station Reference Coordinate Systems Document.

3.3.4 ENGINEERING DATA MANAGEMENT (EDM)/VMDB

3.3.4.1VMDB DATA INTEGRATION MANAGEMENT

3.3.4.1.1 The contractor shall receive and accept delivery from the ISS Program Data Owners, the Vehicle engineering and safety data and GFD defined in DRD VE32, "VMDB Vehicle Engineering Data".

3.3.4.1.2 The contractor shall capture, populate, integrate, and manage configuration of the data (Vehicle engineering and safety data and the GFD needed for Vehicle integration and operations) in the VMDB.

3.3.4.1.2.1 Data capturing includes resolving data discrepancies among data sources and pre-processing to convert hard copy to electronic files, and to configure electronic files for direct loading into the VMDB.

3.3.4.1.2.2 Data population includes formatting, loading, analyzing and resolving data discrepancies. The contractor shall populate the VMDB with nominal change traffic and documents, which includes:

- Engineering drawings, which meet DRD F-VE-09, Engineering Drawings and Associated Lists.
- Tabular data-Integrated, top to bottom vehicle, manifest configurations, attributes, and PDF documents.
- Data integration includes receiving, migrating and releasing Indentured Parts List (IPL) data.
- Configuration Management includes validating and assessing data integrity; implementing the processes and procedures as defined in the VMDB Data Integration Plan, D684-10090-01.

3.3.4.1.3 The Contractor shall provide an electronic data conversion facility to format drawing data in accordance with DRD F-VE-13, Data Conversion and Interface Facility for GFE/IP/commercial resupply vehicles (SpaceX and Orbital) drawings to the VMDB, SSP 50177/GFD Description Document, and VMDB requirements for Engineering drawings for NASA GFE and IP/P hardware. (S/A 1614)

3.3.4.1.4 The contractor shall deliver all GFE, commercial resupply rehicles (SpaceX and Orbital) hardware and IP/P released engineering drawings to the VMDB, which includes integrating with the Space Station Library to coordinate deliveries of the data packages that contain hardcopy drawings and IP electronic deliveries to the VMDB. (S/A 1614)

3.3.4.1.5 RESERVED

3.3.4.1.6 RESERVED

3.3.4.1.7 The contractor shall implement and maintain the process for VMDB manifest data as described in the VMDB Work Instruction for VMDB Manifest Data Processing, MGT-OL-012.

3.3.4.1.8 The contractor shall provide help desk function VMDB user community for help calls, data issues, missing data and ad-hoc queries.

3.3.4.1.9 The contractor shall provide functional data training to VMDB users. This includes:

a. Develop and implement training to educate users on how to navigate the VMDB and retrieve data. This training focuses on data needs, problem solving and navigating the VMDB using the reporting and browser tools.

b. Coordinate (set-up, notify and distribute information).

c. Create and maintain training documents.

3.3.5 RESERVED

3.3.6 RESERVED

3.3.7 SOFTWARE SUSTAINING ENGINEERING

3.3.7.1 SOFTWARE MANAGEMENT

The contractor shall develop and implement a software sustaining strategy to manage, update, and maintain the ISS Program software. The ISS Program's software shall consist of flight, ground, and test software/simulation and data developed for the USOS and common software provided to the IP/P and Payloads. The software sustaining strategy shall specify the contractor's integrated maintenance and software systems engineering of all CSCIs (see SOW, appendix B), simulation software, commercial off-the-shelf (COTS), and the resolution of related software problem reports.

3.3.7.2 SOFTWARE MODIFICATION

3.3.7.2.1 The contractor shall develop, test, verify and deliver software modifications (recompiles, application software releases, patches, pre-positioned loads and simulations) in accordance with D684-10017-01 Software Development Plan and SSP 50482 Software Management Plan to ensure verification of software modifications prior to operational use.

3.3.7.2.2 The contractor shall develop and execute Formal Qualification Test for each flight software CSCI release, patch, and PPL in accordance with D684-10017-01 Software Development Plan to ensure certified software releases are delivered.

3.3.7.2.3 The contractor shall develop, test, verify, and deliver, per DRD SE02, software patches as required for On-Orbit software fixes that are deemed critical by the ISS Program and cannot wait for the next flight software CSCI release of the software. When directed by the ISS Program for catastrophic and time critical software patches, the contractor shall deliver a certified patch within 24 hours.

3.3.7.2.4 The contractor shall develop, test, verify, and deliver, per DRD SE02, PPL to meet vehicle performance requirements for the flight software CSCIs and Firmware Controllers listed in Appendix B. When directed by the ISS Program for catastrophic and time critical PPLs, the contractor shall deliver a certified PPL within 24 hours.

3.3.7.2.5 The contractor shall integrate all signal data and inputs including: Ips to develop and deliver a Standard Out file per NASA approved Software CR process. The Standard Out file (DRD VE28) shall conform to the format described in Standard Out Definition Document (SODD) D684-10177-01 and the Data Integration Standards. The Data Integration Standards shall be documented per DRD F-SW-01.

3.3.7.2.6 TIMELINER BUNDLE DEVELOPMENT AND VALIDATION SUPPORT (S/A 1374)

The contractor shall provide support to the NASA/Mission Operations Directorate (MOD) timeliner bundle development activity by:

a. Participating in the Timeliner Operations Review Panel as a member.

b. Assisting in the development of timeliner bundle function requirements and verification tests.

c. Performing detailed analyses and tests which assess the performance of the CCS flight software in the presence of the executing bundle.

d. Performing formal qualification (defined as formal Hardware/Software horizontal testing and assessment) of the timeliner bundles.

e. Confirming that commands and telemetry used on the timeliner bundle are certified.

f. Providing software quality assurance witness to verification test activities performed in the Software Verification Facility (SVF) and configuration management of the test procedure used in the SVF.

g. Developing timeliner flight software in accordance with existing software development processes and standards.

3.3.7.3 INTEGRATED FLIGHT LOADS (IFL)

3.3.7.3.1 The contractor shall produce and deliver software in the form of IFLs DRD SE02, to the user community.

3.3.7.3.2 The Contractor shall provide the documentation associated with an IFL defining the On-Orbit software configuration requirements that include all of the software products that must be up-linked, the constraints associated with the software products, and the On-Orbit operational impacts if the product is not up-linked.

3.3.7.4 STAGE TEST (S/A 1976, SSCN 13629)

The contractor shall define and execute Stage tests that verify the software-to-software interfaces for all CSCI releases utilizing the SDIL in accordance with the Software Development Plan D684-10017-01 and the Software Management

Plan SSP50482. Additionally, Boeing shall provide Hardware Software Integration Testing for SpaceX missions in support of JSL visiting Vehicle Operations.

3.3.7.5 RESERVED

3.3.7.6 CREW DISPLAYS

3.3.7.6.1 The contractor shall develop and maintain requirements and architecture associated with Crew Displays. The requirements and architecture shall comply with SSP 50313, ISS displays and graphics commonality standards.

3.3.7.6.2 The contractor shall develop displays in accordance with requirements from the Integrated Display and Graphic Standards (IDAGS) charter, ISSP-PPD 503.

3.3.7.6.3 The contractor shall provide data, analyses and input to status and decision making at the IDAGS Panel to ensure display implementation.

3.3.7.7 CAUTION AND WARNING

The contractor shall develop and maintain Caution and Warning files for the ISS Vehicle per NASA approved Software CR process. The C&W files shall conform to the format described in SODD D684-10177-01 section 30.7.1.3.2.

3.3.7.8 RESERVED

3.3.7.9 FACILITIES (SSCN 12638 – S/A 1817)

3.3.7.9.1 SDIL SUSTAINING

3.3.7.9.1.1 The contractor shall maintain and operate the SDIL (see Appendix C) including all hardware, support equipment, software and software tools to perform hardware/software integration, flight software verification, anomaly investigation/resolution flight following and other Program integration and test functions. This includes maintaining USOS, GFE, Commercial Visiting Vehicles (SpaceX and Orbital) and IP hardware and software interfaces for the ISS. (S/A 1614)

3.3.7.9.1.2 ESA SIMULATORS (Moved from SOW 6.15.4)

The contractor shall sustain the following SVF simulators

with the SDIL, including procurement and housing of simulator spare parts and repair/replacement:

- ATV (S/A 1485)
- Columbus (COL-SVF) (S/A 1554)

3.3.7.9.1.3 RUSSIAN SIMULATORS

The contractor shall provide the following sustaining functions for the SM and MLM simulation platform hardware and software components in the SDIL: system configuration management, software license maintenance, system and component level design/analysis, and simulation platform hardware and software upgrades.

3.3.7.9.2 The contractor shall utilize the SVF, to complete integration and verification of the ISS Vehicle per applicable open requirements in SSP 41000 per Appendix Z for flight software and data loads.

3.3.7.9.3 The contractor shall utilize the MBF as the official ISS Program repository for storage and distribution of the ISS signal data, flight software, and simulation software, C&W etc.

3.3.7.9.4 The contractor shall utilize the ISS Software Integration Laboratory (ISIL) for anomaly investigation/resolution, flight following and other software integration and testing.

3.3.7.9.5 The contractor shall create the schedule for the labs and facilities to implement formal qualification testing, stage testing, hardware/software integration testing, flight following activities, IP/P software testing, Ground Segment end-to-end testing, operational readiness test, mission configuration testing, procedure validation and other testing as approved by NASA.

3.3.7.9.6 The contractor shall develop, manage and maintain interface requirements/ICDs for USOS test facilities to support interface testing/verification with IP/P provided hardware and software integrated into NASA facilities.

3.3.7.9.7 COMPLETE

3.3.7.9.7.8 MIOP SPARES AND REPAIR (S/A 1422)

3.3.7.9.7.8.1 COMPLETE

3.3.7.9.7.8.2 The contractor shall purchase the necessary parts to support MIOP card maintenance and repair through 2016.

3.3.7.9.7.9 ISIL COMPLETION PHASE 4 IMPROVEMENTS (S/A 1457)

The contractor shall implement the following improvements into the ISIL:

a. Local data interface emulator (as implemented in the pump flow control subassembly of the photo voltaic thermal control system).

b. Thermal control system pump and control valve package emulator.

c. Additional fault injection capability in the major constituent analyzer.

3.3.7.10 COMMAND AND TELEMETRY

The contractor shall conduct an analysis of the Command and Telemetry and to provide a certification report for each CSCI release per the Command and Telemetry Certificationfor the USOS System, D684-10436 or equivalent ASCB approved process.

3.3.7.11 SOFTWARE SCHEDULING

3.3.7.11.1 The contractor shall provide data, analyses and decision making input to the ISS Program panel chartered to control integrated software schedules, oversee development status, control configuration of formally released software, integrated software loads, and data files developed to satisfy verification, training and mission objectives.

3.3.7.11.2 The contractor shall deliver an integrated software schedule per DRD F-SW-03 to ensure software deliveries meet the ISS Program milestones.

3.3.7.12 SOFTWARE NON-CONFORMANCES

3.3.7.12.1 The contractor shall provide data, analyses and decision-making input to the team chartered per the SOW paragraph 3.2.1 to disposition non-conformances documented in Software Change Requests (SCRs).

3.3.7.12.2 The contractor shall manage the Station Program Note (SPN) process, track open SPNs and ensure resolution of problems or issues with drafted SPNs that document flight software workarounds in accordance with the NASA Approved SPN Process.

3.3.7.13 FLIGHT SOFTWARE OPERATIONS HANDBOOK

The contractor shall maintain the Flight Software Operations Handbook (FSOH) per DRD F-SW-05.

3.3.7.14 DELAY TOLERANT NETWORKING (DTN) (S/A 2051 – SSCN 13799)

The Contractor shall provide the text file changes required to update the DTN configuration files and updates to support new protocols or versions of the DTN protocol stack (ION). The contractor shall also provide integrated DTN testing with payload users in support of payload development and verification (DTN operational April 2015).

3.3.8 USOS POST PRODUCTION SUPPORT (PPS)

The Post Production Support (PPS) effort provides logistics for flight hardware listed in Appendix A and includes the maintenance and repair of failed hardware and replenishment/procurement of spares, and repair parts. The contractor shall plan the performance of PPS tasks on an annual basis and provide NASA with an annual plan which delineates the logistics responsibilities and products required to successfully support the operational phase of the ISS Program. The contractor shall perform technical integration which supports ISS Program planning and prioritization of flight manifests for all USOS hardware candidates for flight to the On-Orbit vehicle.

The contractor shall provide acquisition logistics and PPS functions for Government furnished equipment (GFE) as follows: (S/A 1696)

- Logistics support analysis record (LSAR) development and maintenance (SOW3.3.8.1)
- Technical data and documentation (TD&D) development and maintenance per SSP50520. (SOW 3.3.8.1)
- Spares tracking (SOW 3.3.8.5.2)
- On-orbit anomaly support (SOW 3.2.1)
- Manifest planning (SOW 3.3.8.2.4)
- SODF review (SOW 3.2.1.8.2)

3.3.8.1 LOGISTICS SUPPORT ANALYSIS

The contractor shall develop and maintain technical data including LSARs and technical data and documentation located in the NASA Enhanced Automated Graphical Logistics Environment (EAGLE) database to ensure the ISS Program

has accurate data readily available to maintain and logistically support ISS hardware to the on-orbit maintenance concept level. The contractor shall integrate technical data developed for the USOS and the ISS Vehicle to provide a comprehensive body of data (i.e., in EAGLE) for the vehicle. The contractor shall convert MIL-STD 1388-2A data delivered from International Partners/Participants into MIL-STD 1388-2B data compatible with EAGLE. Updates of Logistics Support Analysis and Technical Data & Documentation shall be performed in accordance with the standards and processes in SSP 50520, International Space Station Logistics & Maintenance Operational Support Concepts and Requirements.

3.3.8.2 MAINTENANCE PLANS

3.3.8.2.1 The contractor shall develop and submit to the MAPI contractor, on-orbit maintenance plans that are used as inputs to the IDRP and Planning Period for the IDRDs annexes to determine logistics allocations for crew time and up mass/down mass for the USOS and the ISS Vehicle.

3.3.8.2.2 The contractor shall assess the supportability of the USOS, the ISS Vehicle, and non-Boeing Sustained Payload Facilities, in terms of crew time, up mass/down mass and functional availability to support management decisions concerning supportability of the ISS. (DRDS F-LM-01, F-LM-02).

3.3.8.2.3 The contractor shall develop, update and maintain IDRD Annex 2 (DRD F-LM-03) for each ISS stage for the USOS, and the ISS Vehicle to integrate the maintenance requirements and planning across the ISS Vehicle.

3.3.8.2.4 The contractor shall develop and submit the MAPI contract Manifest Requests, for USOS hardware required to be delivered to/returned from the On-Orbit vehicle to perform this contract's function per the Mission Integration Dataset Blankbook, SSP 50622 and SSP 50200-02, SPIP Volume 2. The contractor shall ensure on time delivery of hardware and supporting documentation for flight of hardware in Appendix A with an "SE" or SE-Pri" in the designation. The contractor shall implement pre-flight imagery requirements for new ORU installations per SSP 50502 and the ISS Hardware Pre-flight Imagery Requirements, including On-Orbit imagery requirements. The contractor shall validate mass and dimensional data and other part attributes prior to submission of Manifest Requests for hardware in Appendix A with an "SE" or "SE-Pri" in the designation Task to ensure the spares, repair parts, tools and maintenance.

3.3.8.2.5 The contractor shall provide logistics up-mass, crew time and On-Orbit stowage requirements for the operations summary for the USOS and the ISS Vehicle. This information defines the resources required long term to maintain the ISS Vehicle. (Ref: DRD F-LM-01)

3.3.8.3 ON-ORBIT MAINTENANCE OPERATIONS

3.3.8.3.1 The contractor shall provide logistics and maintenance data generated from maintenance operations to the MAPI contractor, analyses and decision-making input to ISS vehicle operations issues and anomalies to support On-Orbit USOS maintenance operations.

3.3.8.3.2 The contractor shall maintain logistics data products and databases consistent with On-Orbit hardware status. This task includes up-dating the Maintenance Data Collection for the USOS and ISS Vehicle as maintenance occurs and the tracking of limited life items per Joint Program Directive (JPD)-315, Limited Life Item (L&I) Tracking and Control. This task ensures that historical data is readily available to support future maintenance planning, spares management and repair decisions.

3.3.8.4 ON-ORBIT GOVERNMENT PROPERTY

The contractor shall perform On-Orbit government property accounting of the USOS using GOLD to ensure accountability of government hardware.

3.3.8.5 MATERIAL MANAGEMENT

3.3.8.5.1 The contractor shall track spare hardware On-Orbit in the GOLD database to include USOS and IP/P core systems hardware and payload support hardware.

3.3.8.5.2 The contractor shall perform asset tracking inventory management and maintenance data collection of hardware required to execute the logistics function.

3.3.8.5.3 The contractor shall perform vendor and parts obsolescence monitoring and identify issues for hardware to ensure that NASA has opportunities to address obsolescence through procurements or redesign in time to avoid supportability issues. (DRD F-LM-04)

3.3.8.5.4 The contractor shall package and ship hardware per approved engineering and the version of NPR 6000.1 cited in SSP 50257 to ensure safe, timely delivery of ISS hardware. Domestic shipments via commercial bills of lading (CBLs) shall be pursuant to Clause F.3,

BILLS OF LADING (NFS 1852.247-73)(JUNE 2002), for all property accountable to or hardware/software delivered under this contract.

3.3.8.5.5 The contractor shall manage the residual asset process including the review, disposition, preparation and archival of all hardware from the USOS vehicle development contract in order to retain hardware potentially useful to the ISS, and to excess hardware causing unnecessary expense. This includes ensuring hardware credentials are maintained or created and hardware is packaged and shipped for long term storage or use at the depots.

3.3.8.5.6 The contractor shall procure or manufacture hardware to execute hardware repair as directed by a Maintenance Action Request (MAR) from the System Problem Resolution Teams (SPRTs) and to meet hardware delivery requirements. The contractor shall provide SPRT support including MAR processing for USOS hardware.

3.3.8.6 MAINTENANCE AND REPAIR

3.3.8.6.1 The contractor shall maintain and repair flight hardware per program requirements at facilities certified per SSP 50276. The hardware shall be delivered to the next level integrator with all acceptance test requirements satisfied. This task is performed to ensure hardware is repaired-to-print in time to meet on-going support requirements.

3.3.8.6.2 The contractor shall resolve issues in the SPRTs and manage the MAR process per ISS JPD 327. This task is performed to coordinate hardware disposition per the SPRTs and to ensure SPRT direction is supported by the repair facilities.

3.3.8.6.3 The contractor shall perform modifications and minor up-grades that have been approved by the ISS Program so that flight worthy hardware is available when needed. This may include the production or procurement of modification kits per ISS Program approved engineering.

3.3.8.6.4 The contractor shall up-date technical documentation (ADPs, TCTIs, INCs) and databases, as required, to document up-grades, modifications, maintenance and repair actions. This includes the delivery of as built parts lists for kitted items. This task is to ensure that the USOS technical baseline is consistently up-to-date. Up-dates to technical documentation as a result of modification kits and up-grades shall be performed in accordance with D684-10749-01.

3.3.8.6.5 The contractor shall fabricate or procure piece parts or low dollar (less than $200K per item) ORU replenishments to support corrective

(repair) and preventative maintenance. If the total estimated cost to repair an ORU exceeds the cost of a replacement, the ORU will be replaced.

3.3.8.6.6 The contractor shall maintain, repair, and/or replace ISS program accountable components, contingency kits/items, flight support equipment (FSE), ground support equipment (GSE), operational items, orbital replacement units (ORU), orbital support equipment (OSE), and parts; regardless of source. The contractor shall use Boeing form, Maintenance Action Request (MAR), to document and obtain authorization for the following maintenance activities for ORU/SRU, which include as required, the development of procedures and the touch-labor required to accomplish the defined maintenance:

- TEST, TEARDOWN & EVALUATION (TT&E) – Fault isolation to identify the cause of failure**,** includes fault location inspection and testing, disassembly, condition determination, and failure analysis required to complete the maintenance action. Does not include detailed failure analysis (i.e. root cause).

- CORRECTIVE MAINTENANCE (CM) - Servicing, post repair test, inspection, adjustment/alignment, access, assembly/disassembly, lubrication, operation, decontamination, removal, replacement, installation, calibration, repair, rework, refurbishment, overhaul, rebuilding and reclamation based upon a TT&E disposition.

- PREVENTIVE MAINTENANCE (PM) – Servicing, test, inspection, adjustment/alignment, access, assembly/disassembly, lubrication, operation, removal, replacement, installation, calibration, overhaul, rebuilding and reclamation based upon a preventive maintenance schedule.

- MODIFICATION (MOD) – Installation of Modification Kit (less than $200K per item) and completion of all related documentation in support of an approved Class I engineering change.

- OTHER – NASA COTR approved activities other than TT&E, CM, PM, or MOD such as, but not limited to cannibalization; unscheduled test; disassembly in support of failure analysis.

3.3.8.6.7 DEPOT TRANSITIONS

The contractor shall transition subcontracts for ORU repair, refurbishment and scheduled maintenance, including subcontracts with

Original Equipment Manufacturers (OEMs) and repair depots to transition repair support from a specific vendor to a NASA depot. The contractor shall provide training and technical support, transfer and installation of maintenance support equipment (MSE), repair manuals, and depot certification activities for transitions.

3.3.8.7 DATA SYSTEMS

The contractor shall provide sustaining support for the GOLD, EAGLE, CITRIX and TACTRAC data systems hardware and software operations, administration, maintenance, patches and upgrades as needed to meet the requirements of this contract.

3.3.9 ON-ORBIT CONSTRAINTS TESTING (OOCT) – NOT IN 2011 – 2015 CONTRACT EXTENSION

The contractor shall perform, and document results of element cable and fluid mate, demate, and fit checks (e.g., On-Orbit Constraints Test) for all flight elements available through the contract period.

3.3.10 USOS STRUCTURAL HARDWARE LIFE EXTENSION (PHASE 2 AND PHASE 3) (S/A 1660)

3.3.10.1 The contractor shall perform an analytical assessment of the feasibility of extending the structural life of USOS primary structural hardware installed on-orbit through December 31, 2028.

3.4 ISS SUBSYSTEM MANAGEMENT

The contractor shall manage the integrated performance of the end-to-end subsystem, across all ISS segments for the following subsystems and specialty engineering areas:

- Electrical Power Subsystem (EPS)
- Structures and Mechanical Subsystem (S&M)
- Passive Thermal Control Subsystem (PTCS)
- Active Thermal Control Subsystem (ATCS)
- Environmental Control and Life Support Subsystem (ECLS)
- Command and Data Handling Subsystem (C&DH)
- Communication and Tracking Subsystem (C&T)

- Guidance, Navigation and Control Subsystem (GNC)
- Caution and Warning Subsystem (C&W)
- Materials and Processes
- EEE Parts
- Electromagnetic Effects (EME)
- Natural and Induced Environments

The contractor shall ensure physical, functional, safety and operational compatibility at the USOS element to IP/P element interface within constraints of the MOUs, IGAs and JMPs to protect the crew and vehicle and facilitate the ISS research activities. NASA will provide these documents. The IP/P element providers are responsible for sustaining their contribution (e.g., hardware, software, data products, schematics, unless specifically called out in an IP/P MOU, IGAs or JMPS).

3.4.1 SUBSYSTEM ANALYSIS AND INTEGRATION

3.4.1.1 The contractor shall perform GFE, Commercial Visiting Vehicles (SpaceX and Orbital), and IP integration per DOP definition in Appendix K to assess Subsystems hardware and software interface compatibility, validate verification requirements and plans, analyze and document subsystem integrated performance, and define integrated Subsystem test configuration, test procedure and test requirements. (S/A 1614)

3.4.1.2 The contractor shall perform ISS time-phased power resource analyses and integration in support of the ISS assembly and utilization operations. This work shall include the development of operational concepts, procedures and vehicle power configurations that are compatible with the limitations of the ISS power system.

3.4.1.2.1 The contractor shall obtain time-phased power generation elements to perform this effort from the ISS repository or directly from NASA.

3.4.1.2.2 The contractor shall develop and maintain power and thermal resource data and submit it to the VMDB.

3.4.1.3 The contractor shall provide assessments of Vehicle hardware, software, consumable and logistics impacts to flight attitude and altitude profiles under evaluation by the MAPI contractor.

3.4.1.4 The contractor shall provide assessments of Vehicle hardware thermal performance to resolve issues identified by the ISS MAPI contractor launch to

activation evaluation, ensuring certified thermal limits of Vehicle hardware are not exceeded.

3.4.1.5 The contractor shall generate the design and verification requirement definition for Vehicle Subsystem hardware being integrated into the ISS and for Subsystems across element interfaces, including allocated requirements across element-to-element interfaces to ensure complete requirements verification closure.

3.4.1.6 The contractor shall perform the following to integrate the vehicle hardware requirements with the associated FSE, External Stowage Platform, and External Carrier development, integration, and operations performed by the NASA, International Partners, Commercial re-supply vehicles (SPACEX and Orbital (pressurized only)), and the MAPI contractor.

3.4.1.6.1 Deliver to the appropriate Program repository the following information pertaining to ORU's sustained in Appendix A for use in the development, configuration, certification and integration of FSE, External Stowage Platforms and External Carriers:

3.4.1.6.1.1 Structural, thermal, CAD and mass properties models.

3.4.1.6.1.2 Non-operating hardware constraints.

3.4.1.6.1.3 Interface definition.

3.4.1.6.2 The contractor shall participate in design and integration reviews to identify and resolve issues associated with specific carrier configuration and carrier or FSE design as it impacts ORU's sustained by this contract.

3.4.1.6.3 The contractor shall provide technical requirements for Carrier or stowage platform configuration and integration to ensure vehicle certification limits are protected, and to identify issues with carrier configuration by performing the following:

3.4.1.6.3.1 The contractor shall participate in design and integration reviews to identify and resolve issues associated with carrier configuration and design as it impacts the On-Orbit Vehicle.

3.4.1.6.3.2 In support of operations planning, the contractor shall perform EVA assessments of carrier configurations under

evaluation by the carrier integrator and identify and resolve issues with the carrier integrator.

3.4.1.6.4 The contractor shall provide analytical integration of integrated carrier or stowage platform configuration with the ISS Vehicle by performing the following:

3.4.1.6.4.1 The contractor shall perform integrated ISS structural, thermal, power, MMOD, microgravity, EMI/EMC and EVA analyses to identify issues with carrier configuration or operations.

3.4.1.6.4.2 The contractor shall provide up-dated thermal, structural, dynamic, EMI, and MMOD environments and results of assessments to the International Partners and commercial re-supply vehicles for issue resolution with ORU providers.

3.4.1.6.4.3 The contractor shall resolve issues between carrier configuration and the On-Orbit vehicle with the International Partners and commercial re-supply vehicles.

3.4.1.6.4.4 The contractor shall resolve structural issues associated with structural launch environments exceeding manifested ORU capabilities for internal and external ORUs sustained by this contract. (S/A 1660)

3.4.1.7 The contractor shall perform as-built measurement of flight hardware (not in 2011 – 2015 contract extension)**.**

3.4.1.7.1 (not in 2011 – 2015 contract extension)

The contractor shall provide as-built measurement data of flight hardware that will attach to the Vehicle to support clearance analyses and integration tasks (e.g., static fit analysis for ISS element mating interfaces). The items to be measured on the elements are defined at the Measurement Technical Interchange Meetings (TIMs) for the elements of USOS, GFE, commercial resupply vehicles (SpaceX and Orbital) hardware, and IP/P hardware. The contractor shall incorporate the as-built measurements into the final CAD model. Elements to be measured through September 30, 2008 are:

1. DPA measurement and analysis of ESA Columbus Module, JAXA JEM PS, JAXA JEM PM, JAXA JEM ES, JAXA JEM EF, SPDM, HTV1 CBCS, and Node 3 element-to-element interfaces. (S/A 1355)

2. Redo DPA measurement and analysis of MPLM FM1 and MPLM FM2 element-to-element interfaces due to hatch replacement (PRACA 3251). (S/A 1297)

3. Perform DPA of ESP3. (S/A 1300)

4. Perform DPA of Node 3. (S/A 1315)

5. Perform DPA of UMAs removed from the outboard MT/CETA Rails. (S/A 1456)

Elements to be measured from October 1, 2008 through September 30, 2010 will be determined on a case-by-case basis. The contractor shall provide the capability to perform DPA measurement and analysis of 6 elements/year. (S/A 1614)

3.4.1.7.2 (not in 2011 – 2015 contract extension)

The contractor shall conduct Measurement TIMs to gather requirements from the ISS/SSP Program users on the following element flight hardware requiring as-built dimensions: HTV1 CBCS, and Node 3. The Measurement TIMs will be held at L-12 months and the users shall submit their request on the Measurement Form via the CAD Team website on the ISS homepage. (S/A 1355)

3.4.1.7.3 The contractor shall conduct as-designed audits for Node 3 fluid and cable interfaces and develop a report on the audit findings. (S/A 1315)

3.4.1.7.4 The contractor shall conduct on-orbit constraints tests (OOCT) for Node 3. (S/A 1315)

3.4.1.8 The contractor shall define Station Detailed Test Objectives (SDTOs) according to SSP50448, SDTO Catalog, as needed to evaluate system capability expansion necessary to sustain the vehicle.

3.4.2 PERFORM MISSION EVALUATION

3.4.2.1 The contractor shall monitor and maintain status of overall subsystem architecture and topology changes, including the addition of IP/P, Commercial Visiting Vehicles (SpaceX and Orbital), GFE, or Payload hardware to the subsystem to ensure thorough understanding of the Subsystem configuration for supporting Subsystem performance assessment or anomaly resolution. (S/A 1614)

3.4.2.2 The contractor shall track and document the consumed life of all life-limited hardware sustained by this contract to support assessment of impacts on maintenance planning and On-Orbit operations.

3.4.3 FLIGHT PLANNING

Assess ISS launches, stages and increments to assure the planned activities fall within the certified capability of the vehicle and the end-to-end subsystem.

3.4.4 IP TEST AND VERIFICATION

3.4.4.1 TEST

The contractor shall conduct functional interface testing for IP provided modules and components as specified in bilateral integration and verification plans. The task includes system and subsystem coordination, and preparation of test reports with Ips. This task is required to ensure thorough interface compatibility verification with the USOS prior to launch, On-Orbit assembly, and On-Orbit activation operations with Vehicle Subsystems.

3.4.4.2 COMPLETE

3.4.5 IP ELEMENT TECHNICAL INTEGRATION

The contractor shall perform the following tasks to technically integrate IP elements (JEM/HTV, Columbus, Cupola, ATV, SPDM) into ISS subsystems:

3.4.5.1 Define data requirements for and participate in NASA-supported, IP element/segment-level reviews, including requirements reviews, design reviews, qualification and verification reviews, acceptance reviews, and pre-shipment reviews to validate that the IP element meets requirements defined in SSP41000 by performing the following. Identify and resolve issues.

3.4.5.2 RESERVED

3.4.6 SPECIALTY ENGINEERING

In addition, to the generic tasks required for subsystem management above, the following tasks are also required for the specialty engineering areas (Materials & Processes, EEE Parts, Electromagnetic Effects, and Natural & Induced Environments).

3.4.6.1 The contractor shall maintain and implement specialty engineering control programs for the ISS Program to ensure compliance with Program requirements and engineering practices as defined in:

- SSP 41000, System Specification for the ISS (Natural and Induced

Environments section).

- SSP 30312, EEE and Mechanical Parts Management and Implementation Plan.

- SSP 30233, Space Station Requirements for Materials & Processes (M&P). The materials used for the ISS Program hardware shall be reported and reviewed through the processes identified in DRD's VE09, MIUL and VE10 MUA.

- SSP 30243, Space Station Requirements for Electromagnetic Compatibility.

3.4.6.2 The contractor shall review waivers and exceptions to ISS specialty engineering requirements for hardware provided or modified by all ISS Program contracts, GFE providers, Commercial Visiting Vehicles providers (SpaceX and Orbital), payload providers, and IP/Ps to ensure consistency in implementation. The contractor shall audit submitted MUA's, MIUL's for hardware provided or modified by all ISS Program contracts (except those managed by NASA JSC and NASA MSFC) and by IP/Ps to ensure consistency in implementation. This responsibility shall be consistent with the Depth of Penetration scope definition in Appendix K. (S/A 1614)

3.4.6.3 The contractor shall develop and maintain an integrated ISS Vehicle acoustics model excluding payload hardware.

3.5 EXTRA-VEHICULAR ROBOTICS (EVR) INTEGRATION (not in 2011 – 2015 extension)

3.5.1 The Contractor shall ensure physical, functional, safety, and operational EVR compatibility at the USOS element-to-IP/P element interface within constraints of the BIVP, BHSEALS, and BDEALS. IP/P element providers are responsible for sustaining their contribution (e.g., hardware, software, data products, schematics), unless specifically called out in an IP/P BIVP, BHSEALS, and BDEALS.

3.5.2 The contractor shall develop and implement requirements and procedures for end-to-end EVR operations across the ISS Vehicle to ensure ORU/element Robotics compatibility and to ensure Robotics operability.

3.5.3 The contractor shall integrate the system design of the elements involved in the ISS robotic assembly/maintenance operations and validate assembly/maintenance operational concepts to ensure ISS hardware robotics compatibility.

3.5.4 The contractor shall conduct EVR functional interface testing for IP/P provided modules and components as specified in bilateral integration and verification plans. The tasks include system and subsystem coordination and preparation of test reports

with IP/Ps. These tasks are required to ensure thorough interface compatibility verification with the USOS prior to launch On-Orbit assembly and On-Orbit activation operations with Vehicle Subsystems.

3.5.5 The contractor shall perform end-to-end berthing integration to achieve safe and effective ISS robotic assembly operations on each berthing attempt. These analyses shall be performed via a program approved schedule.

3.5.6 The contractor shall integrate all (including GFE, commercial resupply vehicles (SpaceX and Orbital) hardware and IP/P) dexterous ISS robotic hardware with the Special Dexterous Manipulator (SPDM) to ensure compatibility. The contractor shall identify all hardware ORU deficiencies as related to EVR operations and recommend corrective action to ensure successful SPDM operations. (S/A 1614)

3.5.7 The contractor shall integrate USOS hardware with IP/P's, including JEM RMS systems, to ensure compatibility and successful IP/P's, including JEM and RMS, operations.

3.5.8 The contractor shall document the as-designed location and orientation for the SRMS and the Space Station Remote Manipulator System (SSRMS) grapple fixtures manifested for USOS, commercial resupply vehicles (SpaceX and Orbital) hardware GFE, and IP/P hardware and provide to the VMDB at L-1 year to track the configuration of grapple fixtures on the ISS. Update the document prior to flight with as-built data from the DPA. (S/A 1614)

3.5.9 The contractor shall provide SSRMS, and SPDM kinematics/graphical analysis associated with robotic manipulation of the ISS element for the ISS Program to ensure compatibility and successful ISS robotic maintenance and sustaining operations. The contractor shall deliver a kinematics analysis report documenting the assessment performed.

3.6 EXTRA-VECHICULAR ACTIVITY (EVA) INTEGRATION

3.6.1 The contractor shall perform EVA integration with all IP/Ps to ensure the ISS Program EVA requirements are met (includes defining verification requirements and requirements closure). This includes providing technical input to IP/P requirements and design reviews.

3.6.2 The contractor shall evaluate requirements and procedures for end-to-end EVA operations across the ISS Vehicle to ensure existence of sufficient translation corridors, to ensure existence of proper worksites/conditions, and to ensure proper tool compatibility with required ORU fastener operations. The applicable document is SSP41000. (Russian EVA hardware and operations are excluded).

3.6.3 The contractor shall integrate EVA issues with affected ISS Vehicle Subsystems to ensure impacts to their operations are evaluated and properly resolved.

3.6.4 The contractor shall provide data, analyses and input to EVA training activities associated with hardware sustained by this contract.

3.6.5 The contractor shall perform mission evaluation for all planned Vehicle Segment EVA operations to ensure operations are successfully executed and to aid in resolving issues.

3.6.6 The contractor shall sustain the EVA subsystem data products associated with certification and verification of EVA requirements for NASA GFE elements Node 2, Node 3, Cupola, and PMM.

3.7 PROPULSION SYSTEM INTEGRATION

3.7.1 The contractor shall perform Propulsion system integration with all IP/Ps to ensure propulsion system performance meets the ISS Program requirements. This includes providing technical input to IP/P requirements and design reviews.

3.7.2 The contractor shall integrate Propulsion system issues with the GN&C Subsystem and the Vehicle Integrated Performance team to ensure impacts to the ISS Program mission operations or flight/mission planning are evaluated.

3.7.3 The contractor shall provide real time mission data, analyses and inputs for Propulsion System status monitoring (propellant quantity tracking, keeping Mission Evaluation management informed of Propulsion System health, data retrieval and evaluation, daily activity reports, summary reports of significant system operations, etc.), critical operations and problem investigation.

3.7.4 The contractor shall maintain the Russian Propulsion and Propellant Resupply Systems for the ISS, JSC27979, to ensure an accurate status of the Russian propulsion and propellant transfer systems is maintained. The contractor shall develop and maintain future IP propulsion element smart books (e.g., ATV, HTV) to document their architectures and capabilities for vehicle sustaining operational assessments.

3.8 SAFETY AND MISSION ASSURANCE (S&MA)

For hardware sustained within the scope of this SOW, the S&MA analyses (e.g., FMEAs, hazards, etc.) previously developed for this hardware shall be maintained per the requirements within this section of the SOW.

3.8.1 S&MA MANAGEMENT

3.8.1.1 S&MA/RISK MANAGEMENT PLAN

The contractor shall maintain and implement a Safety & Mission Assurance/Risk Management (S&MA/RM) Plan consistent across all contractor

sites in accordance with DRD F-SA-01. Upon approval, the S&MA/RM Plan shall be incorporated into the contract.

3.8.1.2 AS 9100

The contractor shall establish and maintain a Quality Management System (QMS) that complies with the International Organization for Standardization document SAE, AS 9100 Rev A Quality Systems – Aerospace –Model for Quality Assurance in Design/Development, Production, Installation and Servicing. Third party certification/registration is not required at contract award, however, the contractor must be certified by third party audit within 18 months of contract award. If the contractor is AS 9100 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.

3.8.1.3 AUDIT/SURVEILLANCE

The contractor shall provide access to data, personnel, and facilities for government audit/surveillance of contractor 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.

3.8.1.4 MISHAP INVESTIGATING AND REPORTING

The contractor shall investigate and report mishaps (DRD SM03), in accordance with NPR 8621.1, NASA Procedures and Guidelines for Mishap Reporting, Investigating and Record keeping and NPR 8715.3, NASA Safety Manual (Sections 1.3.7, 1.5.11, 1.15.1, and 1.15.2.4). 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:

- All mission failures and type A and B mishaps resulting in injury to contractor personnel or equipment damage occurring on-site at NASA facilities and offsite at contractor facilities.

- Type C mishaps resulting in equipment damage on-site at NASA facilities and offsite at contractor facilities.

- Type C mishaps resulting in injury to contractor personnel located onsite at NASA facilities.

- Incidents and close calls occurring on-site at NASA facilities.

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 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. The contractor shall enter mishap reporting and provide summary data into the Incident Reporting Information System (IRIS) per NPR 8621.1.

3.8.1.5 SAFETY AND HEALTH

The contractor shall develop and implement a process to identify how personnel and property will be protected from injury or harm. 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 contract work onsite at NASA installations. The contractor shall document the assessments in monthly safety and health metrics (DRD F-SA-02).

3.8.1.6 LESSONS LEARNED

The contractor shall develop, implement and maintain a lessons learned process to capture, disseminate and implement lessons learned, both positive and negative.

3.8.2 RESERVED

3.8.3 PROGRAM RISK

3.8.3.1 RISK MANAGEMENT

The contractor shall identify risks and provide inputs to the ISS risk process, the ISS Risk Management Application (IRMA) and in accordance with SSP 50175 Risk Management Plan and JPD 306 Establishment of the Program Risk Management System, and coordinate risks with NASA counterparts.

3.8.4 ISS SAFETY PROGRAM

3.8.4.1 ISS SYSTEM SAFETY ASSESSMENT

The contractor shall perform and deliver flight and/or Stage Specific Integrated Safety Assessments, such as Integrated Hazard Analysis (IHA), Integrated Experiment Hazard Analysis (IEHA), IVA and EVA crewmember injury or ISS

damage, and IVA crewmember exposure to excessive noise and touch temperatures for the ISS Vehicle in accordance with SSP 30599, SSP 30309, NSTS 1700.7, KHB1700.7, and SSP 50021 as specified between SSP 41000 and SSP 41162 (DRD F-SA-04).

3.8.4.2 USOS SYSTEM SAFETY ASSESSMENT

The contractor shall perform and deliver assessments for all USOS sustained hardware/software and supporting ground test equipment (H/W, S/W, etc.) in accordance with SSP 30599, 30309, NSTS 1700.7, SSP 13830, KHB1700.7, and SSP50021 as specified between SSP41000 and SSP41162 (DRD F-SA-04).

3.8.4.3 SAFETY REQUIREMENT VERIFICATION

The contractor shall perform safety requirement verification planning and deliver associated documenetation. The contractor shall perform verification analyses, test and inspection to certify compliance to the Safety requirements as defined in paragraph 3.8.4.2 for all USOS sustained hardware/software and supporting ground test equipment.

3.8.4.4 SOFTWARE SAFETY

The contractor shall conduct software safety analyses in accordance with SSP 30309 and ensure compliance with SSP 50038. The analyses shall include review of software products such as requirement documents, non-conformance reports, change proposals and SPNs for safety impact and compliance.

3.8.5 RELIABILITY AND MAINTAINABILITY (R&M)

3.8.5.1 FAILURE MODES AND EFFECTS ANALYSIS AND CRITICAL ITEMS LIST (FMEA/CIL)

The contractor shall develop, maintain and deliver the FMEA/CIL Report and FMEA/CIL worksheets in accordance with DRD F-SA-05.

3.8.5.1.1 USOS FMEA/CIL WORKSHEETS

The contractor shall maintain FMEA/CIL worksheets for USOS hardware based on needed changes to establish accurate and complete FMEA/CIL worksheets in accordance with SSP 30234. (S/A 1626)

3.8.5.1.2 INTEGRATED FMEA/CIL WORKSHEETS

The contractor shall receive IP/GFE commercial resupply vehicles (SpaceX and Orbital) hardware FMEA worksheets and update them in accordance with SS P 30234, paragraph 4.5 to reflect the integrated

ISS configuration and functionality. The contractor shall notify NASA R&M when critical items are identified as a result of the FMEA/CIL integration process. (S/A 1614, S/A 1626)

3.8.5.1.3 REVIEW AND APPROVAL OF FMEA/CIL

All USOS and integrated FMEA/CIL worksheets shall be submitted to NASA R&M for review and approval. When required by SSP 30234, the contractor shall present USOS critical items to the Space Station Program Control Board for approval. This requires identification of retention rationale with concurrence from other teams identified in SSP 30234.

3.8.5.1.4 CRITICAL ITEMS LIST

The contractor shall maintain the Critical Items List in accordance with SSP 30234.

3.8.5.2 R&M DATA AND ANALYSIS

The contractor shall develop, maintain and deliver a R&M Allocation, Assessment and Analysis (AAA) Report in accordance with DRD F-SA-06.

3.8.5.2.1 USOS R&M DATA AND ANALYSIS

3.8.5.2.2 The contractor shall develop, maintain, and deliver R&M AAA Report in accordance with DRD F-SA-06 for USOS sustained hardware. The contractor shall maintain USOS R&M source data to reflect hardware operational performance. The contractor shall utilize baselined reliability block diagrams and data to perform quantitative R&M analyses. The contractor shall submit newly generated or updated source data and analyses to NASA R&M for approval.

3.8.5.2.3 INTEGRATED R&M DATA AND ANALYSIS

3.8.5.2.4 The contractor shall receive IP/P, commercial resupply vehicles (SpaceX and Orbital) hardware and GFE R&M data to perform and deliver integrated R&M analyses in accordance with DRD F-SA-06. (S/A 1614)

3.8.6 QUALITY ASSURANCE (QA)

3.8.6.1 QUALITY ASSURANCE REQUIREMENTS

The contractor shall implement and update the quality assurance plan, as documented in the S&MA/RM Plan DRD F-SA-01, which ensures that the

performance of this contract is in accordance with SSP 41173, Space Station Quality Assurance Requirements.

3.8.6.1.1 FLIGHT QA STATUS

The contractor shall track open QA actions and issues impacting each flight in accordance with SSP 41173. The contractor shall provide reports to NASA QA and launch teams.

3.8.6.1.2 GOVERNMENT INDUSTRY DATA EXCHANGE PROGRAM (GIDEP) AND NASA ADVISORY PROBLEM DATA SHARING, UTILIZATION PROGRAM DOCUMENTATION AND REPORTING

The contractor shall participate in the GIDEP in accordance with the requirements of the GIDEP S0300-BT-PRO-010 and S0300-BU-GYD-010, available from the GIDEP Operations Center, PO Box 8000, Corona, California 91718-8000.

The contractor shall review all GIDEP ALERTS, GIDEP SAFE-ALERTS, GIDEP Problem Advisories, GIDEP Agency Action Notices and NASA Advisories to determine if they affect the contractors products/services provided to NASA.

For those that affect the program, the contractor shall take action to eliminate or mitigate any negative effect to an acceptable level.

The contractor shall generate the appropriate failure experience data report(s) (GIDEP ALERT, GIDEP SAFE-ALERT, GIDEP Problem Advisory) whenever failed or non-conforming items, available to other buyers, are discovered during the course of the contract.

The contractor shall provide intervention recurrence control for all hardware in Appendix A impacted by alerts and SCANs.

3.8.6.1.3 PROBLEM REPORING SYSTEM

The contractor shall develop and implement a closed-loop problem reporting system in compliance with the requirements of SSP 41173. The contractor shall report, promote, and participate in the investigation and resolution of applicable problems in accordance with SSP 41173, SSP 30524, and SSP 30223.

3.8.6.2 HARDWARE ACCEPTANCE

3.8.6.2.1 The contractor shall maintain and provide the ADP for existing hardware, as a result of implementing NASA approved changes, such as hardware processing refurbishment, repair, rework and design upgrades, including all associated software and firmware. The contractor shall complete work, document open actions and closure, and maintain ADPs in accordance with SSP 41173, SSP 41170, SSP 50287, and SSP 30695.

3.8.6.3 SOFTWARE ACCEPTANCE

3.8.6.3.1 The contractor shall maintain and provide the acceptance data package (ADP) for existing software, as a result of implementing NASA approved change requests, such as software processing, patches and design upgrades. The contractor shall complete work, document open actions and closure and maintain ADPs in accordance with SSP 41173, SSP 41170, SSP 50287, and SSP 30695. Software shall be accepted by the government per SSP 50287.

3.9 UNPRESSURIZED CARGO INTEGRATION (S/A 1660)

3.9.1 UNPRESSURIZED CARGO ANALYTICAL INTEGRATION (S/A 1700 – SSCN 11967)

The contractor shall perform unpressurized cargo analytical integration for ORUs and payloads launching on visiting vehicles and for ORUs and payloads stowed on stowage platforms on-orbit, including the EXPRESS Logistic Carrier (ELC). ELC work shall begin for all flight configurations post ULF6 flight.

3.9.1.1 The contractor shall act as the primary point of contact with the Visiting Vehicle providers for unpressurized cargo analytical integration and shall attend reviews/meetings/TIMs, identify and document required interface control documents/agreements during integration, and provide mission support for on-orbit activities.

3.9.1.2 The contractor shall provide all data listed in SOW 3.4.1.6 and subparagraphs for Boeing provided integrated ORU/ /FSE/carrier configurations launching on a visiting vehicle.

3.9.1.3 The contractor shall review interface (ICA/ICD) documents (and other applicable cargo integration documentation) and verification data developed by the visiting vehicle provider for the external ORUs to determine if ORU requirements are met.

3.9.1.4 The contractor shall provide analytical integration products required for physical integration of unpressurized cargo for Boeing provided ORU/FSE/carrier configurations. Cargo analytical products shall be delivered to the physical integrator.

3.9.1.5 The contractor shall perform EVA assessments of FSE/carrier translations to / from the Visiting Vehicle, external carrier, or end use locations on ISS to ensure the feasibility of the configuration for a mission. Analysis shall be performed for each change to the cargo arrangement on the ISS external carrier.

3.9.1.6 The contractor shall perform thermal analysis of the transfer of ORU/FSE/carrier to/from the Visiting Vehicle, external carrier, or end use locations on ISS to ensure the feasibility of the configuration for a mission.

3.9.1.7 The contractor shall perform on-orbit structural analysis of integrated assemblies (Boeing ORUs with Visiting Vehicle FSE/carrier).

3.9.1.8 The contractor shall determine bolt torque data (1819 data) and perform failure tolerant analyses for all FSE listed in Appendix A manifested on a flight.

3.9.1.9 The contractor shall review visiting vehicle coupled loads assessments, including potential FSE negative structural margins that may have been identified as a result of the analyses, and identify issues.

3.9.1.10 SAFETY DATA PACKAGES (S/A 1660)

3.9.1.10.1 The contractor shall develop and deliver integrated flight safety data packages for Boeing provided ORU/ FSE/carrier configurations and participate in safety reviews as required to ensure flight safety.

3.9.1.10.2 The contractor shall develop and deliver integrated ground safety data packages for Boeing provided ORU/ FSE/carrier configurations. The contractor shall provide a Safety Re-flight Assessment data package to the Safety Review Panel for each mission for flight and rround support equipment (GSE),.

3.9.2 UNPRESSURIZED CARGO PLANNING

The contractor shall provide assessments of unpressurized cargo manifest and manifest options to support the overall ISSP planning process.

3.10 FE 1410 TESTING

The contractor shall perform Passive Common Berthing Mechanism (PCBM) FE 1410 acceptance testing of every Commercial Resupply Service (CRS) SpaceX and Orbital) vehicle, at the CRS contractor location, in order to verify that all PCBM components are within design limits.

3.11 FPMU GROUND STATION

The contractor shall sustain and operate the Floating Potential Measurement Unit (FPMU) Ground Station (G/S).

4.0 OTHER PRODUCT DEVELOPMENT

4.1 S-BAND UPGRADE

4.1.1 IMPLEMENT TRIPLE DATA ENCRYPTION STANDARDS (3DES)

The Contractor shall design, develop, test and deliver modified Assembly/Contingency Baseband Signal Processor (ACBSP) ORUs in accordance with the Triple Data Encryption Standards 3DES defined by American National Standards Institute (ANSI) X9.52.

4.1.2 LOW RATE VOICE

The Contractor shall modify the ACBSP and transponder to add low rate voice capability.

4.1.3 CONNECTOR ALIGNMENT

The Contractor shall design, develop and build an alignment tool in the alignment of the module edge connector.

4.2 NODE 2 RECONFIGURATION

4.2.1 COMMON HARDWARE/SOFTWARE RELATED TO NODE 2

The Contractor shall develop Hardware and Software for installation in Node 2 for delivery in accordance with Section J, Attachment J-5 Deliverable Items List. This hardware and software shall be considered Common Hardware and Software and controlled in accordance with SSP 41170, paragraphs 3.3.2.2, 3.3.2.3, and 3.3.2.4. Prior to establishment of the NASA baseline, the Contractor shall provide notification of changes to the Common Hardware to the Marshall Space Flight Center, and Alenia by sending a copy of all proposed and authorized changes as well as revisions and change notices to the Common Hardware Specifications to each of the locations identified. Traceability from the common component Hardware and Software shall be completed to the Node 2 PIDS (SSP50290) by NASA as GFD.

4.3 COMPLETE

4.4 RESERVED

4.5 COMPLETE

4.6 NODE 3

4.6.1 PROCURE HARDWARE FOR NODE 3, AND NODE 3 ENVIRONMENTAL CONTROL AND LIFE SUPPORT SYSTEM (ECLSS) RACKS (S/A 1171, SSCN 6647, REV A)

The Contractor shall procure and deliver hardware in accordance with the Section J, Attachment J-5 Deliverable Items List. All hardware to be delivered is already under subcontracts.

4.6.2 NODE 3 FIBER OPTIC INSPECTION

The Contractor shall travel to Alenia and inspect each Node 3 fiber optic termination in all connectors using OHB post-polishing termini end-face inspection criteria (N2-PR-OHB-005, Para 4.6). The Contractor shall clean fiber end-face and caps as determined by the inspection. (S/A 1299)

4.7 FABRICATION AND ASSEMBLY OF FLIGHT RELEASE ATTACH MECHANISM (FRAMS) AND ADAPTER PLATES (S/A 1171, SSCN 6179, Rev. D)

The contractor shall procure and deliver hardware in accordance with SSCN 6179. All hardware to be delivered is already under subcontracts.

4.8 COMPLETE

4.8.1 COMPLETE

4.8.2 COMPLETE

4.8.3 COMPLETE

4.8.4 COMPLETE

4.8.5 COMPLETE

4.9 COMPLETE

4.10 COMPLETE

4.10.1 COMPLETE

4.10.2 COMPLETE

4.11 SSQ CONNECTORS FOR COLUMBUS EXTERNAL PAYLOADS ADAPTER (CEPA) (S/A 1239)

a) COMPLETE

b) Accelerate acceptance testing of the Medium Adapter Plate Assembly (MAPA) and the Large Adapter Plate Assembly (LAPA) to be complete by early March 2004 and to be performed in MSFC facilities.

4.12 COMPLETE

4.13 CARGO COMPATIBILITY ANALYSIS (CCA) MANIFEST FLEXIBILITY TASK (MSF) (S/A 1245)

Complete and document the Cargo Compatibility Analysis Manifest Feasibility Task for the Resupply Stowage Racks (RSR), Resupply Stowage Platforms (RSP), and the integrated MPLM. This task was previously done by United Space Alliance (USA) under the Space Flight Operations Contract (SFOC).

4.14 FLIGHT SUPPORT EQUIPMENT (S/A 1247)

4.14.1.1 COMPLETE

4.14.2 ANALYTICAL SLOSH MODEL FOR THE AMMONIA TANK ASSEMBLY (ATA) ORU (S/A 1247)

Develop an analytical model for the ATA ORU to account for internal structural loading as a function of varying fluid levels and conduct an analysis at a design level (DCLA) to determine internal ORU structural loading and ATA/FSE structural interface loading. Document results per DRD F-VE-3.

4.14.3 COMPLETE

4.14.4 COMPLETE

4.14.5 AMMONIA TANK ASSEMBLY FSE REDESIGN

4.14.5.1 The Contractor shall redesign the Ammonia Tank Assembly (ATA) Flight Support Equipment (FSE) to meet the design for minimum risk (DFMR) requirements. The design shall include the capacity to release the ATA from an empty carrier in case of a jammed ATA EVA bolt. (S/A 1307)

4.14.5.2 The Contractor shall not meet requirements to launch and return on the Integrated Cargo Carrier (ICC) with an ATA installed. (S/A 1632)

4.14.6 AMMONIA TANK ASSEMBLY (ATA) MODAL TESTING

The contractor shall incorporate the following test requirements into the modal survey test being performed for the LMC ATA Flight Support Equipment (FSE) (DIL item 31944).

- Perform x-y cg test on the ATA.
- Perform removal/re-installation of the tank debris shield.
- Perform water fill/drain/dry of one tank.
- Perform one test configuration with water and with outside enclosure/debris shields removed.
- Perform ATA model correlation update based on results from FSE test.
- Perform additional pre-test analysis and updates to test documentation (Plan, Procedure, and Report).

4.15 FACTORY EQUIPMENT (S/A 1247)

4.15.1 BATTERY CYCLING UNITS (S/A 1247)

Design, develop, manufacture, test and provide battery cycling units (BCU) factory equipment (FE). This equipment shall:

1) Monitor the health, including the level of precharge, of battery Orbital Replacement Units (ORU)

2) Charge and discharge batteries

3) Operate with batteries mounted on the Integrated Equipment Assembly (IEA) as well as with individual uninstalled Battery ORUs.

4.15.2 COMPLETE

4.16 COMPLETE

4.17 COMPLETE

4.18 COMPLETE

4.19 COMPLETE

5.0 WORK NOT COMPLETED; DISCRETE TASKS TRANSFERRED FROM PREVIOUS SOW

5.1 COMPLETE

5.2 NODE 3 SOFTWARE

5.2.1 The contractor shall define, develop code, verify, and deliver the software for the Node 3 CSCIs.

5.3 COMPLETE

5.4 COMPLETE

5.5 NODE 2/3 INTEGRATED RACK STRUCTURAL ANALYSIS

The Contractor shall provide the following Node 2/3 Avionics Integrated Rack structural analysis:

5.5.1 COMPLETE

5.5.2 COMPLETE

5.5.3 COMPLETE

5.5.4 COMPLETE

5.5.5 COMPLETE

5.5.6 COMPLETE

5.5.7 COMPLETE

5.6 NODE 3 HARDWARE PROCUREMENT

5.6.1 The contractor shall develop, manufacture, and verify the hardware required to support the Node 3 development by NASA and deliver the hardware as identified on the Section J, Attachment J-5 Deliverable Items List in accordance with the contractor developed and controlled specifications for those items.

5.6.2 COMPLETE

5.6.3 COMPLETE

5.7 NODE 3 ANALYSIS AND PLANNING

The Contractor shall provide Node 3 internal ATCS analysis, GFE environmental and fracture analysis, integrated test and verification planning, and end-to-end schedule development and maintenance.

5.8 AMMONIA TANK ASSEMBLY (ATA) SUPPORT OF UF-4 SPACELAB PALLET (SLP) INTEGRATION ACTIVITIES

The Contractor shall:

a. Perform a structural assessment of the Ammonia Tank Assembly (ATA) using the Design Coupled Loads Analysis (DCLA) #2 interface force information and provide it to the Government in contractor format via contract letter.

b. COMPLETE

c. Using Government provided thermal data perform a revised structural assessment of the Ammonia Tank Assembly (ATA) to support cargo item integration activities and provide it to the Government in contractor format via contract letter.

5.9 IMPLEMENTATION OF PRELIMINARY DESIGN AND ANALYSIS OF THE EXPRESS PALLET CONTROLLER ASSEMBLY

a. The Contractor shall develop a preliminary design of the EXPRESS Pallet Controller Assembly (ExPCA).

b. The Contractor shall develop the following program plans associated with the development of the ExPCA: Quality Assurance Plan; SW Quality Assurance Plan; CM Plan; EMC Control Plan; Parts Control Plan; ESD Control Plan; Maintainability Plan; Safety Plan; Reliability Plan; HW Test Plan; Test Verification/Requirements Plan; SW Development Plan (Flight); SW Development Plan(Testing); Corrosion Control Plan; M&P Plan; Structural Control Plan; Manufacturing Plan; Radiator Development Plan; Radiator Safety Plan; STE Test Plan and Methodology; SW STE Test Plan and Methodology; and DPA Plans and Procedures.

5.10 COMPLETE

5.11 CUPOLA PRESSURE PANE PROOF TESTING

a. The Contractor shall perform an evaluation to determine if the Cupola window pane stresses match the proof fixture pane stresses.

b. The Contractor shall plan and conduct pressure testing of Cupola side pressure pane

5.12 CUPOLA WINDOW PANE MARKINGS

The Contractor shall provide markings on Cupola Window Panes to identify location and orientation of specific panes within the cupola.

5.13 CENTERLINE BERTHING CAMERA SYSTEM (CBCS)

a. COMPLETE

b. COMPLETE

c. COMPLETE

d. COMPLETE

e. COMPLETE.

f. COMPLETE

g. COMPLETE

h. COMPLETE

i. The Contractor shall perform DPA of the JAXA JEM PS for verification of the CBCS. (S/A 1355)

5.14 COMPLETE

5.15 RESERVED

5.16 CUPOLA VERIFICATION SUPPORT

a. The Contractor shall perform Fluid and Cable fit-checks of the Cupola side of the interface with Node 1 vestibule jumpers.

b. The Contractor shall perform the digital Pre-assembly tasks for Cupola at KSC.

c. The Contractor shall perform the Fluid and Cable Fit Checks for Cupola at KCS after Cupola delivery.

5.17 PCBM KITS

a. The Contractor shall deliver the Passive Common Berthing Mechanism (PCBM) kit (including the equipment, installation instructions, checkout procedures, and kit proofing) in accordance with the Section J, Attachment J-5 Deliverable Items List. The Contractor shall provide the personnel for ESA technicians to consult, during the ESA installation of the PCBM rings and mechanisms as well as the ATP, on-site at the ESA contractor.

b. COMPLETE

c. COMPLETE

d. COMPLETE

e. The Contractor shall perform end-to-end berthing analysis in order to assure that the Cupola can be mated to Node 1.

f. The Contractor shall modify the PCBM rings to include the interface holes for the Cupola Restraints and Mobility capability. This new interface shall be documented in SSP 41004, part II.

5.18 COMMON HARDWARE STORAGE

The Contractor shall provide the storage space to accommodate all of the U. S. contractor provided Cupola Component Hardware from the time of delivery to NASA per the Section J, Attachment J-5 Deliverable Items List until NASA delivery to ESA per the NASA to NASA GFEL.

5.19 COMPLETE

5.20 COMPLETE

5.21 CUPOLA DEBRIS PANES REDESIGN

a. The Contractor shall develop and implement an approach to modify the exiting Debris Panes and also produce new debris panes for the ESA Cupola to accommodate debris panes assembly replacement both EVA and IVA.

b. The Contractor shall develop this approach using Cupola test and flight frames provided to the Contractor by Alenia.

5.22 COMPLETE

5.23 COMPLETE

5.24 COMPLETE

5.25 COMPLETE

5.26 NODE 2 VERIFICATION SUPPORT

a. The Contractor shall provide the technical support and expertise necessary to support the NASA verification activities for the Node 2. The activities that the Contractor shall support are as specified in the Program Master Integration and Verification Plan (D684-10020-1).

b. The Contractor shall perform fit-checks of the CAM, JEM, MPLM, and APM side of the interface with Node 2 vestibule jumpers at KSC after Node 2 delivery.

c. The Contractor shall perform the Digital Pre-assembly tasks for Node 2.

d. The Contractor shall perform the Fluid and Cable Fit Checks for Node 2 at KSC after Node 2 delivery.

e. The Contractor shall re-do measurement and analysis of Node 2 element-to-element interfaces due to hatch replacement. (PRACA 3251) (S/A 1297)

5.27 SOFTWARE USER MANUALS

The Contractor shall document the Software User Manuals in accordance with D684-10017-1 for the N2-1 and N2-2, CSCI's.

5.28 SPARES WAREHOUSE (SWH) CARGO INTEGRATION

a. COMPLETE

b. COMPLETE

c. COMPLETE

d. The Contractor shall develop, fabricate, and deliver a high fidelity NBL compatible mock-up for the Trunnion Pin Attachment Mechanism.

e. COMPLETE

f. COMPLETE

g. COMPLETE

h. COMPLETE

i. The Contractor shall perform modifications to ITS Z1 to add a power outlet and to verify that the added power outlet can provide up to 1000 watts of secondary electrical power at a voltage of 115 to 126 volts.

5.29 COMPLETE

5.30 COMPLETE

5.31 FUNCTIONAL EQUIVALENT UNIT ENHANCED MDM SOLID STATE MASS MEMORY UPGRADE

The contractor shall upgrade 25 Functional Equivalent Unit (FEU) Enchanced MDMs that are used for ground testing, with solid state Mass Memory Units (MMU) in place of the existing rotational drive Mass Storage Device (MSD) untis and provide an additional 12 solid state memory cards.

5.32 COMPLETE

5.33 CUPOLA RELOCATION TO NODE 3

The Contractor shall perform the required hardware and software analysis and the testing of existing hardware and software to accommodate the relocation of the GFE provided Cupola to the GFE provided Node 3 Forward and Aft Ports (S/A 1362).

6.0 I&O DISCRETE TASKS

6.1 INTEGRATION OF REGEN ECLSS INTO LAB

The contractor shall integrate the Oxygen Generation System (OGS) and Water Recovery Systems (WRS-1 and WRS-2) Regenerative Environmental Control and Life Support (REGEN ECLSS) racks into the U.S. Lab to support the ULF-2 flight. The changes made for integration shall not preclude the ability to move the racks to Node 3 on-orbit and maintain in the U.S. Lab in an operational condition.

6.1.1 HARDWARE AND SOFTWARE MODIFICATIONS

The contractor shall deliver all of the required hardware and software modifications to the U.S. Lab to allow for integrating with the REGEN ECLSS.

6.1.2 SYSTEMS INTEGRATION AND OPERATIONS

a. The contractor shall perform the systems integration, operational analysis and procedure development, verification and product assurance required to integrate the REGEN ECLSS racks into the U.S. Lab for full activation on ULF2.

b. The contractor shall develop and verify requirements for early activation of the OGS prior to ULF2. (S/A 1386)

c. The contractor shall update hazard analyses required for early activation of the OGS prior to ULF2. (S/A 1386)

6.1.3 NASA/MSFC TEST ACTIVITIES

The contractor shall participate in the Regenerative ECLS rack test activities being conducted by NASA/MSFC by:

a. Maintaining calibration on the following equipment:
- T1001-6 Power Breakout Box
- T1001-19 Power Breakout Box
- FE1053 Support Equipment Controller
- T1226 Trielectron Power Source
- SQ2-20066 Rack Manifold Fixture
- P305D TCS Differential Pressure Sensors
- Calibrate required items in three Moderate Temperature Loops of the Rack Manifold Fixture

b. Reviewing and providing comments via memorandum on the rack test procedures listed below:

- OGS Rack Tests 14 Procedures
- WRS Rack Tests 12 Procedures

c. Providing engineering participation in the first three days of testing the WRS Rack 2 and the OGS Rack.

d. Providing "on-call" support as requested by NASA on an "as available basis" during periods when a technician is not scheduled to be supporting the ECLS activity.

e. Performing weight and CG measurements for the OGS, WRS-1 and WRS-2 Racks (Total of 5 tests). NASA MSFC shall be responsible for shipping, handling, and transportation of the rack hardware to and from the Boeing facilities for the activity.

6.1.4 OXYGEN GENERATOR SYSTEM (OGS) EARLY ACTIVATION

6.1.4.1 The contractor shall develop and release an Appendix C to the Stage Requirements Document (D684-12172-01), which documents the OGS feedwater assembly interfaces and top level functional requirements required for early activation of the OGS in the U.S. Lab.

6.1.4.2 The contractor shall modify software as required to accommodate early activation of the OGS with power from the U.S. Lab overhead rack 5 locations.

6.2 INTEGRATED STATION LAN (ISL)

6.2.1 EDGE ROUTERS

The contractor shall procure 10 edge router flight equivalent units (FEU) as designed for the Integrated Station LAN and compatible with both 220V and 120V power.

6.2.2 TRANSITION FROM OPSLAN TO INTEGRATED STATION LAB (ISL)

6.2.2.1 The contractor shall recommend a commercial off-the-shelf (COTS) Ethernet wireless access point (WAP) for use on-board the ISS in the Russian segment and shall develop a specification for procurement of this hardware. (S/A 1389)

6.2.2.2 The contractor shall conduct joint US-Russian worst case Ethernet characterization for the ISL link, including all cabling. (S/A 1389)

6.2.2.3 The contractor shall provide data products required for NASA to qualify the WAPs for use on the USOC. (S/A 1389)

6.2.3 LOCAL AREA NETWORKS (LANS)

6.2.3.1 SHUTTLE TO STATION (S/A 1512)

The contractor shall modify the ISS Wireless Access capabilities to enable:

- Initial wireless file transfer between the Orbiter and the ISS.
- Network connectivity between the Orbiter/Payload General Support Computer (PGSC) network and the Mission Control Center (MCC)/Orbiter Communications Adapter (OCA) via ISS beginning with flight ULF2.
- Expansion of the wireless capabilities onboard for ISS/STS crew operation.
- Payload and General Support Computer (PGSC) connection to have the same network connectivity capabilities as would be delivered via the Shuttle Orbiter Communications Adapter 2 (OCA2)
- Deployment of all wireless capabilities to operate as one integrated system.

6.2.3.2 CREW LAN AND INTERNET SERVICES (S/A 1554)

The contractor shall design and implement on-orbit Crew dedicated LAN capability and internet services consistent with the requirements in NPR 2810.1A, "Limited Personal Use of Information Technology (IT) Resources including Internet Access," applicable IT security assessments and update the ISS Security Plan to incorporate these new requirements and applicable IT security assessments and provide updates to the ISS Security Plan.

6.2.4 ESA LAN INTEGRATION

6.2.4.1 The contractor shall integrate the ESA Columbus Ethernet LAN into the Joint Russian-US Station LAN, while maintaining Node 2 portable workstation (PWS) connectivity of the ESA LAN by April 1, 2011. (S/A 1610)

6.2.4.2 The contractor shall identify NASA ground and training facility updates required to reflect the on-orbit architecture change (due to ESA LAN integration) by March 1, 2010. (S/A 1610)

6.2.4.3 The contractor shall provide USOS hardware and software configuration information necessary to upgrade the ESA ground and training facilities to reflect the on-orbit architecture (due to ESA LAN integration) change by March 1, 2010. (S/A 1610)

6.2.5 ISL SUPPORT TO SMCC TELEMETRY (S/A 1645)

The contractor shall update (by October 2011) the Integrated Station LAN (ISL) routers to support two unique 256 Kbps streams of Service Module Central Computer (SMCC) telemetry data from Russian provided equipment connected to the Joint Station LAN (JSL) in the SM.

6.2.6 JOINT STATION LAN (JSL) EXTENSION

6.2.6.1 EXTENSION INTO NODE 3 (S/A 1658)

6.2.6.1.1 The contractor shall identiy and document all the Joint Station LAN (JSL) user requirements for wired Ethernet connectivity from Node 3 to the Cupola module and deliver via mod kits, the required JSL data cabling with associated interface panels/attach hardware to support connectivity to the JSL in the Cupola as documented on the DIL. This hardware will be designed for stowed launch/delivery to the International Space Station (ISS) via any of the current launch vehicles and to be installed on-orbit.

6.2.6.1.2 The contractor shall provide (via 1149) two Node 3 Ethernet Network devices (part numbers 684-015068-0501 and 943 912-001) by April 6, 2011.

6.2.6.2 EXTENSION INTO RUSSIAN MULTIPURPOSE LABORATORYMODULE (MLM) SSCN 12816 – S/A 1808)

The contractor shall perform the following tasks in support of extending the JSL to the MLM:

6.2.6.2.1 Provide MLM Ethernet manufacture test cable assembly via DD1149 by 05/15/12**.**

6.2.6.2.2 Provide one test cable that interfaces between the Fluke cable analyzer and theMLM Ethernet via DD1149 by 05/15/12.

6.2.6.2.3 Provide input to end-to-end validation testing of edge router and Russian routerfunctionality over the MLM cable including:

- Development of end-to-end functional test procedures for the US router by 06/15/12.
- Integration of US and Rocket Space Corporation – Energia (RSC-E) procedures into a common volume by 07/30/12.
- Execution of the end-to-end validation test procedures that pertain to USOS devices. Test shall be performed as RSC-E by 09/26/12.
- Ethernet cable testing using the Fluke cable analyzer by 09/26/12.
- Generate final test report for the complete (USOS and Russian tests) end-to-end validation testing by 10/15/12.
- Deliver edge router configuration file upgrades to support redundant link to the Russian Segment MLM router by 10/30/12.

6.2.6.3 Media Conversion for Payloads (S/A 1993; SSCN 13672)

The contractor shall procure an Off-the-Shelf (OTS) media converter to provide conversion from wired Ethernet to IEEE 802.11 wireless communication, implement required modifications to support flight operations, and deliver (via 1149) sixty five Class I Modified OTS (MOTS) circuit cards to NASA by August 27, 2014.

6.2.7 JAXA LAN

The Contractor shall update (by June 2013) the Integrated Station LAN (ISL) routers to support connectivity between the JAXA/JEM payload network and the OCA Ku band network.

6.2.8 COMMERCIAL VISITING VEHICLES

6.2.8.1 ETHERNET INFRASTRUCTURE

The contractor shall develop, test, and deliver an Edge Router configuration file which supports the transfer of SpaceX Dragon Trunk video Ethernet packets. The configuration file shall be delivered to the Mission Build Facility (MBF) no later than 60 days prior to the SpaceX 3 (by May 2013) and SpaceX 4 (by August 2013) missions SPACE X CONNECTIVITY.

6.2.8.2 ADDITIONAL SPACE X CAPABILITIES (S/A 1976, SSCN 13629)

The contractor shall update (by September 2013) the onboard ISS Integrated Station LAN (ISL) routers to support connectivity between the Space-X visiting Vehicle network and the ICU Ku bank network and provide the following capabilities during berthed operations only

- Downlink of recorded data from SpaceX data recorder,
- Downlink of real-time telemetry,
- Downlink of payload data on the Payload LAN from Powered Cargo Payloads (externally in the Dragon Trunk or internally in the Pressurized Cargo Rack)
- Uplink of files for contingency purposes.

6.2.9 Network Monitoring System for the International Space Station (ISS) Joint Station LAN (JSL) (S/A 1951, CD 13614)

The contractor shall deliver a network monitoring capability for the ISS Joint Station LAN which provides real-time network (ground and on-orbit) performance monitoring, diagnostics, reporting capability and data collection (by December 2013).

6.3 REVISED SHUTTLE LAUNCH LOADS

The contractor shall assess the impact of NSTS 37329, revision B, change 3, "Structural Integration Analyses Responsibility Definition for Space Shuttle Vehicle and Cargo Element Developers," for all Boeing sustained elements launched on the Shuttle. This includes the determination and recommended resolution of issues and concerns.

6.4 MODEL ENHANCEMENT

The contractor shall develop and incorporate model enhancements to the passive thermal models (ISS simplified model and detailed element level models of S0, P6, S1 and P1) resulting in an overall improvement of 50% (combination of both accuracy and efficiency improvement) to the detailed element level-models. (S/A 1346)

6.5 WASTE AND HYGIENE COMPARTMENT INTEGRATION (WHC) (S/A 1376 – 6.5.1) (S/A 1488 – 6.5.2 through 6.5.8) (S/A 1548 – 6.5.9)

6.5.1 The contractor shall perform the following tasks in support of the early RSC-Energia efforts for ACYK (Russian toilet + "Kabin") conceptual layouts and analysis:

- Develop a low fidelity volumetric computer aided design (CAD) model of the refrigerator freezer rack in IGES format and provide to NASA by September 14, 2006.

- Develop the not-to-exceed internal rack limit loads and provide to NASA by September 14, 2006.

- Develop the list of data required from RSC-Energia for the development of an internal interface control document (IICD) and provide to NASA by August 29, 2006.

- Support the review and draft development of the IICD and the JSC WHC requirements documents.

- Support weekly NASA/RSC-Energia telecons related to the ACYK through October 24, 2006.

6.5.2 The contractor shall provide an Internal Interface Control Document (IICD) defining interfaces between the Refrigerator Freezer Rack and the RSC-E ACY-K.

6.5.3 The contractor shall provide a Unique Interface Control Document (UICD) defining requirements for the WHC using SSP 57000 "Pressurized Payloads Interface Requirements" document as a template.

6.5.4 The contractor shall support the following activities to be conducted in Russia:

- ACYK Critical Design Review (CDR)

- ACYK System Acceptance Review (SAR)

6.5.5 The contractor shall perform structural analysis of the local attachment structure of the following ACY components to determine the ability of the components to meet MPLM launch requirements:

- EDV
- Wringing collector
- Water pump
- Solid waste tank
- Air Filter
- Fan
- Pre-treat assembly
- Sensor assembly
- Pump-sep control
- Fan Control panel
- Air and electrical pre-treat unit

6.5.6 The contractor shall develop one prototype and two protoflight power supplies for the WHC rack power distribution by March 2007.

6.5.7 The contractor shall provide a non-functioning rack ACY fit check unit by September 30, 2008.

6.5.8 The contract shall track on-orbit performance of the WHC rack system, including ACYK components, and recommend qualtity of spares and consumables to be purchased by NASA on a yearly basis.

6.5.9 The contractor shall provide the following items to support the launch of the WHC on flight ULF-2 in November 2008:

- Delivery of hardware items via DD1149, tagged with part numbers and bagged for delivery:
  - A clear flexible silicone rubber cover fitting the outside dimensions of the following components in the WHC rack. The surrounds of the material will be fitted with strip magnets for attachment:

    ACY-SPK-U and Hydraulic Interface Control Panels (one piece) ACY fan control panel, rack power switch, and the Urine Monitoring System (UMS) power and fluid interface Connections (one piece)

  - A clear flexible silicone rubber cover fitting the outside dimensions of the Avionics 3 Rack power. The surrounds of the material will be fitted with strip magnets for attachment.

  - A clear flexible silicone rubber cover fitting the outside dimensions of the Utility outlet Panel between the WHC and AV-3 racks. The surrounds of the long sides of the material will be fitted with strip magnets for attachment.

  - An aluminum foam filter fitting the outside dimensions of the WHC fan inlet. The filter frame will contain a full shield on the front and partial deflector on the bottom and sides. The filter will be replaceable on orbit. The contractor shall provide 6 replacement filters.

  - A 316 stainless steel mesh cover fitting the top opening dimensions of the WHC Kabin. The attachment methodology will include eyelets that can be used with existing on-orbit bungee cords to attach to the Kabin walls

- Materials certification for the above items.

- A hazard assessment of the above items as stand-alone covers (not the integrated function).

- A Computational Fluid Dynamics analysis with all the covers in place to calculate air flow paths and ventilation within the WHC and Kabin.

6.5.10 ADDITIONAL WHC COVERS

6.5.10.1 The contractor shall provide via 1149 the following Waste Hygiene Compartment (WHC) cover by October 20, 2010:

- 316-Stainless steel mesh cove fitting the top opening dimensions of the WHC Kabin – Part Number SK683-99217-5- Quantity = 1

6.5.10.2 The contractor shall provide via 1149 the following Waste Hygiene Compartment (WHC) covers by October 31, 2011:

- Quantity of five (5): ACY-SPK-U and Hydraulic Interface control Panels Covers – Part number SK683-99217-10

- Quantity of six (2 modified): Covers for ACY fan control panel, rack power switch, and the Urine Monitoring System (UMS) power and fluid interface connections – Part number SK683-99217-11. Two of the six covers shall bedelivered modified for UMS utility cable interface according to the on-orbitprocedure for modification of the cover. "WHC Hygiene Cover Mod Procedure," December 2010.

- Quantity of three (3): 316-Stainless steel mesh covers fitting the top opening dimensions of the WHC Kabin – Part number SK683-99217-5

6.6 SOLAR ARRAY LONGERON SHADOWING MITIGATION (S/A 1384)

6.6.1 SOFTWARE MODIFICATIONS

The Contractor shall develop software requirements and generate the standard out product necessary to detect shadow zone infringement on the solar arrays, reconfigure the SAFJ to mitigate the structural hazard, and autonomously operate the solar arrays to provide additional power generation.

6.6.2 DEVELOPMENT OF NOMINAL AND CONTINGENCY OPERATIONS RESPONSE PLAN (S/A 1398)

The contractor shall provide technical input to the NASA Mission Operations Directorate (MOD) for development of a nominal and contingency response plan for solar array operations by:

a) Providing loads and dynamics and environmental analysis of the beta gimbal assembly (BGA) and solar alpha rotary joint (SARJ) as a function of SAFJ and BGA angle for ISS vehicle attitude maneuvers and operations (including shuttle docked).

b) Providing input on the development of Mission Control Center (MCC) tools and validation of the tool.

c) Providing an assessment of the risk posture for exceeding load limits to support resolution of a long duration loss of attitude control recovery.

6.6.3 SOLUTION TO MITIGATE SOLAR ARRAY LOGERON SHADOWING CRITICAL HAZARD AND SUPPORT POWER GENERATION CAPABILITIES (S/A 1451)

6.6.4 ACCELERATION OF ADJACENT ARRAY STUDY (S/A 1717 – SSCN 12632)

The contractor shall accelerate the longeron shadowing adjacent array shadowing special study, to assess the adjacent array longeron shadowing phenomenon and quantify the likelihood of sustaining a shadowed condition sufficient to cause an ISS hazard (approved by the Space Station Program Control Board on 10/19/10), from June 14, 2011 to May 17, 2011.

6.6.3.1 The contractor shall deliver flight software to manage electrical power imbalance at high solar beta angles due to solar array shadowing and that provides automated detection and mitigation of longeron shadowing hazard.

6.6.3.2 The contractor shall deliver validated solar array pre-positioned loads for high solar beta energy balance management that supports all flights.

6.6.3.3 COMPLETE

6.6.3.4 Develop and verify ground based tools to define array positioning.

6.7 FUNCTIONAL CARGO BLOCK (FGB) INTEGRATION

6.7.1 COMPLETE

6.7.2 COMPLETE

6.7.3 EXTENSION OF THE FUNCTIONAL CARGO BLOCK (FGB) STRUCTURAL LIFE CERTIFICATION (Clause H.58 Applies) (S/A 1499)

6.7.3.1 The Contractor shall conduct testing of the FGB dynamic test article to determine the FGB structural life capability.

6.7.3.2 The Contractor shall assess the subsystems within the FGB to identify requirements and impacts for delta life certification:

a) Hardware requiring delta life certification;
b) Analysis or testing required to accomplish delta life certification;
c) Suppliers impacted;
d) Schedule for when analysis or re-testing is required.

6.7.4 EXTENSION OF FGB DOCKING MECHANISM STRUCTURAL LIFE CERTIFICATION (S/A 1563)

The Contractor shall perform testing and analysis to support the extension of the life certification of the FGB module docking units by as much as 15 years past the current certification date of 2013.

6.7.5 SERVICE LIFE EXTENSION OF FGB NON-REPLACEABLE HARDWARE (S/A 1669) (SSCN 12283 – S/A 1794)

6.7.5.1 SERVICE LIFE EXTENSION THROUGH 2020 (S/A 1669)

The contractor shall perform test and analysis to determine the viability of the FGB propulsion system (including propellant transfer and storage), thermal system, pressurized hull passthroughs, and Gas Composition Support System (GCSS) for extended service life through 2020.

6.7.5.2 SERVICE LIFE EXTENSION THROUGH 2028 (SSCN 12283 - S/A 1794, SSCN 12283 – S/A 1820)

6.7.5.2.1 NON-REPLACEABLE HARDWARE (SSCN 12283 – S/A 1794)

The contrctor shall perform tests and analyses by August 2014 to assess the viability of Functional Cargo Block (FGB) Non-Replaceable Hardware through 2028 for components of the propulsion system,

structures system, thermal control system, electrical power system, gas composition system and soft goods.

6.7.5.2.2 THERMAL ANALYSIS (SSCN 12283 – S/A 1820)

The contractor shall perform thermal analysis for the Functional Cargo Block (FGB) Power Loss scenario, evalulate the transient effects, including time to effect for freezing of the cooling loops, and develop a mitigation plan for the risk of freezing the FGB module by August 31, 2013.

6.7.5.2.3 PRE-EMPTIVE R&R PROCEDURE (SSCN 12283 – S/A 1820)

The contractor shall accelerate the development of the pre-emptive R&R procedure for the set of spare EPS units (Main power assembly bus, Filter unit, Power supply unit (11M156M) from August 2014 to December 13, 2012. The R&R procedure delivered at this time will be based on preliminary thermal analysis and preliminary shut down command procedure. The final pre-emptive R&R procedure shall be delivered with the newly built EPS spares (DIL items 51494, 51495, 51496).

6.7.5.2.4 SUSTAINING AND MAINTENANCE PLANS FOR EPS ORUS (SSCN 13209-S/A1878)

The contractor shall develop diagnostics procedure(s) for FGB non-replaceable Electrical Power System (EPS) units (Main Bus Unit, Filter Unit, and Power Distribution Unit) and a diagnostics data analysis plan, including frequency of conducting procedures and data analysis procedures to determine hardware health (by November 2013).

6.7.6 FGB Module Maintenance and ORU Replacement (S/A 2060 – SSCN 13079)

The contractor shall provide an FGB Maintenance and ORU Replacement Plan, including required repair and replacement procedures, for the FGB Phase IV DIL (DIL ID numbers 51750 – 51794) items by June 2018 (H. 57 Clause).

6.8 COMMERCIAL ORBITAL TRANSPORTATION SERVICES (COTS) INTEGRATION

6.8.1 SUPPORT TO COTS SYSTEM REQUIREMENTS REVIEW (SRR) (S/A 1401)

The contractor shall provide multidiscipline technical review of SSP 50808, ISS to COTS IRD, and SSP 50809, ISS to COTS ICD (both dated 10 October 2006), and perform the following tasks pertaining to these documents:

a) Identify areas of incompatibility or risk.

b) Propose revisions to the documents to ensure compatibility with ISS standards.

c) Attend customer coordination meetings.

d) Prepare for and support COTS formal reviews pertaining to these documents (for both Rocketplane Kistler and Space X).

6.8.2 SYSTEM REQUIREMENT REVIEW (SRR) ACTION CLOSURE (S/A 1487)

The contractor shall close all assigned SpaceX SRR actions and issues.

6.8.3 INTERFACE REQUIREMENTS DOCUMENT (IRD) DEVELOPMENT

6.8.3.1 The contractor shall revise the SpaceX COTS to ISS Interface Requirements Document (IRD) to include coordinated verification requirements (Section 4). (S/A 1487)

6.8.3.2 The contractor shall provide inputs to SSP 50808 "ISS to COTS IRD" necessary for the SpaceX and Orbital vehicles to interface with the ISS vehicle during proximity operations, including automated rendezvous and docking/berthing (AR&DB) and departure and integrated on-orbit operations. (S/A 1571)

6.8.3.3 The contractor shall provide training and training materials to Orbital Sciences for interface requirements familiarization. (S/A 1571)

6.8.4 SOFTWARE ICD DEVELOPMENT

6.8.4.1 The contractor shall develop, coordinate and Program baseline the SpaceX COTS to ISS software Interface Control Document (ICD) and update as required. (S/A 1487)

6.8.4.2 The contractor shall develop and release a Common Visiting Vehicle Software ICD which contains software interface requirements for a generic vehicle that include the definition of the command and data interface to the ISS command and data handling architecture and update as required. (S/A 1571)

6.8.4.3 The contractor shall provide training and training materials to Orbital Sciences for software requirements familiarization. (S/A 1571)

6.8.5 VERIFICATION PLANNING, DEVELOPMENT AND CLOSURE

6.8.5.1 The contractor shall develop and coordinate a verification strategy for SpaceX COTS (S/A 1487)

6.8.5.2 The contractor shall develop and coordinate a verification strategy for the Orbital Sciences Demo flight. (S/A 1571)

6.8.5.3 The contractor shall review closeout verification data products for compliance to The SpaceX to ISS IRD in preparation for the SpaceX Demo 2 Flight (rendezvous) and Demo 3 (berthed) flight. (S/A 1571)

6.8.5.4 The contractor shall review closeout verification data products for compliance to the ISS to COTS IRD (SSP 50808) and the Orbital hardware ICD (SSP 50885) in preparation for the Orbital Sciences Demo berthed flight in March 2011 (FY 10/11). (S/A 1605)

6.8.6 DATA SUBMITTAL AND EXCHANGE

6.8.6.1 The contractor shall develop coordinated data submittal agreements for SpaceX COTS, including all required data to be transferred and associated delivery dates. (S/A 1487)

6.8.6.2 The contractor shall develop coordinated data submittal agreements for the Orbital Science vehicle to support requirements development, verification planning, assessment of requirements compliance and subsystem analysis including all required data for transfer and associated delivery dates. (S/A 1571)

6.8.7 DESIGN AND SAFETY REVIEW PARTICIPATION

6.8.7.1 The contractor shall review design and safety review data for COTS (SpaceX and Rpk) to determine ISS interface requirement compliance, identify areas of incompatibility and risk, and obtain necessary data for authorized technical integration activities. The contractor shall participate in review for this data. (S/A 1571)

6.8.7.2 The contractor shall review design and safety review data for Orbital Science COTS to determine ISS interface requirement compliance, identify areas of incompatibility and risk, and obtain necessary data for authorized technical integration activities. The contractor shall participate in reviews for this data. (S/A 1571, 1605)

6.8.8 ACTION AND ISSUE CLOSURE FROM DESIGN AND SAFETY REVIEWS

The contractor shall close all assigned actions and issues from COTS vehicle, SpaceX and Orbital Science vehicle design and safety reviews. (S/A 1487, 1571, 1605)

6.8.9 INTERFACE DEVELOPMENT

6.8.9.1 The contractor shall provide inputs to and identify issues/risks related to the SpaceX COTS ICD and review and provide inputs to support revisions. (S/A 1487)

6.8.9.2 The contractor shall provide inputs for hardware interface control requirements definition for the Orbital vehicle and review and provide inputs to support revisions. (S/A 1571, 1605)

6.8.10 HARDWARE/SOFTWARE CHANGE DEFINIION (S/A 1487/1571)

The contractor shall develop draft requirements for ISS H/W and/or S/W development or modification required to accommodate the SpaceX and Orbital Sciences vehicles at the ISS.

6.8.11 TEST STRATEGY DEFINITION

6.8.11.1 The contractor shall support development of and identify issues related to the draft test strategy/approach for the SpaceX COTS Program to ensure required tests exist to allow the vehicle to be integrated with the ISS and to satisfy ISS Program CoFR requirements. (S/A 1487)

6.8.11.2 The contractor shall develop draft test strategy/approach for recommended or required tests to allow SpaceX and Orbital Science COTS vehicles to integrate with the ISS and successfully complete CoFR. (S/A 1571)

6.8.12 OPERATIONAL CONSTRAINT DEFINITION (S/A 1487)

The contractor shall define operational constraints as part of performing the SpaceX COTS SOW tasks.

6.8.13 DESIGN AND VERIFICATION ANALYSIS

6.8.13.1 The contractor shll define and perform applicable analyses to support planned verification of the initial demonstration flight of SpaceX COTS to determine design drivers for the following areas: (S/A 1487)

- Loads and Dynamics
- Robotics/End-to-End Berthing and Integration
- Guidance, Navigation and Control
- Environmental Control and Life Support
- Environments
- Material and Processes;
- Propulsion System Integration
- Vehicle Integrated Performance
- Resources

6.8.13.2 The contractor shall perform verification analysis cycle (VAC) analyses for the SpaceX Demo flight2 (rendezvous) and Demo flight 3 (berthed) to support execution/closeout of pre-flight verification tasks. (S/A 1571)

6.8.13.3 The contractor shall perform required analysis for demo flights of the Orbital Sciences COTS vehicle to determine design drivers for the Orbital Sciencevehicle and support pre-flight verification planning. The analyses shall be in the following areas: (S/A 1571)

- Loads and Dynamics
- Robotics/End-to-End Berthing and Integration

- Guidance, Navigation and Control
- Environmental Control and Life Support
- Environments
- Material and Processes;
- Propulsion System Integration;
- Vehicle Integrated Performance
- Resources
- Thermal
- Power

6.8.13.4 The contractor shall perform verification analysis cycle (VAC) analyses for the Orbital Sciences Demo flight to support execution/closeout of pre-flight verification tasks. The VAC will include GN&C (FY10/11). (S/A 1605)

6.8.14 PASSIVE COMMON BERTHING MECHANISM (CBM) ENGINEERING PACKAGE (S/A 1487)

6.8.14.1 The contractor shall deliver a complete engineering package to NASA to enable manufacture and verification of a passive common berthing mechanism (CBM) by June 2008. This package shall include the latest up-to-date drawings of the Node 2 Nadir Passive CBM configuration, identification of equivalent processes for Boeing proprietary specifications, and identification of open items, waivers and/or noncomformaces for the configuration

6.8.14.2 The contractor shall provide interpretation of data for 90 days after the last data delivery.

6.8.15 JOINT TESTING WITH SPACEX AND ORBITAL SCIENCESs

6.8.15.1 PCBM ACCEPTANCE TESTING

6.8.15.1.1 The contractor shall perform passive CBM acceptance testing for the SpaceX Dragon Flight vehicle 3 at the SpaceX facility. (S/A 1556)

6.8.15.1.2 The contractor shall perform passive CBM acceptance testing for the Orbital Sciences Cygnus Flight vehicle at the Orbital Sciences facility (FY11). (S/A 1605)

6.8.15.2 POWER QUALITY TESTING

6.8.15.2.1 The contractor shall develop and perform power quality testing per SSP 50808 (source and load electrical requirements) for the ISS to SpaceX Dragon electrical interface and document in a final test report. (S/A 1556)

6.8.15.2.2 The contractor shall develop and perform power quality testing per SSP 50808 (source and load electrical requirements for the ISS to Orbital Sciences Cygnus electrical interface and document in a final test report (FY10). (S/A 1605)

6.8.16 INTEGRATION OF SPACEX AND ISS AVIONICS AND SOFTWARE SYSTEMS (S/A 1563)

6.8.16.1 INTEGRATION ACTIVITIES (S/A 1563)

The contractor shall perform the activities required to integrate the SpaceX and ISS avionics and software systems to support test and flight operations (proximity and berthed operations) through SpaceX Demo Flight 3. This includes system hardware and software integration of the COTS Ultra High Frequency Communications Unit (CUCU) with the ISS vehicle.

6.8.16.2 CHANNELIZATION ASSESSMENTS (S/A 1563)

The contractor shall perform channelization assessments between the following:

- ISS vehicle and the SpaceX CUCU
- SpaceX vehicle interface with the ISS vehicle

The SpaceX vehicle to ISS vehicle assessment shall be performed to the first level of interface between the two vehicles and include ISS GNC and ISS flight critical interfaces.

6.8.16.3 SIMULATOR DEVELOPMENT AND INTEGRATION (S/A 1563)

6.8.16.3.1 SDIL SIMULATION CAPABILITIES (S/A 1563)

The contractor shall update SDIL with the hardware and software capabilities necessary to support integration, test and verification activities for the SpaceX vehicle, including functional and physical interface between the SDIL and the SpaceX simulator.

6.8.16.3.2 ISS SIMULATOR DEVELOPMENT AND INTEGRATION (S/A 1563)

The contractor shall perform the following simulator and integration activities:

- Develop and provide an ISS simulator to SpaceX for use in integrated testing at the SpaceX facility.
- Deliver all associated software and hardware tools, documents, and user guides necessary for the installation and operation of the ISS simulator.
- Develop and provide an ISS simulator to SpaceX for use in integrated testing at the SpaceX.
- Provide the hardware interface between the ISS simulator and the SpaceX facility.
- Provide training to SpaceX personnel on the use of the ISS simulator.

6.8.17 COFR PLANNING

6.8.17.1 The contractor shall submit inputs for the development of updates to the ISS CoFR plan (SSP 50108) for the SpaceX demo 2 flight (rendezvous) and Demo 3 flight (berthed). (S/A 1571)

6.8.17.2 The contractor shall submit inputs for the development of updates to the ISS CoFR plan (SSP 50108) for the Orbital Sciences Demo flight (FY10/11). (S/A 1605)

6.8.18 INTEGRATION OF ORBITAL SCIENCES COTS CYGNUS VEHICLE AND ISS AVIONICS AND SOFTWARE SYSTEMS (S/A 1599)

6.8.18.1 INTEGRATION ACTIVITIES

The contractor shall perform the activities required to integrate the COTS Cygnus vehicle and ISS avionics and software systems to support test and flight operations (proximity and berthed operations) through the Cygnus demo flight.

6.8.18.2 CHANNELIZATION ASSESSMENTS

The contractor shall perform a channelization assessment between the ISS and Cygnus vehicles using data provided by NASA/Orbital. The assessment shall be performed to the first level of interface between the two vehicles and include ISS GNC and ISS flight critical interfaces.

6.8.18.3 SIMULATOR DEVELOMENT AND INTEGRATION

6.8.18.3.1 SDIL SIMULATION CAPABILITIES

The contractor shall update SDIL with the hardware and software capabilities necessary to support integration, test and verification activities for the Cygnus vehicle, including functional and physical interface between the SDIL and the Orbital Sciences simulator.

6.8.18.3.2 ISS SIMULATOR DEVELOPMENT AND INTEGRATION

The contractor shall perform the following simulator and integration activities:

- Develop and provide an ISS simulator to Orbital Sciences for use in integrated testing at the Orbital facility
- Deliver all associated software and hardware tools, documents, and user guides necessary for the installation and operation of the ISS simulator.
- Provide the hardware interface between the ISS simulator and the Orbital Sciences facility.

- Provide training to Orbital Schiences personnel on the use of the ISS simulator.

- Provide integration support for checkout at the Orbital Sciences facility.

6.8.19 ACBM TO PCBM PRESSURE SEAL ANALYSIS FOR ORBITAL DEMO FLIGHT BERTHING TO ISS

The contractor shall perform an analysis using Orbital provided models to verify the ACBM of the ISS will support the capability to attach to and from a pressurized seal with the PCBM of the Cygnus for the Orbital Demo flight (FY10 & FY11). (S/A 1605)

6.8.20 DIGITAL PRE-ASSEMBLY (DPA) AND CABLE/FLUID ASSESSMENT

6.8.20.1 The contractor shall perform DPA measurements and static fit analysis for ISS element mating interfaces with Orbital visiting Vehicle (FY11). (S/A 1605)

6.8.20.2 The contractor shall perform Cable and fluid Asessments (C&FA), including an as-designed audit, as-built audit, and mate/fit-check of IVA cable and fluid interfaces between the ISS and Orbital visiting vehicle (FY11). (S/A 1605)

6.8.21 OUTGAS TESTING (S/A 1629)

The contractor shall perform outgas rate testing on SpaceX and Orbital vehicle materials to support analysis and verification that these vehicles are compliant with induced contamination limits defined in the COTS IRD. Testing shall be performed according to the ASTM E 1559 standard (Standard Test Mthod for Contamination Outgas Characteristics of Spacecraft Materials) and the results of the testing shall be provided NLT Launch -4 months for the specific vehicle.

6.8.22 INTEGRATION OF HRSGFS ON SPACEX FSE (FLIGHT SPACEX-2) (S/A 1647)

The contractor shall perform the following functions to launch and integrate two Heat Rejection System Grapple Fixtures (HRSFSs) on SpX-2 in the Dragon Trunk by 9/30/10:

- Assess SpaceX provided launch loads of the Grapple Bars to determine if the grapple bars can support those loads at the cup cone interface and resolve analytical issues

- Revise the grapple bar interfaces for SpaceX FSE top assembly drawing.

- Participate in "Grapple Bar FSE Preliminary Design Review (PDR)" and "Interim Design/Ops Review #3 (CDR)" to identify issues and concerns with the designs and interfaces, write Review Item Discrepancies (RIDs), and work actions assigned to close.

- Perform thermal evaluation of on orbit operations of the grapple bar attached to the SpaceX FSE.

6.8.23 ASSESS SPACEX UNPRESSURIZED CARGO PROCESSES (S/A 1660)

The contractor shall assess SPACEX processes for unpressurized analytical and physical integration for two early non-demonstration flights with external cargo, and provide issues, concerns, and recommendations for improvement.

6.8.24 SPACEX 4 FRAM DEVELOPMENT TESTING (S/A 1706-SSCN 12546)

The contractor shall perform the following testing to support SpaceX in the first manufacture and test of FRAMs:

- Thermal-Vacuum and random vibration acceptance testing and bake out of one SpaceX provided (EXPRESS) Pallet Adapter (ExPA) per acceptance test report CMC-FRAM-00001-ATR by April 29, 2011.

6.8.25 PARTIALLY INSTALLED FRAM ON SPACEX 3 FLIGHT (S/A 1745 – SSCN 12820

The contractor shall perform the following tasks to determine issues associated with a partially installed FRAM on SpX-3 by December 201l:

1) A capability study to determine FRAM allowable loads in a worst-case partially installed state in the SpaceX 3 trunk for STP-H3 payload insertion for disposal. This shall include validation of assumptions on turn count and load path configurations.

2) Integrate passive and active non-linear FRAM model to SpaceX – provided Craig-Bampton (CB) model of Dragon capsule and trunk

3) Develop loads, including non-linear effects, of a partially installed FRAM during on-orbit loading unberth, and SSRMS maneuver to separation point

4) Provide non-linear FRAM model for coupled loads assessment of SpX-3 separation maneuver

5) Develop FRAM loads for separation maneuvers within the ISS Keep-Out-Zone (KOZ).

6.8.26 CONTAMINATION ASSESSMENT OF DRAGON TRUNK (SSCN 13366 – S/A 1899)

The contractor shall perform analyses of contamination induced by the SpaceX Dragon trunk and integrated Dragon payloads/cargo/FSE complement while in transit and mated to ISS prior to deployment on ISS, and identify induced contamination issues and violations to payloads/cargo. Analyses shall be completed by Launch-5 months for SpX-3 (July 2013 launch) and Launch-6 months for all subsequent SpaceX flights. Analyses include the following:

- Analysis of Dragon trunk with integrated payloads/cargo and FSE material outgassing induced contamination onto payloads/cargo surfaces (trunk to payloads/cargo and payload/cargo/FSE-to-payload/cargo contamination).

- Analysis of Dragon trunk plume/pyro induced contamination onto payloads/cargo (Dragon separation from Falcon 9 upper stage) for SpaceX 3 only.

6.9 PAYLOAD INTEGRATION

6.9.1 PASSIVE RACK ISOLATION SYSTEM (PaRIS)

6.9.1.1 PASSIVE RACK ISOLATION SYSTEM (PaRIS) ISOLATION PLATE RECONFIGURATION AND ENGINEERING SUPPORT OF A NASA PaRIS TRAINER BUILD

A. The contractor shall perform the following physical integration functions to assist NASA in the modification of the PaRIS isolation base plate assembly:

1) Remove the isolation plate from the Combustion Integrated Rack (CIR) located at the NASA Glenn Research Center (GRC) and prepare it for shipment to the HPSC.

2) Reconfigure the isolation base assembly into a stowed assembly, integrate captive fasteners, re-identify /identify hardware as necessary,

install GFE identify labels and perform verification and requirement reviews.

3) Re-install the modified isolation plate less the crossbeam into the CIR at GRC. Provide the crossbeam as part of the PaRIS stowed items kit.

B. The contractor shall perform the following tasks to assist NASA in the development of a PaRIS trainer:

1) Modify a residual asset international standard payload rack (ISPR) by drilling holes necessary for installation of the PaRIS equipment per PaRIS to ISPR ICD, SSP 57058.

2) Modify a residual asset PaRIS front isolator base bracket assembly per NASA specified drawing and assemble the same captive fasteners specified in SOW 6.9.1.1.A.

3) Provide engineering input to the development of the NASA PaRIS trainer.

6.9.2 INTEGRATION OF THE EXPEDITE THE PROCESSING EXPERIMENTS TO SPACE STATION (EXPRESS) SUBPALLET PAYLOADS IN THE EXPRESS LOGISTICS CARRIER (ELC) (S/A 1430) (S/A 1547)

6.9.2.1 PROGRAM DOCUMENTATION

The contractor shall develop and Program baseline the following documents:

- ELC to P/L and Cargo Interface Requirements documents [DR F-SE-44]
- Develop ELC to P/L and Cargo Interface Control Document Template [DR F-SE-44]
- ELC to International Space Station Interface control Documents [DR F-PA-16]
- ELC to Payload Interface Control Documents [DR F-PA-16]

6.9.2.2 STAGE ANALYSIS

The contractor shall perform stage analyses for the ELC and the payloads for the ULF3 stage.

6.9.2.3 PAYLOAD EXCEPTIONS

The contractor shall process ELC and ELC subpallet payload exceptions as required.

6.9.2.4 UPGRADE THE PAYLOAD SOFTWARE INTEGRATION AND VERIFICATION FACILITY (PSIV)

The contractor shall upgrade the payload software integration and verification facility hardware and software to support ELC, flight equivalent units (FEUs), and ELC payload simulations to perform payload software interface verification with the payload command and data handling system.

6.9.2.5 SUSTAINING ENGINEERING AND POST PRODUCTION SUPPORT OF THE ELC ELECTRICAL GSE (EGSE)

6.9.2.5.1 The contractor shall convert the GSFC provided ELC EGSE drawings to a format maintainable by Boeing.

6.9.2.5.2 The contractor shall provide design support to the GSFC ELC Project.

6.9.2.5.3 The contractor shall provide sustaining engineering and post production support for the GSFC provided ELC electrical GSE (payload interface test equipment). (S/A 1547)

6.9.2.5.4 The contractor shall provide Help Desk support to users of the EGSE devices. (S/A 1547)

6.9.2.6 MODIFICATION TO STEP SOFTWARE FOR ELC INTERFACES TO PAYLOADS (S/A 1658)

The contractor shall develop and incorporate a patch to the Suitcase Test Environment for Payload (STEP) software that will emulate the EXPRESS Logistics Carrier (ELC) MIL-B-1553B and Ethernet interfaces to Payloads by October 2010.

6.9.3 SUPPORT TO THE OPERATIONAL CONCEPT FOR 6 PERSON CREW FOOD PREPARATION SYSTEM (S/A 1451) (S/A 1547)

6.9.3.1 The contractor shall develop/update, baseline, and maintain the following ICDs:

- EXPRESS Rack 6 ICD, SSP 57206
- Food Warmer ICD, SSP 53110
- Potable Water Dispenser (PWD) ICD, SSP 53109
- Food Preparation Rack (EXPRESS Rack 6) Unique Software ICD, SSP 57306.

6.9.3.2 The contractor shall participate in one preliminary design review and one critical design review for the PWD by reviewing the data packages, identifying issues and concerns, and participating in the resolution of issues and concerns.

6.9.3.3 The contractor shall process exceptions for the potable water dispenser (PWD).

6.9.3.4 The contractor shall support PWD testing and food warmer functional checkout with a flight EXPRESS Rack at KSC by providing engineering discipline support in order to resolve and close interface issues, as required.

6.9.3.5 The contractor shall provide engineering evaluation of verification data for the PWD and food warmer and track and status verification closure of PWD and food warmer requirements.

6.9.3.6 The contractor shall lead the certification of flight readiness for the EXPRESS Rack 6 payload.

6.9.3.7 The contractor shall perform mission integration for the PWD, food warmer and the microgravity experiment research locker incubator (MERLIN).

6.9.3.8 The contractor shall perform an integrated safety assessment of the EXPRESS Rack 6.

6.9.4 HTV PRESSURIZED LOGISTICS CARRIER (PLC) VIBRO ACOUSTIC TEST

6.9.4.1 RACK HARDWARE (S/A 1516)

The contractor shall provide an EXPRESS Transportation Rack (ETR) and rack handling ground support equipment (GSE) to support the ETR incorporation in the HTV Pressurized Logistics Carrier (PLC) acceptance acoustic vibration test on location in Japan.

6.9.4.2 TEST DEVELOPMENT, PLANNING AND IMPLEMENTATION (S/A1516)

The contractor shall provide the engineering necessary to plan, develop, implement and document the incorporation of the ETR into the HTV PLC acceptance acoustic vibration test on location in Japan.

The contractor shall provide on-site support to the HTV PLC acceptance acoustic test and document the results of the testing.

6.9.5 PRCU TO ACASS (S/A 1539)

6.9.5.1 The Contractor shall design and deliver a new cable harness set to connect the KSC payload rack checkout unit (PRCU) remote interface panel (RIP) and a local 120 VDC power supply to the active common attachment system simulator (ACASS) to allow processing or attached payloads in the express logistics carrier rotation stand (ELCRS) in the KSC SSPF.

6.9.5.2 The Contractor shall perform analysis of the cable to verify the resulting PRCU, cable, power supply and ACASS sysem will result in a configuration capable of supporting the required ISS verification testing of attached payloads per SSP 57003, the Attached Payloads Interface Requirements Document, paragraph 3.2.2.3.1 “WIRE DERATING” applies to the cable design.

6.9.6 EXPRESS RACK 8 INTEGRATION ON ULF 5 (S/A 1629)

The contractor shall provide payload integration functions for EXPRESS Rack 8 for launch on ULF-5 (September 2010).

6.9.7 SOFTWARE AUTOMATION TOOLS (S/A 1696 – SSCN 12539)

The contractor shall define, develop and provide the following data recording and tracking tools for use in NASA management of ISS Payloads:

6.9.7.1 Automation software tool to track the initiation, review and approval process for the NASA ISS Payloads Office change evaluation (CEF) form traffic (due May 31, 2011).

6.9.7.2 ISS increment research plan spreadsheet with payload attributes, including mass, volume, and crew time, to upload research plan data directly into the Boeing developed "Payload Tactical Plan Automation Tool" (PAT) database (due April 20, 2011).

6.9.8 INTEGRATION OF BIGELOW EXPANDABLE ACTIVITY MODULE (BEAM) ON ISS (S/A 1697 – SSCN 12616) (S/A 1760 – SSCN 12845)

The contractor shall perform the following tasks to support integration of the BEAM on ISS:

6.9.8.1 Review the NASA provided draft BEAM to ISS Vehicle ICD and provide concurrence on the requirements or identify issues/concerns (due January 2011). **(S/A 1697 – SSCN 12616)**

6.9.8.2 Provide an engineering cost estimate for integration of the BEAM to the ISS based on updated ICD requirements (due January 2011). (**S/A 1697 – SSCN 12616)**

6.9.8.3 Develop and baseline the "Bigelow Expandable Activity Module (BEAM) to ISS Interface Control Document" (SSP 57239) for review at the BEAM SRR and release a post-SRR ICD baseline version by February17, 2012.

6.9.8.4 Participate in the BEAM Systems Requirements (SRR) to ensure the BEAM requirements properly invoke the interface requirements and to determine if there are any specific issues/concerns with the passive thermal and structure and mechanical systems requirements. **(S/A 1760 – SSCN 12845)**

6.9.8.5 Review the draft BEAM Concept of Operations to ensure compatibility with ISS interfaces (due 3 weeks after GFD received). **(S/A 1760 – SSCN 12845)**

6.9.8.6 The contractor shall integrate the BEAM (berthed to Node 3 aft location) with the ISS System for on-orbit operation by May 2015. (S/A 1959 – SSCN 13121).

6.9.8.7 The contractor shall perform the following testing, analysis and audits on the BEAM hardware (S/A 1959 – SSCN 13121; S/A 1991 – SSCN 13121 Rev 2):

- CBM FE1410 acceptance testing on BEAM PCBM in order to verify that all PCBM components are within design limits by October 2014 (Payload Readiness Review (PRR) – 4 months).

- Digital Pre-assembly (DPA) of the as-built measurement for the pre-inflated configuration at the BEAM contractor location and update of the CAD models for these measurements by October 2014 (PRR – 4 months).

- Assembly Analysis of the BEAM as-designed configuration by February 2014 (CDR + 3 months) to validate the approach corridor to Node 3 aft interface. Assebmly Analysis of the as-built models for input to the End-to-End Berthing Integration Team (EBIT) by March 2015 (launch – 2 months).

- Cable & Fluid Assessments (C&FA) audits of the as-designed and as-built configurations, and a mate-fit check/On-Orbit Constraints Test to validate Node 3 interfaces by therne 2014 (PRR – 4 months). Test reports shall be submitted by January 2015 (prior to PRR).

6.9.9 NITROUS OXIDE FUEL BLEND (NOFBX™) ENGINE INTEGRATION (S/A 1722 – SSCN 12634)

6.9.9.1 FEASIBILITY ANALYSIS

The contractor shall perform a study limited to evaluation of the plume effects (contamination, erosion,loads and GN&C) from firings of a Nitrous Oxide Fuel Blend (NOFBX™) engine located on-orbit on a Columbus Starboard Deck X –direction (SDX) attached payload site and identify issues and concerns by July 2011.

6.9.10 PAYLOAD VERIFICATION SOFTWARE TOOL (S/A 1731 – SSCN 12649)

The contractor shall deliver, implement, beta test (within the ISS Payload Community), and provide training materials for a software tool which provides the following functions (by January 2012):

- Allows electronic (web-based) submittal of verification data by Payload Developers,

- Provides web-based interface for Payload Developers to view applicable requirementsand submittal status,

- Allows electronic processing and review of verification data,

- Interfaces with the Interface Control Document (ICD) Development Tool for direct input of applicability matrices from ICDs and Preliminary Interface Revision Notices(PIRNs),

- Provides real-time verification status.

6.9.11 WAKE-ALIGNED REPEATING PULSE (WARP) PROPULSION SYSTEM (S/A 1776 – SSCN 12948)

6.9.11.1 CHARACTERIZATION (SSCN 12948 – S/A 1776)

The contractor shall characterize the key ISS technical parameters of the Wake-Aligned Repeating Pulse (WARP) propulsion system located at P5/S5 locations as defined below (by January 20, 2012).

a. The contractor shall assess the assembly-complete (including the proposed future Russian Science Power Modules and mini connecting node) response of the ISS Momentum management system and the existing GN&C filtering process to the pitch disturbance torque expected from the WARP concept.

b. The contractor shall define preliminary induced environments constraints for plume pointing and distance with respect to ISS hardware. The contractor shall define bounding limits determined by erosion, contamination, molecular column density, net ion density and vehicle charging requirements on ISS.

c. The contractor shall calculate the expected electrical power that will be availableto the WARP system and determine the best option to provide uninterrupted and two fault tolerant power to the WARP system.

d. The contractor shall review existing ISS integrated Hazard Reports to determine if the installation of the WARP system on the ISS will require new hazard causes, controls, or non-compliances.

6.9.12 PAYLOAD LAPTOPS (SSCN 12836 – S/A 1786)

The contractor shall provide the capability to perform virus scans on the EXPRESS and WORF Payload Laptops by March 2013.

6.9.13 KU-BAND FORWARD ACCESS FOR PAYLOAD OPERATIONS (SSCN 13351 – S/A 1919)

The contractor shall perform the following activities to enable KU-Band forward access for Payload Operations:

- Update (by February 2014) the Integrated Station LAN (ISL) routers and the Ipehg to support LAN connectivity between the HOSC Control Center and the ISS Payloads network via Ku band network.

- Provide releases of EXPRESS Common Laptop Software (CLS), PRCU, STEP, Rack Software Test Bed (RSTB) tools, and PSIV/ Payload Test Environment (PTE) software which integrate the Government provided Consultative Committee for Space Data Systems (CCSDS) File Data Protocol (CFDP) software to support Ku band uplink connectivity (by March 2014).

6.9.14 PAYLOADS OFFICE WORKFLOW SOLUTION (S/A1944 – SSCN 12837)

6.9.14.1 The contractor shall provide a web-based, integrated payload–centric data entry interface, Payload Workflow Tool with a common database [all functionality to be complete by February 2015] for payload data which meets the following requirements (S/A1944 – SSCN 12837; S/A 1992 – SSCN 12837 Rev 2):

1. Integrates the following current set of stand-alone software tools and processes listed below:
   A. The following functionality shall be available by September 2013 (Spiral 1):

      - Infrastructure.

      - OZCoFR [NASA Department OZ Certificate of Flight Operations software].

      - Payload Manifest Assessment Tool (PMAT).

      - Change Evaluation Form (CEF) Tracking and Integration (CETI) software, Version 2.0.

      - Verification of Engineering Requirements Interface for Tracking, Approval, and Submission (VERITAS).

- Payload Engineering and Integration (PEI) Internal Tasks & Assignments (PITA).

- Payload Developer (PD) Contact List.

- Payload Unique Documents Website.

B. The following functionality shall be available by March 2014 (Spiral 2):
- Payload Tactical Plan (PTP) Automation Tool (PAT).

- Program Scientist Toolbox.

- Research Plan Spreadsheet.

- CETI Version 3.0.

C. The following functionality shall be available by September 2014 (Spiral 3):

- Payload Integration Manager (PIM), Lead Stage Engineer, and Flight Payload Manager (FPM) schedules within an interactive, integrated visual timeline architecture.

- Cold Stowage Forms.

- Payload Interface Revision Notices (PIRN) Database.

- Payload Guidelines and Constraints (GLC) Database.

D. The following functionality shall be available by February 2015 (Spiral 4):

- Payload Data Library (PDL).

- User Operations Panel (UOP) Resource Requirements.

- Flex Chart [tracking payload objectives].

- Payload Engineering Configuration List/As-Built Configuration List (ECL/ABCL).

- Integrated Payload List (IPL).

2. Includes a capability to display payload end-to-end integration milestones, schedules, and status [September 2014].

3. Includes a capability to exchange data with the ISS Electronic Document Management System (EDMS), Mission Integration Database Application System (MIDAS), Export Control Relational Database Management System (RDBMS), and the Payload/Ground Safety Data Management System (DMS) databases [February 2015].

4. Is housed on NASA Johnson Space Center (JSC) servers under the NASA Data Center (NDC) domain.

6.9.14.2 The contractor shall provide the following documentation for the Payload Workflow Tool (by February 2015):

1. Systems Requirements Document (SRD) [October 2012]

2. Detailed Design Specification (DDS) [Draft October 2012] [Final release February 2015]

3. Concept of Operations (CONOPS) Document [October 2012]

4. Interface Definition Document (IDD) [Draft October 2012] [Final release February 2015]

5. Acceptance Review Plan (ARP) [November 2012]

6. User test procedures and acceptance review package for each spiral phase.

6.10 COMPLETE

6.11 NODE 3

6.11.1 GROUND PROCESSING ACTIVITIES (S/A 1406) (S/A 1547)

A. The contractor shall support/perform the following tasks at Alcatel Alenia Space (AAS):

- Flight wate (ITCS) load
- Software load and post final software load initialization testing
- Active and passive common berthing mechanisms (CBM) final installation, regression testing and acceptance.
- On-orbit constraints test (OOCT) – see SOW section 3.4.1.7.4
- Digital Pre-Assembly (DPA) – see SOW 3.4.1.7.1
- Radial hatch installation (S/A 1451)
- Final installation of CBM meteoroid/debris (M/D) cover (petals) (S/A 1451)

B. The contractor shall refurbish the rack loading kit installation assembly and ship to KSC.

C. The contractor shall coordinate and provide input to resolve government furnished equipment (GFE) nonconformances and issues. (S/A 1451)

H. The contractor shall routinely analyze Node 3 water samples to determine the basic chemical structure**.** (S/A 1451)

6.11.2 LAUNCH AND ASSEMBLY OF INTEGRATED NODE 3 AND CUPOLA (S/A 1460) (S/A 1547)

6.11.2.1 INTEGRATED ELEMENT VERIFICATION

The contractor shall provide input to the verification of the launch configuration of the Integrated Node 3/Cupola element to requirements in SSP 50793 and that the required operations can be executed on-orbit by:

- Performing a Cupola Windows stress analysis

- Performing a CBM to CBM stress analysis for launch
- Performing a thermal environment assessment for the flight element
- Performing a PNP on-orbit analysis of CBM to CBM
- Providing updates to the A&OSP and to operations data for on-orbit operations.
- Assessing on-orbit EVA and Robotics impacts
- Performing an over-pressure analysis of the cupola and IMV for the new launch configuration.
- Closing out verification work.
- Providing input on thermal blanket analysis and design.

6.11.2.2 CBM INSTALLATION

The Contractor shall provide assistance for the CBM-to-CBM ground installation at KSC.

6.12 ZERO PROPELLANT MANEUVERS (ZPM)

6.12.1 The contractor shall perform analyses and develop attitude and attitude rate commands for 4 zero propellant maneuvers.

6.12.2 The contractor shall develop a plan for long term implementation of ZPMs, to streamline the development and execution process.

6.13 COMPLETE

6.14 HARDWARE INTERFACE REQUIREMENTS DEVELOPMENT

6.14.1 The contractor shall develop a draft interface requirements document (IRD) for government and contractor furnished hardware that will operate within the USOS pressurized elements.

6.14.2 The contractor shall lead an ISS Program review of the draft document and present all issues, concerns, and recommendations to the NASA Vehicle Control Board.

6.14.3 The Contractor shall baseline and release SSP 50835, "Pressurized Volume Hardware Interface Requirements Document."

6.14.4 FOAM PACKED ORUs (S/A 1648)

6.14.4.1 ENVELOPING LAUNCH ENVIRONMENT FOR FOAM PACKED ORUs (S/A 1497) (S/A 1648)

The contractor shall determine the enveloping launch environment for foam packed ORUs based on existing ISS Program packing material and packing techniques.

6.14.4.2 PLASTAZOTE FOAM TESTING (S/A 1648)

The contractor shall perform the following tasks in support of Compression and Random Vibration Testing of Plastazote MP15FR Foam (L200 Minicell Foam Replacement):

(Note: The following tasks shall be completed by 9/30/10).

- Develop Test Plan to characterize the static and dynamic stiffness properties of Plastazote MP15FR and to determine if this foam is similar to previously tested foam materials by June 20, 2010.
- Review NASA developed test procedures for compliance with the Boeing developed test plan.
- Participate in the test as an observer to witness test proceeding and resolve testing issues and actions.
- Perform analyses correlation of Plastazote test data with L200 Minicell data and analytical predictions.

(Note: the following tasks shall be completed after 9/30/10).

- Update analytical static deflection and vibration isolation models with Plastazote MP15FR foam test results.

- Document the test results and release Test Report(s).

- Provide inputs to document test results for CIRD update by 2011.

6.14.4.3 LAUNCH VEHICLE HARDWARE ASSESSMENTS (S/A 1701 – SSCN 12560)

The contractor shall perform loads and dynamics reviews and analyses in accordance with SSP 50835, Rev. B, "ISS Pressurized Volume Hardware Common Interface Requirements Document," for manifested hardware items through flight HTV3 (January 2012 per SSP 54100, Rev. D, "Increment Definition and Requirements Document Flight Program").

6.14.4.4 COMPOSITE OVERWRAPPED PRESSURE VESSELS (COPVs) (S/A 2041 – SSCN 13684)

The contractor shall provide three COPVs via DD1149 by December 15, 2013 as spares.

6.14.5 The Contractor shall perform the following tasks in support of the development and implementation of SSP 50835, "ISS pressurized volume Hardware Common IRD" (CIRD) (S/A 1567):

- Provide input to the NASA concept of operations regarding application of the common IDR (SSP 50835) and development of associated certification processes.

- Provide input to and support NASA negotiations with the International Partners (Ips) on approval of the document, development of IP specific appendices, and development of certification processes.

- Document in the appendices the data set required from the hardware provided to satisfy the needs of Ips, cargo integration activities, and mission integration activities.

- Provide input to NASA for approval of unique applicability matrix of CIRD requirements for each hardware item.

- Provide loads and dynamics analysis of GFE and IP hardware items relative to the launch environment and determine hardware compatibility to the launch environment.

6.15 SUPPORT TO INTERNATIONAL PARTNERS (S/A 1425)

6.15.1 HARDWARE/SOFTWARE INTEGRATION (HSI) TESTING

6.15.1.1 COMPLETE

6.15.1.2 COMPLETE

6.15.1.3 COMPLETE

6.15.1.4 JAPAN AEROSPACE EXPLORATION AGENCY (JAXA) H-II TRANSFER VEHICLE (HTV) TESTING (S/A 1465)

The Contractor shall support and conduct an end-to-end test of the H-II Transfer Vehicle (HTV) flight software and HTV Joint Test #20 (additional objectives related to the robotics workstation and HTV rendezvous) utilizing the HTV Control Center (HTVCC) in Japan, the Mission Control Center – Houston (MCC-H), the ground network and the Houston Software Development and Integration Laboratory (SDIL).

6.15.2 COLUMBUS AND JEM MODULE FLUID SAMPLE ANALYSIS

The contractor shall perform analysis on 19 Columbus and 1 JAXA fluid samples to verify the concentration of OPA.

6.15.3 ZERO GRAVITY STORAGE RACKS (ZSRs) CERTIFICATION FOR COLUMBUS LAUNCH CONFIGURATION

The Contractor shall:

- Certify the ZSR for launch in the ESA Columbus module.
- Provide support to ESA’s installation and fit check of the ZSRs.
- Assess operational impacts of NASA rack relocations.

6.15.4 MOVED TO SOW 3.3.7.9.1.2

6.15.5 H-II TRANSFER VEHICLE (HTV) EXPOSED PALLET – MULTI PURPOSE (EP-MP) DESIGN AND DEVELOPMENT SUPPORT (S/A 1494)(S/A 1568)

The contractor shall support the HTV EP-MP Design Review Process by performing the following tasks:

a. Define a "physical shock" capability for the TUS, BCDU, PM, NTA, ATA, CMG, FHRC, and PCU.

b. Perform an integrated on orbit ISS loads assessment with the EP-MP attached to ISS for up to three years. Boeing will assess loads in the ISS structure. Boeing will provide a fatigue spectrum for the EP-MP to NASA.

c. Boeing shall support EP-MP design reviews and Technical Interchange Meetings through FY08. Data packages will be reviewed and Review Item Descrepancies (RIDs) will be written.

d. Technical review of data packages and products for the HTV EP-MP Critical Design Review Package (CDR) and Safety Review Panels (SRP) Phase 0, 1, 2, and 3 to identify areas of incompatibility or risk and submit RIDs.

e. Participate in technical meetings to support development of hardware, issue resolution and formal reviews.

f. Technical review of JAXA provided EP-MP layouts and EVA analyses to determine isues or concerns.

g. Provide an integrated EVA Analysis Report (EAR) of one EP-MP layout (layout to be determined by NASA).

h. Review the ORU max-max loads from 4 of AXA's DCLAs to determine where Environments are not enveloped by previous analysis.

i. Compare JAXA's EP-MP shock environment with the qualification of acceptance tests of the ORUs to thernet any exceedances.

j. Compare JAXA's EP-MP shock environment with the shock rating of the ORUs to identify any exceedances.

6.15.6 ANALYSIS OF ATTITUDES FOR RUSSIAN VEHICLE MANEUVERS (S/A 1500) (S/A 1547)

The contractor shall analyze new attitudes required by Russian vehicle maneuvers to ensure the ISS hardware and software operate within ISS vehicle capabilities. The specific attitudes to be analyzed will be transmitted via a MER CHIT. Analysis will be performed for:

- 2 Russian Vehicle (RV) dockings/yr
- 3RV undockings/yr
- 2RV relocations/yr
- 4 contingency RV dockings/yr
- 2Debris Avoidance Maneuvers (DAMs)/yr

6.15.7 HTV TESTING (S/A 1548)

The contractor shall perform the following tests on the HTV-1 at the Tsukuba Space Center in Japan in accordance with SSP 50420 "NASA/JAXA Bilateral Integration and Verification Plan for HTV":

- Assembly level interface test of the PCBM installed on the HTV-1 Pressurized Logistics Carrier to verify that all PCBM components are within design limits and to satisfy the acceptance test requirements for the PCBM (Test sheet 14).
- As designed and as-bullt assembly analyses to develop flight and stage assessments for the following:
    - HTV-1 to Node 2
    - HTV express pallet (EP) to HTV unpressurized logistics carrier (UPLC)

6.15.8 INTEGRATED MINI RESEARCH MODULE (MRM)-1 POWER TESTING (S/A 1583)

The contractor shall incorporate integrated tests into the verification activities to certify the Russian provided MRM-1 power system and associated CHT-50's (USOS to Russian Segment power converter units) by performing the following tests:

- Primary/secondary power quality testing on a flight or flight equivalent CHT-50.
- Integrated testing on the flight MRM1 module to verify electrical requirements per SSP 50227, "Russian Segment (SSP, SM, and FGB) to PDGF/SSRMS Interface Control Document," Table H4-1, "PVGF to MRM1 Interface Verfication Table."

6.15.9 ADDITIONAL NODE 3 LAUNCH CAPABILITY (S/A 1590)

The contractor shall perform the following tasks to support integration of the Integrated Stowage Platform (ISP) into the MPLM and integration of the PVGF to Node 3 for flights.

- Update impacted software ICDs.
- Perform a standard MIL-STD-1553 analysis to calculate the end to end electrical signal integration of the PVGF to Node 3.
- Update Boeing drawings affected by integration of the ISP into the MPLM and/or integration of the PVGF to Node 3.
- Provide robotics analysis for clearance and SPDM operations.
- Update loads for CBM areas.
- Perform stress review of Alenia work.

6.15.10 INTEGRATION OF CSA MT RELAY BOX ASSEMBY (S/A 1717 – SSCN 12608)

The contractor shall integrate the CSA provided MT relay box assembly (MTRA) with the ISS system in support of a launch no earlier than HTV-3 (January 2012).

6.15.11 RUSSIAN MULTIPURPOSE LABORATORY MODULE (MLM) (S/A 1752 – SSCN 12852) (S/A 1769 – SSCN 10395)

6.15.11.1 RUSSIAN MLM TESTING (S/A 1752 – SSCN 12852)

The contractor shall perform outgassing rate testing on the Multipurpose Laboratory Module (MLM) vehicle materials to support analysis and verification that this module is compliance with induced contamination limits defined in SSP 50094, "NASA/RSA Joint Specifications Standards Document for the ISS Russian Segment." Testing shall be performed according to the ASTM E 1559 standard (Standard Tests Method for Contamination Outgassing Characteristics of Spacecraft Materials) and the results of the testing shall be provided by December 16, 2011.

6.15.11.2 MLM ELECTRICAL POWER SYSTEM INTERFACE (S/A 1769 – SSCN 10395)

The contractor shall perform the following tasks to support implementation and verification of the Electrical Power System (EPS) interface and power transfer cables for the Russian Multipurpose Laboratory Module (MLM):

6.15.11.2.1 Deliver six test cables, representative of DIL items 51467 and 51468, "Cable Assy, Power – MLM" with one end terminated, for MLM flight unit ground checkout by 3/22/2012.

6.15.11.2.2 Provide EPS input, review, and concurrence of USOS to MLM/SM Interface Control Document (ICD) by 6/14/2011.

6.15.11.2.3 Provide EPS input, review, and concurrence of USOS to MLM/SM Interface Control Document (ICD) verification by 8/31/2012.

6.15.11.2.4 Perform power quality and EME testing of DDCU-R by 8/31/2011.

6.15.11.2.5 Perform EPS analysis for post-MLM installed configuration, including analysis for the interim configuration (SM CHT-50 powering the MLM) and the final configuration (MLM receiving power from USOS via external cables) to

determine to MLM/SM compatibility with the USOS EPS (by 9/14/2012).

6.15.12 JEM ORU TRANSFER INTERFACE (JOTI) (SA 1780 – SSCN 12931)

The contractor shall perform the following activities to support the design, manufacture, and certification of the Government Furnished Equipment (GFE) Japanese Experiment Module (JEM) ORU Transfer Interface (JOTI):

- Evaluate the JOTI design and operational environment to determine compatibility with the certification limits /capabilities of the following ORUs (by April 2012):
  - ACBSP, DDCU-E, ECU, EVSU, MDMs, and RJMCs
- Assess the expected compression load the Boeing sustained ORUs will be subjected to by the JOTI hardware. (February 2012)
- Assess the JOTI foam off-gassing against the Boeing sustained ORU capabilities (January 2012)

6.16 SUPPORT FOR SHUTTLE TRANSITION AND RETIREMENT (StaR) DRIVEN ANALYSES AND REDESIGNS (S/A 1460)

6.16.1 SPARES TRADE STUDIES/ANALYSES

6.16.1.1 The Contractor shall create a list of candidate ORUs for redesign. Candidates should have one or more of the following characteristics:

- On the Spares pre-positioned list.
- Planned for procurement on Shuttle Retirement related Provisional Item Orders (PIOs).
- Have a predicted annual upmass demand of greater than 100 lbm.
- Have a predicted annual crew time expenditure of greater than 2 hours for a Remove and Replace (R&R).
- Have parts or process obsolescence issues that make new builds of the current design impossible.

- Have potential incompatibility with expendable launch vehicles (ELVs).

6.16.1.2 The Contractor shall technically evaluate candidate ORUs for potential redesign to minimize upmass, minimize crew time for R&R, resolve obsolescence issues and/or resolve incompatibility issues with ELVs, present the results to the responsible NASA Board, and develop change requests/directives to implement feasible candidates.

6.16.1.3 The Contractor shall screen the 2008 NASA planned spares procurements for build-to-print producibility issues and identify items that require redesign prior to procurement.

6.16.2 SYSTEMS TRADE STUDIES/ANALYSES

6.16.2.1 The Contractor shall conduct detailed trade studies and develop options for supplying nitrogen (ECLSS and TCS), ammonia, and oxygen to the ISS through end-of-life.

6.16.2.2 The Contractor shall conduct a study of all ORUs in the high data rate path, including data sources and recorders, and

- Provide assembly complete architectural descriptions to identify constraints to the system including bottlenecks, single point failures, and signal inputs/outputs.
- Develop architectural redesign options to pursue.
- Perform technology readiness assessments for NASA preferred options.
- Define impacts and schedules associated with recommended options(s).

6.16.3 AVIONICS REDESIGN ACTIVITIES DUE TO OBSOLESCENCE

6.16.3.1 OBSOLESCENCE DRIVEN AVIONICS REDESIGN (ODAR) PHASE II – OPERATIONS CONCEPT DEFINITION AND REQUIREMENTS DEVELOMENT (S/A 1485)

The contractor shall perform the following activities to support the avionics redesign for the SGANT Boom with adapter (new), Automated Payload

Switch (APS) upgrade, Payload Ethernet Hub/Gateway (PEHG) upgrade, and an HDTV communications interface box.

A. Develop a functional requirements matrix which maps the existing capabilities by the orbital replacement unit (ORU) to the proposed new architecture documented on the NASA Avionics webpage.

B. Develop a draft functional requirements document for each proposed new or modified ORU

C. Develop a Concept of Operations for the new system to be coordinated with supporting organizations.

D. Develop pin-to-pin preliminary drawings for the cabling required.

E. Develop single replaceable unit level drawings for the new or upgraded ORUs.

F. Develop a preliminary drawing for Space-to-Ground Antenna (SGANT) boom assembly.

G. Develop a draft Software Description Document for the new ORUs.

H. Develop sequenced configuration sketches for the upgrades and replacements proposed by phase.

I. Develop a program plan for the design, development, test and evaluation of the upgrades and replacements proposed.

J. Recommend a high definition television (HDTV) compression algorithm.

K. Develop high fidelity rough order of magnitude cost estimate for the upgrades and replacements proposed.

6.16.3.2 IMPROVED AUTOMATED PAYLOAD SWITCH (IAPS) PROTOTYPE ACTIVITIES (S/A 1485)

The contractor shall develop and perform prototype activities for the Improved Automated Payload Switch (IAPS) to define hardware and firmware that will perform:

A. All of the legacy functions of the existing APS per SP-M-501B "configuration Item Specification for Automated Payload Switch."

B. New functionality to multiplex Transport Asynchronous Transceiver/Receiver Interface (TAXI) fiber inputs into a single output channel.

6.16.3.3 IMPROVED AUTOMATED PAYLOAD SWITCH (IAPS) IMPLEMENTATION (S/A 1557)

6.16.3.3.1 The contractor shall deliver (DIL items):

- Four modification kits which improve the flight Automated Payload Switch (APS) units to eliminate the 8 channel bottleneck in the KU-band downlink.
- A mod kit for installation of 2 Improved APS (IAPS) units into the US LAB on-orbit.
- One spare switch matrix Circuit Card Assembly (CCA)
- One spare controller CCA

The modification kits to improve the APS shall:

- Retain existing switching function without impacting the faber optic inputs and outputs or the existing users of these inputs and outputs.
- Provide new input dat aggregation function.
- Provide aggregated data output over the existing high rate data link or new high speed digital interfaces to ODAR components.

- Provide a minimum of 95 Mbps aggregated data transfer out the existing high rate data link.

- Provide a minimum of 260 Mbps aggregated data transfer out the new high speed digital interfaces.

- Provide the capability to upload new software/firmware versions.

- Detect, manage and report errors in the commanded input/ouput channel configuration.

6.16.3.3.2 The contractor shall modify one APS qualification unit and one engineering development unit to the improved APS (IAPS) configuration.

6.16.3.3.3 The contractor shall update the flight software to support implementation of the IAPS units in July 2010 (Flight ULF5).

6.16.3.4 ODAR DEVELOPMENT TASKS THRU PDR (S/A 1564)

6.16.3.4.1 The contractor shall perform all activities required to prepare for and conduct System Requirements Reviews (SSRs) and Preliminary Design Reviews (PDRs) for the ODAR Project, the Integrated Communicaitons Unit (ICU), and associated interfacing flight software Computer software Configuration Items (CSCI).

6.16.3.4.2 The contractor shall procure all parts required to build ground and flight cables for the ODAR project and to provide ODAR lab equipment.

6.16.3.4.3 The contractor shall provide a preliminary assessment of ISS Systems Integration Laboratory (ISIL) upgrades required due to ODAR related upgrades.

6.16.3.5 IMPROVED PAYLOAD ETHERNET HUB GATEWAY (Ipehg) (S/A 1593)

The contractor shall provide the following non-flight IPEHG units to support the implementation of the Ipehg:

- One engineering development unit by June 30, 2010 for use in the ISIL.
- One qualification unit by December 31, 2010 for use in the ISIL.
- An Ethernet Test Suite (ETS) for the Joint Station LAN (Houston) to augment existing payload ground facility hardware and enable operation with payloads with 100 base T Ethernet by March 31, 2011.
- Four ground units to support the ETS in Houston (2 units) and the PSIVF in Huntsville (2 units) by March 31, 2011.

6.16.3.6 INTEGRATED COMMUNICATIONS UNIT (ICU) DEVELOPMENT (S/A 1595)

6.16.3.6.1 The contractor shall perform all activities required to deliver and integrate the ODAR High Rate Communication System (HRCS) components with the on-orbit Vehicle and the ISS ground system. This includes all required hardware, software, integration and documentation products.

6.16.3.6.2 The contractor shall provide two ICU engineering development units (EDU) as follows:

- One EDU for use in the ESTL and the SDIL in October 2010 to support systems level integration, verification and validation.
- One EDU shall be provided upon completion of hardware and software development (September 2011).

6.16.4 NITROGEN/OXYGEN RECHARGE SYSTEM (S/A 1567) (S/A 1644) (SSCN 13383 – S/A 1905)

6.16.4.1 The contractor shall perform all activities necessary to develop the requirements for a nitrogen/oxygen recharge system (NORS) that enables delivery and recharge of the ISS airlock, including the nitrogen tank

assemblies located externally on the trusses. The contractor shall conduct a Systems Requirements Review on these requirements.

6.16.4.2 PRELIMINARY DESIGN

The contractor shall perform all the following activities for the preliminary design phase of the NORS project by September 30, 2010:

- Develop a design of the NORS to recharge the ISS airlock nitrogen and oxygen tanks, the Portable Breathing Apparatus (PBA), and the Nitrogen Tank Assembly (NTA) through System Preliminary Design Review (PDR). The NORS design shall accommodate the presence of the Cabin Air Separator for EVA Oxygen (CASEO), as defined by the Boeing developed ICD.

- Fabricate 2 COPV development liners to the point of being ready to weld cylinder sections to forged domes and 6 engineering test unit liners to the point of completing cylinder fabrication.

- Complete a trade study by the Systems PDR to identify concepts for delivery of nitrogen to the ISS cabin prior to a fully functional NORS systems delivery.

- Complete component PDRs for the composite overwrapped pressure vessel (COPV), regulators, quick disconnects (QDs), manual valve , gamah fittings, couplings and hoses.

- Procure long lead material procurement for COPV tasks, valves, regulators, QDs, hoses and the heater black.

- Perform an independent safety and risk assessment of the integrated NORS hardware design.

- Complete Phase 0 and Phase 1 Safety Review.

6.16.4.3 GROUND SUPPORT, SHIPPING, AND TRAINING HARDWARE

The contractor shall complete the following Nitrogen/Oxygen Recharge System (NORS) tasks:

- Provide the following hardware via 1149:
  1. One ground fill assembly (GFA) and spare parts (component parts required to maintain the 1 GFA for life of NORS usage through 2020), designated as ground support equipment (GSE), to allow for filling the recharge tank assemblies (RTAs) by March 2013.

  2. One training set of mock up hardware for a Recharge Tank Assembly (RTA) with valve and QDs by February 2012.

  3. One set of mock up regular training hardware by February 2012.

  4. One set of mock up External Fill Assembly (EFA) training hardware by February 2012.

  5. Thirty five (35) shipping containers (concurrent with RTA DIL deliveries).

  6. Ground support hardware needed to complete oxygen testing at White Sands Test Facility (WSTF) by June 2012.

6.16.4.4 DEVELOPMENT OF NORS CONTINGENCY DEPRESSURIZATION TOOL (NCDT)

The contractor shall deliver:

- Two flight fidelity NORS Contigency Depressurization Tool (NCDT) (DIL item 32405) for direct venting of a NORS Recharge Tank Assembly (RTA) into the cabin atmosphere without use of the NORS regulator or manifold assemblies. The NCDT shall be certified using a proto-flight approach and shall not be certified to ISS intermittent and continuous acoustics requirements.
- One high fidelity mockup (via DD1149) of the NCDT (DIL item 32405) for crew training by October 31, 2013.

6.17 SDIL OPERATION AND MAINTENANCE (S/A 1465) (S/A 1904)

6.17.1 HORIZONTAL TEST RIG OPERATIONS

The contractor shall maintain and provide operational support to the second horizontal Software Verification Facility (SVF) test rig in the Software Development

and Integration Laboratory (SDIL) during FY08 to support increased International Space Station (ISS) test requirements. This is in addition to the SDIL requirements called out in SOW 3.3.7.9.1.

6.17.2 REMOTE ACCESS CAPABILITY

The contractor shall implement a Configurable Remote access Capability within the SDIL to provide remote users' access to vertical and horizontal test assets to support ISS test capability, define all user/system capability requirements for remote users (international Partners (Ips). Visiting Vehicles (VV), and subsystem teams) to perform testing within SDIL requiring remote access, and provide all engineering documentation to maintain the SDIL lab configuration baseline, including requirements and design documentation, SDIL System Architecture Notebook (SAN), hardware design/drawings, Concept of Operations, Prime Item Development Specification (PIDS), Interface Control Documents (ICDs), SDIL SOP, Security Assessment Report (SAR), Contingency Plan/Disaster Recovery Plan (CP/DRP) by November 2013.

6.18 HARDWARE SOFTWARE INTEGRATION (H S I) TEST SUPPORT FOR MISSION OPERATIONS (S/A 1475)

6.18.1 COMPLETE

6.18.2 The Contractor shall support ten additional 8 hour shifts to meet specific Robitics Special Purpose Dextrous Manipulator (SPDM) training objectives defined by the NASA MOD.

6.19 BIOLOGICAL RESEARCH PROGRAM SOLID STATE POWERCONTROL MODULE (BSSPCM) MOTHER BOARD RETROFIT (S/A1464) (S/A 1547)

The Contractor shall deliver 12 modification kits to correct the BSSPCM motherboard fill and drill design issue and install and test the 12 modification kits.

The Contractor shall repair the BSSPCM 1553B RAM discrete anomaly for BSSPCM S/N 13.

6.20 CONSTELLATION PROGRAM CREW ESCAPE VEHICLE (CEV) I INTEGRATION

6.20.1 INTERFACE REQUIREMENT DEFINITION

- The contractor shall reviewthe ISS to CEV Interface Requirements Document (IRD) to audit coordinated verification requirements (Section 4) and identify areas of incompatibility and risk. (S/A 1487).

- The contractor shall provide and coordinate inputs to SSP 70031 "CEV ORION to ISS IRD" necessary for the CEV vehicle to interface with the ISS vehicle during proximity operations, including automated rendezvous and docking/berthing (AR&DB) and departure and integrated on-orbit operations. (S/A 1571).

6.20.2 INTERFACE DEVELOPMENT

The contractor shall provide inputs to and identify issues/risks related to the CEV Interface Control Document (ICD) and review and provide inputs to support revisions. (S/A 1487, 1571)

6.20.3 CEV SOFTWARE ICD DEVELOPMENT

6.20.3.1 The contractor shall develop, document and Program baseline the ISS to CEV Software ICD and update as required. (S/A 1487)

6.20.3.2 The contractor shall develop, document and Program baseline ICDs SSP 50858 – ISS PCS to Orion Ethernet and SSP 50859 – ISS to Orion ICCA Ethernet, reflecting the command and data interfaces to ISS C&DH architecture and update as required. (S/A 1571)

6.20.4 DESIGN REVIEW PARTICIPATION

6.20.4.1 The contractor shall review design and safety review data for CEV to determine ISS interface requirement compliance and to identify areas of incompatibility and risk. The contractor shall participate in reviews for this data. (S/A 1571)

6.20.4.2 The contractor shall review design and safety review data for the ATLAS PDR, CxP PDR, LIDS CDR and ICCA SDR to determine ISS interface requirement compliance, identify areas of incompatibility and risk, and obtain necessary data for authorized technical integration activities. The contractor shall participate in reviews for this data. (S/A 1487, 1571)

6.20.5 ACTION AND ISSUE CLOSURES FROM DESIGN REVIEWS

6.20.5.1 The contractor shall close all assigned actions and issues from the CEV SDR and PDR Design reviews. (S/A 1487)

6.20.5.2 The contractor shall close all assigned actions and issues from ATLAS PRD, CxP PDR, LIDS CDR, and ICCA SDR. (S/A 1571)

6.20.6 VERIFICATION PLANNING

6.20.5.1 The contractor shall develop and coordinate generic stage verification and Certification of Flight Readiness (C0FR) planning for CEV. (S/A 1487)

6.20.5.1 The contractor shall develop and coordinate a verification strategy for the Orion flights (Orion 1 no dock, Orion 2 docked). (S/A 1571)

6.20.7 DATA SUBMITTAL AND EXCHANGE (S/A 1487) (S/A 1571)

The contractor shall develop coordinated data submittal agreements for CEV to support requirements development, verification planning, assessment of requirements compliance and subsystem analysis, including all required data for transfer and associated delivery dates.

6.20.8 HARDWARE/SOFTWARE CHANGE DEFINITION (S/A 1487) (S/A 1571)

The contractor shall develop change requests for ISS hardware and/or software development or modification required to accommodate the CEV vehicle on the ISS.

6.20.9 TEST STRATEGY DEFINITION (S/A 1487)

The contractor shall develop draft test strategy/approach for recommended or required tests needed to allow CEV to be integrated with the ISS and to satisfy ISS Program CoFR requirements.

6.20.10 OPERATIONAL CONSTRAINT DEFINITION (S/A 1487)

The contractor shall define operational constraints as part of performing the CEV SOW tasks.

6.20.11 DESIGN AND VERIFICATION ANALYSIS

The contractor shall define and perform applicable analyses to support planned verification of the initial CEV demonstration flight to determine design drivers and support pre-flight verification planning for the following areas: (S/A 1487) (s/a 1571)

- Loads and Dynamics
- Robotics/End-to-End Berthing and Integration
- Guidance, Navigation and Control

- Environmental Control and Life Support
- Environments
- Material and Processes
- Propulsion System Integration
- Vehicle Ingrated Performance
- Resources
- Thermal
- Power

6.20.12 CEV IMV FLOW ASSESSMENTS AND TESTING (S/A 1583)

6.20.12.1 The contractor shall determine the feasibility of providing increased IMV flow to the CEV at the Node 1 nadir/PMA-3 and the Node 2 forward/PMA-2 locations. (S/A 1571)

6.20.12.1 The contractor shall perform analysis to determine required hardware modifications and associated integrated impacts to ISS subsystems necessary to provide air ventilation to the CEV using the Node 2 IMV fan. An analysis report on flow pressure findings and recommendations for hardware modifications shall be delivered. (S/A 1583/1610)

6.20.13 ISS TO CEV DOCKING ADAPTER (S/A 1590)

The contractor shall perform the following tasks in support of the requirements definition stage of the CEV to USOS docking adapters:

A. Perform a requirements analysis for the CEV to ISS docking adapter by September 24, 2009, which will identify:

- The docking mechanism that will be used to interface to the ISS.

- The launch configuration of the adapter, including attach hardware concepts assuming launch on the HTV.

- The on-orbit configuration to be supported between launch and activation of the docking adapter.

- The recommended hardware providers for the docking adapter components and their specific areas of responsibility.

B. Develop a concept of operations by September 24, 2009 for delivery, for integration and sustaining engineering of docking adapters to be installed on the USOS in support of CEV.

C. Define draft system requirements for docking adapter and establish preliminary design allocations for key system components by September 24, 2009, assuming the following:

- Adapters (one/flight) will be delivered via HTV flights on exposed platform.

- Adapters may be stowed on the ISS without active thermal conditioning up to one year.

- Adapters will be operational from 2015 through 2025, supporting 2 crew rotation flights/year and additional visiting vehicle flights per Program baseline.

- Adapter will will provide umbilicals for automated mating to supported ISS heritage and Orion baselined interfaces.

D. Define preliminary interface agreements between docking adapter sub-assembly hardware by September 24, 2009.

E. Develop conceptual design for hardware elements in support of the analysis.

F. Perform long-lead material evaluation and assessment of existing GFE assets for use in the development of the docking adapter by September 24, 2009.

6.21 ROTARY JOINT HARDWARE MODIFICATION (S/A 1489)

The contractor shall develop a design for a new A3 motor driver circuit card assembly (CCA) configuration to replace the existing CCA as installed in the rotary joint motor controller (RJMC) used in configuration item (C1) number 222032A, solar alpha rotary joint (SARJ) system, and C1 222033A, thermal radiator rotary joint (TRRJ) system. The design shall incorporate the following features:

- Continuous operation of the common motor select circuit after RJMC power-on.
- Limited potential cross-conduction or shoot through of Q31/Q32 and Q24/Q35 transistor pairs.

6.22 IATCS COOLANT REMEDIATION

6.22.1 SYSTEM LEVEL TEST (S/A 1497)

The contractor shall extend the system level test at the MSFC ITCS System Simulator to validate treatment effects through September 30, 2008 and perform the following tasks:

1) Sample coolant monthly and perform chemical and microbiological analysis of the coolant.

2) Perform OPA shock effectiveness testing on planktonic microorganisms isolated after re-growth in the IATCS system test coolant to determine if resistance to OPA has increased.

3) Perform ONE application of an effective ORA shock concentration the systems test for the recommended duration and lower OPA shock concentration to 75-105 ppm OPA with OPA removal resin.

6.22.2 MAINTENANCE (S/A 1621)

The contractor shall perform the following tasks in support of ITCS coolant maintenance in all USOS pressurized modules (including Node 2 and Node 3) and the Columbus and JEM elements:

1) Determine if the effective shelf life of ortho-phthalaldehyde (OPA) loaded resin and OPA test strips can be extended and what the effective shelf life is (to be complete by December 20, 2010.)

2) Identify and qualify a new antimicrobial removal resin that removes 99.9% of OPA in any USOS IATCS loop from initial levels of up to 325 ppm OPA (to be complete by November 30, 2010).

3) Increase the measurement accuracy of OPA test strips (to be complete by September 30, 2010).

6.23 NODE 3 ATMOSPHERE REVITALIZATION (AR) RACK LAUNCH ON MPLM (S/A 1496)

The contractor shall perform MPLM loads analysis to verify the AR Rack is acceptable to launch on the MPLM.

6.24 PORTABLE COMPUTER SYSTEM (PCS) LAPTOP RE-HOST (CLAUSE 58 APPLIES) (S/A 1498)

The contractor shall re-host the Portable Computer System (PCS) software to run on a GFE portable laptop, replacing the IBM A31p laptop.

6.25 COMPLETE

6.26 ANALYSIS OF XVV FLIGHT ATTITUDE (S/A 1500)

The contractor shall provide updates to SSP 50699 Volume III, "ISS Certification Baseline Volume 3: Fligh Attitudes" to include –XVV Z nadir for all flight/stages including assembly complete.

6.27 MDM ENHANCED PROCESSOR AND INTEGRATED COMMUNICATIONS (EPIC)

6.27.1 The contractor shall deliver and install updated MDM circuit card assemblies and associated software to recover CPU and memory margins and provide growth for future C&DH functionality. (S/A 1504)

6.27.2 The contractor shall deliver and integrate the ground and onboard hardware and software required to utilize the command and control and payload MDM EPIC thernet port for the downlink of the current value table (CVT) data and payload data, respectively. The thernet capability for the C&C MDM shall be ready for uplink by October 2012. The thernet capability for the Payload MDM shall be ready for uplink by October 2012. (S/A 1557/1595)

6.27.3 The contractor shall perform all tasks required to implement the EPIC processor in the on-orbit payload MDMs by December 2011. (S/A 1557)

6.27.4 The contractor shall deliver and incorporate the EPIC capability, similar to the on-orbit vehicle, into the Software Verification Facility (SVF) prior to activation of the capability on-orbit. The SVF upgrade shall allow for parallel EPIC software development and testing of software releases that have been migrated to the new platform. (S/A 1557)

6.27.5 The contractor shall modify the Payload rack checkout unit to incorporate the EPIC capability prior to activation of the capability on-orbit. (S/A 1557)

6.27.6 The contractor shall modify the payload software integration/verification facility to incorporate the EPIC capability into the FEU MDM prior to activation of the on-orbit capability. (S/A 1557)

6.27.7 The contractor shall provide the following non-flight hardware: (S/A 1557)

- 15 EFEU CCAs (includes 4 spares and 2 with in circuit emulator (ICE)
- 3 proto CCAs
- 2 Engineering development units with ICE

6.27.8 CONTAINER DELIVERY (S/A 1722 – SSCN 12770)

The contractor shall deliver via 1149 the following hardware by 5/16/2011:

- 6 standard MDM card containers (part number ST8274480-801)
- 2 MDM power supply card containers (part number ST8274485-801)
- 6 Edge router card containers (ST8275060-801).

The hardware shall include material certifications, verification of hardware cleanliness, structural analysis, engineering drawings and launch configuration drawings necessary for NASA to certify the hardware for flight.

6.27.9 EPIC FOR EXTERNAL MDMs (S/A 1738 – SSCN 12648)

The contractor shall deliver (via 1149) 11 Enhanced processor and Integrated Communications (EPIC) EFEUs (9 P/N 8272510-803 and 2 P/N 8272510-804) and 3 Proto-C circuit cards (P/N 275155-801) by June 15, 2012 to support implementation of the EPIC processor upgrade to the EXT MDMs.

6.28 COMPLETE

6.29 TREADMILL-2 (T2) PROJECT

In support of the second treadmill for the ISS, the contractor shall perform the following:

6.29.1.1 Deliver a Vibration Isolation System (VIS) to be temporarily installed in the Node 2 Deck 5 bay and permanently installed in the Node 3 Port 5 bay. One flight VIS (DIL) and one ground VIS are required.

6.29.1.2 Deliver an International Standard Payload Rack (ISPR) outfitted to accommodate Vibration Isolation System (VIS) hardware. One flight rack (DIL) and one ground rack are required for delivery.

6.29.1.3 De-integrate components from the Habitat Holding Rack (HHR) to be used as Government Furnished Equipment (GFE) and supplied to Bioastronautics. No updates to existing HHR drawings are required; however, Acceptance Data Packages (ADPs) shall be generated for de-integrated components to document the residual configuration of the de-integrated components and the HHRs. De-integrated components shall be delivered in the as-is condition. No cleaning of parts shall be required.

6.29.1.4 Provide detailed design input into development of Mission Operations Directorate (MOD) procedures.

6.29.1.5 Prepare and deliver operations data and Assembly and Operations System Procuredure date.

6.29.1.6 Develop and release the interface control document between Treadmill 2 and Nodes 2 and 3.

6.29.1.7 Provide technical support to the Bioastronautics contractor for questions that may arise from the re-integration of GFE hardware.

6.29.1.8 Integrate Treadmill 2 with the ISS Vehicle.

6.29.1.9 Incorporate the entire T2 system LSAR and illustrated parts breakdown (IPB) data into the Enhanced Automated Graphical Logistics Environment (EAGLE).

6.29.1.10 Develop and perform Electro-Magnetic Interference (EMI) susceptibility testing in the NASA Johnson Space Center (JSC) EMI test facility, review the test results, develop solutions to mitigate failures, and prepare and deliver the test report.

6.29.2 Treadmill 2 (T2) Spare Vibration Isolation and Stabilization (S/A 1742 – SSCN 12446)

6.29.2.1 The contractor shall perform disassembly, inspection, and analysis of the following subassemblies to determine usability/replacement parts required to support upgrade to flight hardware for incorporation into DIL ID #51375, "Kit, On-Orbit Maintenance, T -2 Spares":

- 1F16172-2, Standoff Arm Assy, Upper (Left Side).
- 1F16183-1, Snubber Assy, Lower (Right Side).
- 1F16183-2, Snubber Assy, Lower (Left Side).
- 1F16190-2, Snubber Assy, Upper (Left).
- 1F16199-1, Standoff Arm Assy, Lower (Right).
- 1F16199-2, Standoff Arm Assy, Lower (Left).
- 1F16223-2, Standoff Arm Attach Assy, Upper (Left).

6.29.2.2 The contractor shall develop a sparing plan for the T2 VIS that identifies all spares needed to support T2 operations through 2028, by 07/29/11.

6.30 COMPLETE

6.30 COMPLETE

6.31 COMPLETE

6.32 COMPLETE

6.33 INTEGRATION OF NEW ELEMENTS INTO ISS

6.33.1 MINI RESEARCH MODULE 1 (MRM1) INTO INTERNATIONAL SPACE STATION (ISS) (S/A 1534)

The Contractor shall integrate the MRM1 into the ISS.

6.33.2 PERMANENT MULTI-PURPOSE MODULE (PMM) (S/A 1677)

The contractor shall integrate the Permanent Multi-Purpose Module (PMM) with the USOS and ISS system to support launch of the PMM on Flight ULF-5. The PMM shall be located at Node 1 Nadir port.

6.34 LAUNCH OF ATA ON ULF3 AND ULF5 (S/A 1550)

The contractor shall provide additional structural, thermal, and electrical analysis and additional thermal models in ISS Program format, for the following configurations of the ATA/FSE launching on ULF3 and ULF5:

- On-orbit configurations (4): ELCs on P3/S3 CAS sites, with ATA/FSE in both inboard and outboard facing configurations.

- Launch configurations (4): ATA/FSE both on top and bottom of ELCs, and with ELCs in both forward and back positions in the PLB.

6.35 STARBOARD SARJ ANOMALY RESOLUTION (S/A 1548)

6.35.1 COMPLETE

6.35.2 QUALIFICATION DLA UPGRADE (S/A 1570)

The contractor shall perform the following tasks on the SARJ qualification drive/lock assembly (DLA) hardware to support the manifest and operation on flight 19A (Feb 2010):

- Refurbish the DLA to full functionality (including motor assembly mechanical components and locking mechanism) to support on-orbit operations.

- Perform inspection, analysis, refurbishment and acceptance testing of the DLA to determine the risk of on-orbit usage of this qual DLA. Develop a risk summary verification document which identifies capabilities and constraints of DLA flight critical item specification applicable requirements.

- Conduct a Risk Assessment Review prior to DD 1149 back to NASA.

- Provide Certification of Flight Readiness (CoFR) endorsement that hardware is suitable for intended use on-orbit.

6.35.3 SARJ "XL" (S/A 1616) (S/A 1626)

The contractor shall perform the following tasks in support of the development of a Solar Alpha Rotary Joint (SARJ) Race Ring for installation onto the Integrated Truss Segment (ITS) Starboard 3 SARJ race ring:

- Perform all activities required to get through IDR-1 in support of SARJ race ring installation into the USOS.

- Perform design engineering preparation for Incremental Design Review (IDR)-2.

- Initiate procurement of long lead parts, raw materials, and purchase items (including required assembly and test).

Develop manufacturing, assembly, test, and production planning documentation and manufacture of piece parts

6.35.4 FULL REDUNDANCY FOR SARJ OUTBOARD OPERATIONS

The contractor shall provide hardware and software to add full redundancy capabilities to the starboard and port SARJ outboard operations mode functionality by December 2011. This shall include software FDIR, auto recovery, tooth crash

recovery and capabilities consistent with the SARJ inboard operations mode RJMC/DLA drive functions. (S/A 1625)

6.35.5 SARJ LUBRICATION INTERVAL TEST & EVALUATION (LITE) (S/A 1660) (SSCN 13041 – S/A 1786)

The contractor shall run the SARJ LITE test until lubricant failure occurs or a 36 year lubricant life is demonstrated.

6.36 ISS MODULE LEAK DETECTION SYSTEM (S/A 1548)

6.36.1 The contractor shall perform all activities necessary to develop the requirements for an ISS module atmospheric leak location system and conduct a Systems Requirements Review on these requirements.

6.36.2 The contractor shall develop a concept for and an overall project plan for implementation of a leak location system, including a rough order of magnitude (ROM) cost estimate to support post-SRR planning and project implementation planning.

6.36.3 The contractor shall provide geometric models for Lab and Airlock for use in ultrasonic environment characterization.

6.37 NODE 3 RELOCATION (S/A 1552)

The contractor shall perform the following tasks for the Node 3 relocation from the Node 1 Nadir to the Node 1 Port location (and clocked ninety degrees):

- Development and delivery of software products to support Node 3 relocation.
- Subsystem integrated analysis products.
- Verification of hardware and analyticl products.

6.38 SPARE PARTS PROCUREMENTS/IN-LINE MODIFICATIONS DURING REPAIR/REFURB (S/A 1552) (S/A 1557) (S/A 1626) (S/A 1690)

6.38.1 The contractor shall procure the following Regen Environmental Control & Life Support System parts and produce, assembly, test, and store all parts such that the following ORUs can be delivered subsequent to further contract direction within one year from Authorization to Proceed (ATP).

Nomenclature	Part Number	Quantity	Date
Catalytic Reactor	PLSV28733	4	01/01/2012
Oxygen Outlet	PLSV28736	2	02/01/2011
Nitrogen Purge	PLSV28735	2	02/01/2011
Gas Separator	PLSV28734	1	04/01/2013
Hydrogen ORU	PLSV28783	2	11/01/2012
OGA Process Controller	SV826025-1	1	01/02/2012
OGA Pump ORU	PLSV28738	2	09/01/2011
Start-up Filter	PLSV28739	4	09/01/2010
Water ORU	PLSV28740	1	12/01/2011
Waste Water ORU	PLSV28741	2	09/01/2011
Pump Separator ORU	PLSV28742	2	06/01/2012
Water Storage ORU	PLSV28743	2	12/01/2011
Water Delivery ORU	PLSV28744	2	09/01/2011
Multi Filtration BED ORU	SV28744	3	03/31/2010
Multi Filtration BED ORU	PLSV28786	8	06/30/2010

6.38.2 The contractor shall procure all necessary parts and produce, assemble, test, and store all parts by January 29, 2010, such that three (3) Multifiltration Bed ORUs (part number SV28787), including packed cylinders, can be delivered subsequent to further contract direction within five (5) months from ATP. (S/A 1626)

6.38.3 The contractor shall procure all necessary parts and produce, assemble, test, and store all parts by December, 2010 (2 sets of parts for Multifiltration Bed ORU kits every 2 months starting in June 2010), such that eight (8) Multifiltration Bed ORUs (part number PLSV28786), excluding packed cylinders, can be delivered subsequent to further contract direction within twelve (12) months from ATP. (S/A 1626)

6.38.4 IPEHB PARTS

The contractor shall (by June 2010) procure, receive, inspect, and store the parts listed below to support follow-on IPEHB builds:

Nomenclature	Part Number	Quantity
IC, HYBRID, 8-SIP	IF95102-1	26
XILINX RADHARD SERIAL PROM	XQR17V16CC44V	63
CONNECTOR, ELECTRICAL	NATC00T13N35PA	30
CONNECTOR, ELECTRICAL	NATC00T13N4PB	30
CONNECTOR, ELECTRICAL	NATC00T13N4PN	30
CONNECTOR, ELECTRICAL	NATC0023N35PN	30
24 PORT GBE SWITCH NO HIGIG	BCM56300B1KEBG	48
BGA 5488 ETH-NET XCEIVER OCTAL	BCM5488SA5KPBG	90
32-BIT RISC PROCESSOR 266 MHz	PPC405EP-3GB266C	32
NAND FLASH 64Mx8	K9F1208U0B-YIB0	32
7SZ08 UHS 21P AND GATE SOT-23	NC7SZ08M5X	117
7WZ07 DUAL BUFFER 2.3-5 5V	NC7WZ07P6X	273

9F 1208 64Mx8 FLH MEMORY 512 MB	K9F1208U0B-YIB0	32
1501 REAL TIME CLOCK WATCHDOG	DS1501WEN+	32
IC 10/100MBS ETH 3.3V	DP838481VV/NOPB	47
LM75 DIGITAL TEMP SENSOR 3.3V	TCN75-3 3MUA	32
7SZ32 UHS 2-IP OR GATE SOT-23	NC7SZ32M5X	32
7WZ241 DUAL UHS BUFFER W/3-ST	NC7WZ241K8X	32
POWER MODULE 75V-3 3V OUT 16A	ATH016A0X3-SRZ	117
3965 ULDO LINEAR ADJ VREG	LP3965EMP-ADJ-NOPB	117
7S08 2IP AND GATE	NC7S08P-5X	32
XFMR GBIT ETH 2PORT SMD50	TG111-S212NW	358
83905 LOW SKEW/JTR BUFFER 3.3V	ICS83905AGLFT	90
CLK OSC 25.000 MHz 50PPM 3.3V	MI3050H48H-25.000	33
CRY OSC 33.333 MHz 3.3V	ASV-30-33.333-L-C-T5	33
CRY OSC 66 MHz 3.3V	MI3050H48H-66.0000MHZ	33
CRY 32.768KHZ50PPM 12.5PF	MC-405-32.768K-A3ROHS	33

6.38.5 WPA CATALYTIC REACTOR PARTS (S/A 1651)

The contractor shall procure all hardware (by January 31, 2011) necessary to upgrade the PIO 92 Catalytic reactor (DIL item 20069) and four additional WPA catalytic reactor kits with the high Temperature seal and pin plug configuration modification (authorized in change 12398).

6.38.6 CDRA MODIFICATIONS (S/A 1690)

The contractor shall upgrade three CDRA desiccant adsorbent beds to the "-3" configuration, in-line during repair or refurbishment (due March 30, 2010, November 2010, and February 2011). The contractor shall upgrade two CDRA desiccant adsorbent beds to the "-4" configuration, in-line during repair or refurbishment (due September 2012 and November 2010).

6.38.7 WATER PROCESSOR ASSEMBLY HOSES

The contractor shall procure the fllowing water processor assembly (WPA) hose kits and fill with dry nitrogen purge for long-term storage such that the kits can be delivered ready for launch, subsequent to further contract direction within one month from Authorization to Proceed.

Nomenclature	Part Number	Quantity	Due Date
WPA System Hose	SV827939	1	6/30/2011
WPA System Hose	SV827940	1	6/30/2011
WPA System Hose	SV827940	1	6/30/2011
WPA System Hose	SV827940	1	6/30/2011
WPA System Hose	SV827941	1	6/30/2011
WPA System Hose	SV827941	1	6/30/2011
WPA System Hose	SV827941	1	6/30/2011

WPA System Hose	SV827941	1	6/30/2011
WPA System Hose	SV828011	1	6/30/2011
WPA System Hose	SV828011	1	6/30/2011
WPA System Hose	SV828012	1	6/30/2011
WPA System Hose	SV828012	1	6/30/2011
WPA System Hose	SV828012	1	6/30/2011
WPA System Hose	SV828019	1	6/30/2011
WPA System Hose	SV828019	1	6/30/2011
WPA System Hose	SV828019	1	6/30/2011
WPA System Hose	SV828019	1	6/30/2011
WPA System Hose	SV828021	1	6/30/2011

6.38.8 WASTE WATER KITS (SSCN 13096 – S/A 1839)

The contractor shall deliver two waste water kits for PIO-95 (by March 20, 2013) which contain:

- One pass-through plug (P/N SV1018162-1)
- One connector cap (from GOLD)
- Screws & washers

6.38.9 PIO 92 REGEN ECLSS KITS (S/A 2024; SSCN 10622)

The contractor shall procure the following PIO 92 Regenerative ECLSS hardware and store without resin packing for launch. The hardware shall be delivered subsequent to further contract direction to perform resin packing within 6 months from Authorization to Proceed (ATP).

Nomenclature	Part Number	Quantity	Date
Inlet Deionizing Bed	SV825569-1	1	9/29/2012
Microbial Valve Check	SV825499-1	1	9/29/2012

6.39 COMPLETE

6.40 ALTERNATE PORT CAPABILITY FOR HTV1 BERTHING (S/A 1583)

The contractor shall perform the following tasks to support the use of Node 2 Zenith as an alternate port for HTV1 berthing in a contingency situation:

- Delta technical analyses required to ensure Node 2 Zenith can be utilized as an alternate port.

- 1553 bus signal margin analysis for the HTV1 located at the Node 2 Zenith interface, with and without a MPLM attached to Node 2 Nadir.

- Develop and release an on-orbit (Node 2 to HTV1) configuration drawing for the interim configuration.

6.41 HARDWARE TESTING

6.41.1 SGANT FSE TESTING (S/A 1589)

The contractor shall perform the following tasks associated with thermal vacuum testing of SGANT FSE Mechanism:

- Configure, calibrate, and check-out test equipment with Data Acquisition System (DAS) per SK683-80500 prior to FSE flight hardware testing to support test start of August 5, 2009

- Provide engineering and technical personnel to assist the Cargo Mission Contract (CMC) with installation of thermocouples per SK683-80501 drawing, routing of heater wires from the bulkhead through the connector to the DAS, and removal of the test article from the test chamber.

- Perform thermal vacuum testing as test conductor of the SK683-97268-002 Thermal Vacuum Acceptance Assembly using Sections 7.1 through 7.7 of the Acceptance Test Procedure D683-80468-1 by August 25, 2009.

- Provide the motors, torque cells, and cold plate defined in the the SK683-97268-02 assembly to support test start of August 5, 2009 for CMC to install with Boeing test conductor direction once the assembly is delivered to MSFC Bldg. 4619.

- Attend and present relevant technical content to weekly status meetings to report progress of activities leading up to the start of testing on August 5, 2009.

6.41.2 SASA ORU TESTING (1594)

The contractor shall develop and deliver a test correlated structural loads model of the SASU ORU in support of ULF5 and ULF6 VLAs by November 24, 2009.

6.41.3 TUS Cable (S/A 1651)

The contractor shall perform a bench test (by 9/30/10) on the TUS Cable to determine thermal effects of increased current from an MT relay box (up to 8A continuous and higher amperage for shorter durations) and shall update the TUS Thermal model with the test results.

6.41.4 OGA Cell Stack Cathode Feed (S/A 1741 – SSCN 12809)

The contractor shall perform a functional test of the Non-Flight Oxygen General Assembly (OGA) Development Cell Stack Cathode Feed Unit (by July 29, 2011) to determine if the unit can be used to perform ground testing to project response and the on-orbit OGA to operation or system design changes.

6.41.5 HEPA Filter Life Testing (S/A 1761 – SSCN 12784)

The contractor shall perform life testing (by June 2012) on seven (7) spare-category expired HEPA filters (PN SV810010-1) to determine if the filter "useful life" can be extended 5 years beyond the current 10 year life and provide a test report containing:

- Test results for all applicable lots.
- Recommendation on whether to extend the filter life.
- Determination on whether lots not tested and stored in an identical manner, are acceptable for life extension.

If testing is successful, the contractor shall provide supporting rationale and recommendation to change lifetime to the number of years supported by the testing.

6.42 IMV IN-LINE FILTER DEVELOPMENT (S/A 1590)

The contractor shall perform the following tasks to support the GFE IMV in-line filterdevelopment:

- Provide the IMV bulkhead interface data for filter development.
- Update stage configuration drawings to reflect addition of mod kits.
- Provide four non-flight, high-fidelity quality flanges for the IMV duct interface by December 2009. Two flanges shall be for the duct flanges and two for the bulkhead flanges.

- Update termperature and humidity control FMEAs to include GFE filters by March 2010.

- Perform an integrated assessment of IMV system performance with the addition of GFE in line filters by March 2010.

6.43 INTEGRATION OF A SABATIER REACTOR IN THE OGS RACK (S/A 1495)

The Contractor shall complete the following activities to support integration of a Sabatier Reactor in the OGS Rack:

- Develop integrated safety products based on NASA Safety Review Panel approved Sabatier safety data package(s).

- Integrate Sabatier in the ISS software.

- Modify the CDRA model to operate according to the ISS Progam approved operational concept.

- Evaluate the impace of the ISS Program approved operational concept on the:

  - Major Constituent Analyzer (MCA) and rack isolation valve life in the Lab Case.

  - Rack isolation valve and standoff CO2 valve life in the Node 3 case.

- Perform integrated analysis of the CDRA and OGS operations up to the Sabatier interfaces to ensure CDRA and OGS continue to operate as previously operating prior to Sabatier integration.

- Develop a unique work breakdown structure (WBS) to track costs for Boeing Sabatier work.

6.44 USOS LIFE EXTENSION

6.44.1 STRUCTURAL LIFE EXTENSION

The contractor shall initiate an analytical assessment of the capability to extend the structural life of the following USOS structural hardware for the purposes of

extending ISS usage beyond the current 15 year design life through the end of CY 2028. Critical tracking locations shall be identified:

- Node 1, PMA-1, 2 and 3, US Lab, Airlock, and Z1 truss, including all CBMs and hatches.

- P6 truss and IEA including BGAs, SAWs and PVRs

6.44.2 S&MA CRITICAL HARDWARE LIFE EXTENSION (S/A 1704 – SSCN 12599)

6.44.2.1 The contractor shall provide the following data to support on-orbit vehicle life extension from 2015 to 2028 (by September 2011) (S/A 1704 – SSCN 12599):

1. A Safety Risk Item List which will identify the following:

   a) Critical operating hardware items which have the potential to cause catastrophic hazard if the hardware is operated between 2015 and 2028 and is not replaceable and has no identified operational workaround.

   b) NCRs that are not viable post 2015 through 2028.

   c) "Must work/must not work" functions at risk of failure post 2015 through 2028.

   d) Critical Items Lists (CILs) supporting functions at risk of failure post 2015 through 2028.

2. Assessment criteria used to screen data for Safety Risk Items List.

3. Recommendation of future engineering analysis needed based on Safety Risk Item List.

6.44.2.2 The contractor shall review the Safety Risk Item List [delivered via Change Directive (CD) 012599] and provide the following by September 2014:

1. Document the following in the Safety & Mission Assurance (S&MA) Life Extension Hazard Control Hardware Matrix (located in the Electronic Document Management System (EDMS):

   a) Any potential candidates for future operational philosophy of "run to failure."

b) Current life expectancy of all non limited life hardware.

c) Engineering recommendation for future risk mitigation augmentation measures needed to maintain current control [workaround, hardware modification (mod), system mod, sparing, and operational (ops) controls] for hardware.

2. Update USOS Integrated Hazard Reports (IHR) and Non-Compliance Reports (NCRs) to reflect life extension assessment as follows:
   a) Retire, re-baseline, or create United States On-Orbit Segment (USOS) Integrated Hazard Reports (IHRs) to document S&MA Life Extension assessment and include any updated risk measures resulting from assessment.

   b) Retire or re-baseline all applicable USOS NCRs to document S&MA Life Extension assessment.

   c) Develop USOS NCRs for any hardware items where current risk mitigation measures are insufficient to meet existing requirements resulting from S&MA Life Extension assessment.

3. Develop and deliver S&MA Life Extension Hazard Control Hardware Risk Identification Management Tool to quickly identify any expiring hazard controls.

4. Update Modeling & Analysis Data Set (MADS) database to capture all applicable changes to currently documented hardware life expectancy.

5. Deliver a Phase II summary report documenting process and results of S&MA Life Extension Project.

6.44.3 Integrated Equipment Assembly (IEA) Advanced Thermal Model

The contractor shall develop an advanced fidelity thermal model of the Integrated Equipment Assembly (IEA) primary structure that will reduce temperature gradients at interfaces and the effects of the current step-function-like gradients on the computed thermal loads, develop a companion thermal-to-structural map of the IEA to convert temperatures into thermal loads, and perform a telemetry comparison to determine if the new, advanced fidelity thermal model is generating temperature data consistent with temperatures measured on-orbit. The P6 IEA thermal data shall be re-generated with the

updated model, and the P6 IEA thermal load cycles re-generated. The P6 IEA Life Extension analysis shall be re-run using the updated thermal loads and spectra by April 30, 2014.

6.45 IV-TEPC INTEGRATION

The contractor shall integrate the GFE active radiation monitoring hardware, composed of the Intra-Vehicular Tissue Equivalent Proportional Counter (IV-TEPC) with the ISS Vehicle by December of 2011.

6.46 SUPPORT TO THE ADVANCED RECYCLE FILTER TANK ASSEMBLY (ARFTA) DEVELOPMENT

6.46.1 The contractor shall perform the following tasks to support development ARFTA:

- Analyze samples from three returned-from-orbit RFTA filter sets for inorganic, organic and Polymer composition (by July 31, 2010) to provide data to support the filter selection and design of the ARFTA.

- Provide on pre-production tank assembly, one pre-production Brine filter, one pre-production 100 micron Produce Water filter and one 20 micron Produce Water filter by January 15, 2011 for the MSFC integrated test to evaluate the new Boeing hardware in an integrated UPA to identify any issues that may impact the ISS. This hardware will be transferred to NASA via DD1149.

6.46.2 The contractor shall perform a trade study of options for on-orbit fill and drain servicing of the ARFTA in the rack, provide associated risk & cost of each otion, and provide recommendation(s) on implementation. The study shall be complete by July 2011. **(S/A 1720 – SSCN 12753)**

6.47 NASA DOCKING SYSTEM (NDS) PROJECT

6.47.2 COMMON DOCKING ADAPTER (CDA) REQUIREMENTS DEVELOPMENT (S/A 1637)

The contractor shall perform the following activities to develop and baseline CDA requirements:

6.47.1.1 COMPLETE

6.47.1.2 COMPLETE

6.47.1.3 COMPLETE

6.47.1.4 Develop (by September 2010) a draft of the end-to-end (active and passive) docking system design requirements based on the NASA provided definition of the International Docking System Standard (IDSS), including system specifications, ICDs, and IRDs, for both the passive Common Docking Adapter (CDA), and the active low impact docking system.

6.47.1.5 Draft an integrated software specification document by September 30, 2010 which encompasses the end-to-end (active to passive) docking sysem.

6.47.1.6 Add the following features, at the concept level of definition, into the end-to-end docking system drawings and ICDs, and applicable requirements for these features in the System Specification and IRDs by September 30, 2010:

- Moding Lights
- Visiting Vehicle Docking Target
- Retractable Pushers

6.47.2 CDA SYSTEM AND PROJECT INTEGRATION (S/A 1637)

The contractor shall perform the following activities to support integration of the CDA project with visiting vehicles:

6.47.2.1 COMPLETE

6.47.2.2 Develop a Visiting Vehicle User's Guide by September 30, 2010 for use by potential visiting vehicle developers, on the CDA design, operational features, and available services.

6.47.3 CDA VERIFICATION (S/A 1637)

The contractor shall perform the following activities to develop and implement verification requirements and plans:

6.47.3.1 COMPLETE

6.47.3.2 Develop a conceptual design of a Common Passive Docking Interface Master Verification Tool by September 30, 2010.

6.47.4 CDA TRADE STUDIES/ANALYSIS/CONCEPT DEFINITION (S/A 1637)

The contractor shall perform the following studies by September 30, 2010:

6.47.4.1 Evaluate alternative approaches for packaging and locating the outside umbilical cables required by the end-to-end docking system.

6.47.4.2 Evaluate potential capability enhancements to the CDA and develop a low fidelity conceptual design to reflect these proposed enhancements.

6.47.4.3 Evaluate the manufacturability of the GFE active docking system design, including avionics and propose design recommendations to increase manufacturing efficiency.

6.47.5 CDA GROUND HARDWARE AND MOCKUPS (S/A 1637)

6.47.5.1 COMPLETE

6.47.5.2 COMPLETE

6.47.5.3 LABORATORY OUTFITTING

The contractor shall deliver (via 1149) by September 30, 2010), the initial hardware necessary to outfit a new docking mechanism prototyping laboratory capable of supporting the development of an active docking system firmware controller.

6.47.6 CDA PROGRAM REVIEWS (S/A 1637)

6.47.6.1 The contractor shall conduct a CDA Project interim review to review project status and forward plans and to assess schedule, technical feasibility and maturity level of the CDA project by September 15, 2010.

6.47.7 CDA PRODUCTION AND MANUFACTURING (S/A 1637)

6.47.7.1 LONG LEAD PARTS

The contractor shall develop a long lead procurement list to support production and manufacturing of the CDA by September 15, 2010.

6.47.8 HYBRID DOCKING SYSTEM DEVELOPMENT (S/A 1648)

The contractor shall perform the following tasks in support of the development of a new hybrid docking system:

6.47.8.1 INTEGRATION

The contractor shall perform the following tasks to integrate the NASA defined low impact ring assembly into the APAS hard mate system (by September 20, 2010):

a. Conceptual design of a structural mounting for LIDS like platform to the APAS body.

b. Conceptual design of a structural mounting for LIDS like passive ring to the APAS body.

c. Analysis of kinematic clearance between LIDS like platform and APAS body.

d. Conceptual design for reconfigurable petals and for a separation system.

e. Study of options for a dual (magnetic and mechanical) latching system for LIDS like ring.

6.47.8.2 ASESSMENTS

The contractor shall assess the following:

6.47.8.2.1 Modification of passive load attenuation system for "low impact" docking characteristics (lower docking forces and moments consistent with latest IDSS IDD docking load limits) and provide results by September 30, 2010.

6.47.8.2.2 Modification of High Energy Dampers (HEDs) to eliminate the "stuck damper" issue currently encountered during Shuttle docking and provide results by February 28, 2011.

6.47.8.2.3 Development of EVA drives option for actuating structural hooks in a contingency and provide results by February 28, 2011.

6.47.8.2.4 Options for APAS mass reduction to accommodate 5-25 MT capsule type vehicles (initial contact conditions consistent with latest IDSS IDD (Rev A dated May 27, 2010) and provide recommendations by February 28, 2011.

6.47.9 CLOSED (S/A 1721)

6.47.9.1 CLOSED (S/A 1721)

6.47.9.2 CLOSED (S/A 1721)

6.47.9.3 CLOSED (S/A 1721)

6.47.10 TRANSITION TO PRODUCTION FOR THE NASA DOCKING SYSTEM (SSCN 12358 – SA 1797, S/A 1871)

The contractor shall perform the following tasks to enable the transition to full scale flight production of the NASA Docking System (NDS):

6.47.10.1 Develop requirements and design concepts for an International Docking Adapter (IDA), that shall attach to a PMA APAS and include an NDS docking interface for Visiting Vehicles, to support a System Requirements Review (SRR) in December 2011.

6.47.10.2 Purchase long-lead items to support assembly of IDA and associated test and qualification unit hardware.

6.47.10.3 Develop conceps for a short tunnel version of the NDS to support a SRR in December 2011.

6.47.10.4 Provide an Informational ROM/engineering estimate and schedule for delivery in 2013 of 10 HMA units, by 9/30/11.

6.47.10.5 RESERVED

6.47.10.6 Upgrade to current NDS design interfaces and deliver (via DD1149) the NDS mock up (Experimental Engineering Mockup Subassemblies (EEMS) for use in 6-Degree of Freedom (6DOF) development testing of the NASA NDS engineering development unit (EDU) by 6/29/12.

6.47.10.7 RESERVED

6.47.10.8 Deliver a qualified NDS Hook Assembly (HA) design which can be incorporated into the NASA NDS design and deliver (via DD1149) HA units as follows:

- Quantity twelve (12) Development Unit HA's for NASA EDU due by 6/29/12.
- Quantity one hundred twenty-four (124) Flight Fidelity HA's for long-lead NDS flight production by 12/22/14.

6.47.10.9 Deliver a qualified NDS Pyro System design which can be incorporated into the NASA NDS design and deliver (via DD1149) one Pyro System development unit for the NASA EDU by 4/9/12.

6.47.10.10 Provide a Hook Assembly Reliability Assessment by 3/30/12.

6.47.10.11 Prepare, inspect, downgrade and disassemble orbiter APAS hardware and provide all shipping and export logistics required for use in IDA testing. Downgrade APAS units from Flight to Non-flighr Class 2. Uninstall APAS assemblies from Orbiter Docking Systems, and remove non-required hardware (hardware not used for IDA testing) and ship to Russia. Package and maintain removed APAS hardware and the ODS Docking Base Assembly as Non-Flight Class 3 hardware. Ship two disassembled APAS units to Russia by 3/30/12. Ship a non-disassembled APAS and the Passive Docking Simulator to Russia by 8/31/12.

6.47.10.12 Provide systems engineering and integration functions for the NDS project.

6.47.10.13 RESERVED

6.47.10.14 RESERVED

6.47.10.15 Deliver (via DD1149) the following hardware:

- Quantity one (1) certified Circuit Card Test Console (CCTC) to support NDSC production testing by 8/10/12.

- Quantity two (2) Static Seals per Boeing design (for NASA) by 7/9/12.

- Quantity five (5) NDS Drill Templates per Boeing design. One unit due on 11/28/11 and two units due on 8/30/12, and two units due on 10/30/12.

- Quantity five (5) flight dynamic seals per NASA design (5 spares) by 8/16/12.

- Quantity six (6) flight fidelity Dynamic Seal Retainers per NASA design (6 spares) by 6/5/12.

- Quantity nine (9) each flight fidelity RTAX1000S-CQ-352-EV, and RTAX2000S-CQ-352-EV Field Programmable Gate Arrays (FPGA) risk mitigation spares by 5/25/12.

- Quantity eight (8) part number 63127142-1RES Linear EMA, EDU. Four by 4/24/12, three by 5/15/12 and 1 by 5/3/12.

- Quantity seven (7) part number 63127142-2RES Linear EMA, EDU. Three by 4/24/12, one by 5/3/12 and three by 5/15/12.

- Quantity nine (9) part number 63240431-1RES Striker Assembly, EDU. Seven units by 3/20/12 and two by 3/27/12.

- Quantity nine (9) part number 63240432-1RES Magnet Assembly, EDU. Seven by 3/20/12 and two by 3/27/12.

- Quantity one (1) part number SLZ29101641-301 Magnet Assembly (flight fidelity to be used by NASA for its component qualification testing activities) by 7/13/12.

- Quantity one (1) part number SLZ29101641-302 Striker Assembly (flight fidelity to be used by NASA for its component qualification testing activities) by 7/13/12.

- Quantity one (1) part number SLZ29101643-301 Lockdown EMA (flight fidelity to be used by NASA for its component qualification testing activities) by 7/19/12.

- Quantity three (3) part number 63127144-1RES Hook EMA, EDU. Two by 5/15/2012 and one by 5/24/12.

- Quantity fourteen (14) part number 63127146-1RES Gearhead, EDU. Twelve by 5/15/12 and two by 5/24/12.

- Quantity four (4) part number 63127150-1RES Separator EMA, EDU by 6/1/12.

- Quantity six (6) part number 63127152-1RES Lockdown EMAs, EDU. Five by 5/31/12 and one by 6/8/12.

- Quantity two (2) part number 63127156-1RES Umbilical EMA, EDU. One by 5/16/12 and one by 5/31/12.

- Quantity two (2) part number 63127156-2RES Umbilical EMA, EDU. One by 5/16/12 and one by 5/31/12.

6.47.10.16 Provide all HA and Pyro System assembly procedures in non-propriety electronic export format to NASA by 12/22/14.

6.47.11 CONCEPTUAL DESIGN FOR SIMPLIFIED ACTIVE DOCKING SYSTEM (SSCN 13575 – S/A 1926)

The contractor shall perform conceptual design and analysis tasks to determine feasibility of implementing a simplified Soft Capture System (SCS) for the NASA Docking System by January 2013.

6.47.12 DEVELOPMENT & DELIVERY OF INTEGRATION OF INTERNATIONAL SPACE STATION DOCKING ADAPTERS (IDAs) /(SSCN 13047-S/A 1943) (S/A 2016 – SSCN 13231)

The contractor shall perform the following activities in support of development, installation, activation and operation of two (2) International Docking Adapters (IDAs) located on PMA2 and PMA3 on-orbit (March 2015 operation for first IDA; September 2015 for 2nd).

6.47.12.1 Develop and deliver required documentation for, perform, and closeout the following reviews:

A. Node 2 IDA Preparation ISS Modkit (IPIM) elements Interim Design Review (IDR) in May 2012.

B. IDA primary structure PDR in May 2012 and CDR in July 2012.

C. IDA/IPIM PDR in July 2012.

D. IDA/IPIM Interim Design Review (IDR) to provide the input necessary to conclude DAC#3 in October 2012.

6.47.12.2 Provide the following input to a SpaceX IDA Flight Support Equipment (FSE) PDR in April 2012 and a CDR in December 2012:

A. IDA thermal condition model (Feb 2012 for PDR, October 2012 for CDR)

B. Integrated IDA/FSE thermal analysis (March 2012 for PDR, November 2012 for CDR),

C. Reduced IDA loads model (Feb 2012 for PDR, October 2012 for CDR)

D. Review products and provide issues, concerns, and RIDs. Work actions.

6.47.12.3 Procure the following IDA long lead parts by December 2012:

A. SLZ29101649 EMA Passive Umbilical Plug, quantity 6

B. SLZ29101649 EMA Passive Umbilical Receptacle, quantity 6

C. SLZ29101648 Separation EMA, quantity 17

D. SLZ2910XXXX Heaters, quantity 60 (final heater design complete in Feb 2012)

E. SLZ29101630 Resistive Thermal Devices, quantity 20

6.47.12.4 Procure long lead IDIS cable harness connectors by November 2012.

6.47.12.5 Deliver (via 1149) a Modified Androgynous Peripheral Attach System (MAPAS) simulator for early EVA feasibility testing of IDA installation concepts by June 2012.

6.47.12.6 Draft the structure and scope of content for the Docking Systems Program Management Plan, which shall include planning, execution and integration processes for the total Docking Systems project. The plan shall address domestic and international implementations with draft plan delivered in September 2012.

6.47.12.7 Complete an IDSS Visiting Vehicle (VV) Test and Verification (T&V) plan to assure that VV and IDA are fully compliant with the Interface Definition Document (IDD) International Docking System Standard, Interface Control Document (IDSS IDD, May 13, 2011) (Note: IDSS IDD is the document number). The Plan shall also include an approach for IDSS verification for non-NDS implementations (by September 2012).

6.47.12.8 Develop and analyze Software Change Requests (SCRs) to define software requirements and implementation approach for core CSCIs (CCS, GNC, INT SYS) and associated IPCL to support IDA 1 (on Node 2 forward). Deliver software code for IMV Fan / IDA1 heater

management and required command and telemetry functions in INT SYS R8, to be delivered to the MBF in October 2012.

6.47.12.9 Perform an integrated therm analysis of IDA in the SpaceX trunk for free flyer configuration and ISS berthed configurations using Space X Simplified Dragon model by June 2012.

6.47.12.10 Provide ISS APAS hardware assessments, analysis and problem resolution through 2015.

6.47.12.11 Perform logistics required to return all NASA hardware provided to Energia in support of IDA, including integration with the NASA Moscow Technical Liaison Office (MTLO) procedures, processes and requirements [by Sept. 2015].

6.47.12.12 Store, maintain and repair IDA flight hardware and associate Ground Support Equipment (GSE) & Special Test Equipment (STE) beginning with IDA hardware DD250 through launch [IDA#1 launch by March 30, 2015 and IDA#2 by September 30, 2015].

6.47.12.13 Develop and implement a program to demonstrate and retire risk on the NDS Block 1 concept and integration of the concept with the active and passive docking system, including IDA – [by Aug 31, 2013].

6.47.12.14 Conduct a delta System Requirements Review (SRR) for the NDS Block 1 NASA Docking System concept, encompassing full mission requirements for docking system (both low earth orbit and deep space mission scenarios) [by Sept. 30, 2013].

6.47.12.15 Conduct trades and develop a conceptual design for consolidated IPIMs at Node 2 – [by September 30, 2013].

6.47.12.16 Revise the flight software CSCIs listed below, including PPL updates and associated IPCL data deliveries, required for IDA#1/PMA-2 and IDA#2/PMA-3 implementation:

- Internal Systems (INTSYS) – R8 [Software Acceptance Review (SAR) complete by May 8, 2013].
- Guidance, Navigation and Control (GNC) – R11 [MBF delivery by Sept. 30, 2013.]
- Command and Control System (CCS) – R13 modified for both IDA and VV related changes – MBF delivery by Sept. 12, 2013]

6.47.12.17 Provide the following IDA software products for ISS reconfigurations (reference CD 13565, "Permanent Multipurpose Module (PMM) Relocation and Second Docking Port at Node 2 Zenith"):

- IDA configurations Software Change Request (by Feb. 15, 2013)
- Standard-In files for the following, to support IDA at Node 2 Zenith and Node 1 Nadir outfitted as a 2nd berthing port(by April 3, 2013):
  - CCS R13 IPCL
  - INTSYS R9 IPCL
  - PMCA R5 IPCL
  - NCS R4 IPCL

6.47.12.18 Procure and store the following NDS parts such that an IDA can be delivered subsequent to future contract action:

- Quantity one (1) Energia Adapter Ring (EAR), flight quality [by June 30, 2014].
- Quantity one (1) Modified Androgynous Peripheral Attachment System (MAPAS) flight version/pedigree delivery [by 5/30/15].

6.47.12.19 Deliver the following hardware via 1149 to NASA for integration with vehicles using the NDS:

- Quantity three (3) non-flight ISS Docking Interface System (IDIS), part number 684-022310-001, by the following dates:
  - One (1) by 8/30/2014
  - One (1) by 2/22/15
  - One (1) by 8/12/16.
- Quantity four (4) IDA/IPIM Test Control Units (ITCUs) and associated cabling, part number ITCU-100000-1, by the following dates:
  - Two (2) by 8/30/14
  - One (1) by 2/22/15
  - One (1) by 8/12/16

6.47.13 PRODUCTION OF NASA DOCKING SYSTEMS FOR VISITNG VEHICLES (S/A 1950 – SSCN 13049) (S/A 1967 – SSCN 13049 Rev 2)

The contractor shall perform the following tasks to enable production of NASA Docking Systems for Visiting Vehicles:

6.47.13.1 Develop and deliver required documentation and conduct a NDS-305 System Requirements Review (SRR) (May 2012) and a NDS-305 Preliminary Design Review (PDR) (September 2012) for the Boeing designed NDS -305 configuration combined with an -305 Tunnel Interim Design Review (IDR). These reviews shall include content for the Smart Mass Simulators (-301 and -305).

6.47.13.2 Procure the NDS pyrotechnic system long lead materials for three NDS flight units and provide five tunnel forgings by December 2012.

6.47.13.3 Procure parts for Ground Support Equipment (GSE) required to assist installation of NDS Flight units by Visiting Vehicle providers by December 2013.

6.47.13.4 Develop a preliminary plan for transition of Technical Authority for the NDS from NASA Engineering (EA) to Boeing (by 3/30/12). Focus shall be placed on areas of commonality between the -301 and -305 designs and areas that will enable an expedited fabrication and delivery of qualification and flight hardware procured under Change Directives (CDs) 12358, "Transition to Production for the NASA Docking System" and 13047, "Development, Delivery, and Integration of International Docking Adaptors (IDAs) for ISS" Transition shall be planned to begin during FY12.

6.47.13.5 Disposition all hardware/material procured or built under CD 13049 Undefinitized Contract Action prior to 11/28/12 the Stop Work Order per Program processes.

6.47.14 NDS BLOCK 1 FLIGHT UNIT DESIGN AND DELIVERY (S/A 2062 – SSCN 13642)

The contractor shall perform the following tasks in support of the design, delivery and integration of the NASA Docking System Block 1:

6.47.14.1 Perform technical and design trade studies to resolve integration issues with NDS Block 1 users.

6.47.14.2 Deliver an engineering package to NASA to enable manufacture of the NDS mass simulator [by May 15, 2014]. The engineering package shall not include any proprietary specifications or processes and shall include only US sourced components.

6.47.14.3 Deliver PDR, CDR and Qualification Complete maturity CAD, structural, thermal, and dynamic math models of the NDS Block 1 docking system for ISS or Vehicle integrated analysis. PDR models [by 10/30/13], CDR models [by 8/29/14] and Qualification Complete models [by 12/15/15]. PDR models shall be delivered in the following formats: CAD (STEP), structural launch (NASTRAN), structural mated (ABAQUS), thermal (Thermal Desktop), dynamic (Adams). CDR and Qualification Complete models shall be delivered in the following formats: CAD (STEP),

structural launch (NASTRAN), structural mated (NASTRAN), thermal (Thermal Desktop), dynamic (Adams an Trick-compatible subsystem model).

6.47.14.4 Assist Visiting Vehicle providers in using NDS Block 1 models and emulators for vehicle functional testing during vehicle development and qualification phases.

6.47.14.5 Provide recommendations for long lead procurements and sustaining engineering for NDS Block 1 hardware and TSE following initial production of 4 flight units [by 7/31/14].

6.47.14.6 Deliver an engineering package to NASA to enable manufacture and verification of a NDS Block 1 docking system. This package shall include the released drawings of the NDS Block 1 docking system configuration, contain no proprietary specifications or processes, contain only US sourced components, and identify waivers and/or non-conformances for the configuration [by 12/22/15].

6.47.14.7 Provide the following hardware via DD1149:

- Early integration hardware, that provide docking system command and telemetry emulation only, for NDS-to-user interfaces checkout by 1/15/15.
- TSE Set #1 for NDS-to-vehicle integration and testing by 12/22/15.
- TSE Set #2 for NDS-to-vehicle integration and testing by 5/16/16.

6.47.14.8 Provide guidelines for NDS Block 1 hardware refurbishment to accommodate 5 uses (launch and entry) [by 8/29/14].

6.47.14.9 Deliver the NDS Block 1 indentured parts list, drawing status and release schedule to NASA monthly.

6.47.14.10 Develop and baseline the following documents:

- SSP 50978 System Specification for NASA Docking System (NDS) Rev Basic by 2/27/14.
- JSC 65795, NASA Docking System Interface Definition Document Rev H by 12/20/13.
- JSC 64600, Executive Summary NASA Docking System (NDS) Concept of Operations Rev Basic by 2/27/14.

6.47.15 PMM RELOCATION AND SECOND DOCKING PORT AT NODE 2 ZENITH (S/A 2066 – SSCN 13565)

6.47.15.1 The contractor shall develop and deliver required hardware, software and subsystem integrated analysis products to implement and sustain the

following major USOS configuration changes, associated with the Permanent Multipurpose Module (PMM) Relocation and Second Docking Port at Node 2 Zenith. (Configuration changes shall be implemented by September 2015).

1. Relocation of PMM from Node 1 Nadir to Node 3 Forward.
2. Outfitting of Node 1 Nadir as the USOS berthing port including different berthed vehicle clocking orientations and scarring for 2 additional 25 Amp feeds for a future Node 1 Galley.
3. Relocation of Pressurized Mating Adapter (PMA)3 from Node 3 Port to Node 2 Zenith (with PMA3 oriented tail forward).
4. Installation of International Docking Adapter (IDA) Preparation ISS Mod kit (IPIM) mod kits and IDA1 enabling docking port at Node 2 Forward.
5. Installation of IPIM mod kits and IDA2 enabling docking port at Node 2 Zenith.
6. Relocation of the P1 Lower Inboard (P1LOIB) camera at Camera Port (CP)7 to CP8.
7. Relocation of Advanced Resistive Exercise Device (ARED) within Node 3 module to allow unobstructed access to PMM.

6.47.15.2 The contractor shall update Phase I and Phase II of the ISS Life Extension analyses to account for the new ISS configuration by June 2017 (Clause H. 57).

6.47.15.3 The contractor shall develop IPIM and ISS Reconfiguration Outfitting Kits (IROK) mock-up hardware, perform an Engineering Fit Check and Crew Configuration Evluation of the hardware installation procedures, and provide hardware to NASA via DD1149. [DD1149 of the equipment used in support of the IPIM Node 2 hardware evaluation by November 1, 2013 (complete) and remaining hardware evluation equipment in support of IROK/IPIM evluation by June 1, 2014].

6.47.15.4 The contractor shall evluate thermal and structural compatability of the proposed ISS configuration in the attitude envelopes as defined in SSP 50699-03 (by May 29, 2015).

6.47.15.5 The contractor shall develop and install Peripheral Docking Targets (PDTs) to be delivered as part of the IDA Delivery Items (DILs 51722 and 51723).

6.48 WATER PROCESSOR ASSEMBLY (WPA) FIRMWARE MODIFICATIONS (S/A 1641)

The contractor shall provide the following updates to the WPA firmware by February 2011:

- Resolve the over pressurization potential within the “mostly liquid separator (MLS)”during warm shutdown.

- Change result of specific faults to "SHUTDOWN" instead of "WARM SHUTDOWN.

- Update default values to reflect actual on-orbit performance.

- Correct algorithms resulting in "P_7116_TOL_FAULT" and "P_7117_LEAK_WARNING" fault messages.

- Modify firmware to allow water in the accumulator to be available for crew use when storage tank is empty.

- Correct Algorithm to eliminate unnecessary "Flow_Test sequence" messages.

- Implement a modification that will flush the Pump/Sep ORU inlet with iodinated water at the completion of each process cycle.

6.49 EMERGENCY EGRESS GUIDANCE SYSTEM (EEGS) IMPLEMENTATION S/A 1641)

The contractor shall provide the logistics engineering, drawing updates, and procedure updates required to implement the deactivation of the existing ISS Emergency Egress Lighting Systems (EELS) and removal of the Lighting Power Supplies (ELPS) from the United States Laboratory (USL), Airlock, and Node 1 by September 2010.

6.50 SUSTAINING TRANSITION S/A 1660)

6.50.1 UNPRESSURIZED FLIGHT SUPPORT EQUIPMENT

The contractor shall provide planning and implementation activities to transition authority and control of sustaining engineering activities from the Cargo Mission Contract (CMC) to Boeing for unpressurzed flight support equipment and on-orbit stowage platforms by January 1, 2011. The contractor shall identify hardware that can be excessed as part of the transition.

6.50.2 URINE PROCESSING ASSEMBLY/POWER SUPPLY MODULE HARDWARE (S/A 1704 – SSCN 12423)

The contractor shall perform the following tasks for the Regenerative Environmental Control and Life Support Systems (ECLSS) Urine Processing Assembly (UPA) Power Supply Module PSM) by September 30, 2011:

6.50.2.1 Develop a UPA/PSM transition strategy for sustaining engineering of this hardware from Marshall Space Flight Center (MSFC) to Boeing and perform a baseline supportability assessment for original equipment manufacturer (OEM) to depot transition.

6.50.2.2 Assess all existing reliability and maintainability products on four ORUs from the UPA system to determine if they support the ISS assembly complete configuration.

6.50.2.3 Observe assembly and test activities for the distillation assembly (DA) and fluid control and pump assembly (FCPA) to understand and document any delta processes and techniques that may exist between MSFC and Boeing operations and to determine if any of the processes and techniques observed may affect/have implications to on-orbit troubleshooting of the Regen ECLSS.

6.50.2.4 Assess UPA software version description document (VDD), software architecture and design documentation , software user's manual and UPA software formal verification and acceptance processes to determine similarities/differences between MSFC and Boeing products/processes.

6.50.2.5 Assess UPA/PSM electrical hardware drawing and unique specifications to determine power quality similarities/differences between MSFC and Boeing products ISS/speci-fications.

6.50.3 EXPRESS LOGISTICS CARRIER (ELC) S/A 1700 – SSCN 11967)

The contractor shall perform the following tasks to support the transition of sustaining engineering of the ExPRESS Logistics Carrier hardware and the ExPRESS Carrier Avionics (ExPCA) software from NASA Goddard Space Flight Center (GSFC) to Boeing by 30 days post activation of the ELC on Flight ULF6 (launch in February 2011):

6.50.3.1 Process sampling of major GSFC data items (models drawings, software source code, major analysis reports, etc.) to determine if products can be opened and manipulated with Boeing tools and provide a summary of major findings (missing data, errors in models, etc) and recommendations for resolution by July 31, 2010.

6.50.3.2 Review the list of residual assets and provide recommendations for disposition by June 30, 2010.

6.50.3.3 Observe the integration and testing of ExPCA at GSFC and the integration and testing of ExPCA 5 at KSC, including comprehensive performance tests.

6.50.3.4 Develop and implement transition plans (agreed to by GSFC, ISS Program, and Boeing) for the following by September 30, 2010.

6.50.3.4.1 Transition of ELC ExPCA software sustaining from GSFC to Boeing.

6.50.3.4.2 Transition of ELC payload test and processing hardware sustaining from GSFC to Boeing.

6.50.3.4.3 Transition of the Advanced Spacecraft Integration and System Test (ASIST) workstations from GSFC to Boeing.

6.50.3.5 Evaluate GSFC hardware and software integration processes and develop an ELC Payload Integration Plan to define the templates and data products required to integrate future Payloads to the ELCs on-orbit by September 30, 2010.

6.50.3.6 Evaluate the ExPRA design engineering for compatibility with Boeing design tools and status of the ExPCA 6 to determine the feasibility for Boeing to complete assembly by December 2010.

6.50.3.7 Perform Space Communication and Navigation (SCAN) payload software integration with the ELC ExPCA software and input the interim ELC3 command and data handling (C&DH) data set into the payload data library, in support of the installation of SCAN on the ELC3 and HTV3 stage by September 2010.

6.50.4 JSC GFE HARDWARE (S/A 1701 – SSCN 12205)

The contractor shall develop sustaining engineering transfer plans, jointly with NASA, to document the GFE provided product baseline (drawings, models, safety data packages, etc.), packaging, handling, and storage requirements, pre-flight processes and non-conformance reports (NCRs). Any issues related to the data shall be documented. The plan shall also identify any multi-use ground support equipment (GSE) and facility dependencies, and provide options for alternative solutions. Plans shall be developed for the following GFE systems and their associated GSE and facilities (in 21 weeks after GFE data is delivered):

- Crew Health Care System (CheCS)
- Flight Crew Systems
- Environmental Control and Life Support/Active Thermal Control System (ECLS/ATCS)

6.50.5 OXYGEN GENERATIONS SYSTEM AND WATER RECOVERY SYSTEM RACKS (S/A 1712 – SSCN 12204)

The contractor shall perform the following tasks for the transition of sustaining engineering responsibilities for the oxygen generation system (OGS) rack and support equipment (including ground), the water recovery system (WRS) racks 1 and 2 and support equipment (including ground), and regenerative ECLSS contingency hardware and support equipment from NASA MSFC to Boeing by no earlier than April 2011:

a. Development and disposition of a Design Transfer Package (DTP).

b. Documentation capture for all hardware.

c. Product structure baseline development and transition for hardware to be transitioned.

d. Logistics supportability assessment to facilitate product support transition.

e. Participate in and provide engineering input for three on-orbit contingency operations that require the use of the microbial shock kit, water delivery system, or hydrogen ORU calibration kit.

6.50.6 CREW QUARTERS (SSCN 12860 – S/A 1827)

The contractor shall perform the following tasks to transition sustaining engineering and post production support of crew quarters from NASA to Boeing:

6.50.6.1 Provide planning and implementation activities, including documentation capture, to transition authority and control of sustaining engineering activities from NASA to Boeing for all Crew Quarters (CQ) hardware (SEG32109500-301, -302), by September 30, 2012.

6.50.6.2 Develop the following LSARs to support the transition and to determine the need for additional spares by May 11, 2012:

- Audio Annunciation Device – P/N: SEG32110362
- ATU Loudspeaker – P/N: SEG32110407
- Test Panel – P/N: SEG32110349
- Electrical Panel – P/N: SEG32110307
- Fan Power / Data / Switch Cable Assembly – P/N: SEG32110117

6.50.6.3 Complete obsolescence assessments for the following spares by April 2012:

- Power Supply Assembly – P/N: SEG32110334-301
- Fan Orbital Replaceable Unit (ORU), Ventilation Assy – P/N: SEG32109721-301
- Intake Airflow Sensor – P/N: SEG32110394-301
- Intake Airflow Sensor – P/N: SEG32110394-302
- Exhaust Airflow Sensor – P/N: SEG1100401-301
- Audio Annunciation Device – P/N: SEG32110362

- ATU Loudspeaker – P/N: SEG32110407
- Test Panel – P/N: SEG32110349
- Fan Power / data / Switch Cable Assembly – P/N: SEG32110117
- Electrical Panel – P/N: SEG32110307

6.50.7 FLIGHT CREW EQUIPMENT (FCE) (SSCN 12870 - S/A 1829)

The contractor shall transition authority and control of sustaining engineering from NASA Engineering to Boeing (by 06/14/12) and Maintenance and Operations (M&O) from the Space Operations Contract (SPOC) to Boeing [by 04/01/12] for the following equipment, including Ground Support Equipment (GSE):

- Portable Breathing Apparatus (PBA)
- Water Transfer Equipment
- Hand Held Microphone (HHM)
- Color Television Camera (CTVC)

6.50.8 Oxygen Generation Assembly Power Supply Module (S/A 1865 – SSCN 13097)

The contractor shall provide planning and implementation activities, including documentation capture, to transition authority and control of sustaining engineering for the Oxygen Generation Assembly Power Supply Module (OGA PSM) from NASA Marshall Space Flight Center (MSFC) to the Boeing NAS15-10000 Contract by December 01, 2012.

6.50.9 ACTIVE THERMAL CONTRAOL SYSTEMS & ENVIORNMENTAL CONTROL AND LIFE SUPPORT HARDWARE (SSCN 13267 Rev 2 – S/A 1925)

The contractor shall transition authority and control of Sustaining Engineering (SE) and Maintenance and Operations (M&O) from NASA JSC to Boeing for Active Thermal Control System (ATCS) Environmental Control and Life Support (ECLS) hardware listed in Appendix A by 04/19/13.

6.51 PRECIPITATION REMEDIATION METHODS FOR UPA (S/A 1674)

The contractor shall support the test and analysis of precipitation remediation methods for the urine processing assembly (UPA) by performing the following tasks in the areas of organic chemistry, microbiology, and materials and processing (to be completed by 9/30/2011):

- Evaluate and recommend potential technologies and remediation techniques.
- Evaluate/determine potential impacts to the environmental control life support system and ISS impacts for remediation methods.
- Provide input to test method selection and test performance criteria definition.
- Provide input to the evaluation of test results of remediation technologies and techniques including: effectiveness of precipitation control; relationship between remediation solution, system Ph, and oxidizer; and consumable rates that would be required to support the remediation.

6.52 FLIGHT STS-335/135 (S/A 1679) (S/A 1713)

6.52.1 PUMP MODULE INTEGRATED ASSEMBLY RETURN STUDY

6.52.1.1 The contractor shall perform a trade study (by 09/09/10) of Lightweight MPESS Carrier configurations to safely return a pump module integrated assembly from on-orbit, on flight STS-335. The following shall be provided:

- Recommendation on the LMC configuration with design concepts and required new or existing hardware.
- Recommendation on using current EVA tools and requirements and design for any new tools required.
- An overall LMC flight integration schedule that includes LMC Flight Support Equipment (FSE) design work, FSE modifications, analytical and physical integration milestones, Shuttle deliverables, KSC deliverables, and long lead procurement parts.

6.52.1.2 The contractor shall initiate procurement of long lead components for required hardware (based on recommendations).

6.52.2 MISSION PLANNING AND OPERATIONS (S/A 1685)

The contractor shall provide integration and operations tasks (SOW 1.0 and 3 .0) to support mission planning and operations for Flight 335 (in June 2011).

6.52.3 LMC ANALYTICAL INTEGRATION (S/A 1685)

The contractor shall perform the analytical integration of the LMC to launch the R2D2 payload and return the failed pump module on Flight 335 and shall provide the necessary products and engineering for physical integration by NASA KSC.

6.52.4 CONTINGENCY LOADS ANALYSIS (S/A 1715 – SSCN 12689)

The contractor shall perform the analysis to determine if the STS-135 LMC Integrated Assembly (IA) can be certified for a landing case with either contingency operations LAPA tool (COLT) not installed for return. The contractor shall certify the LMC IA for this configuration if feasible.

6.53 OGA RECIRCULATION LOOP MAINTENANCE HARDWARE (S/A 1679)

The contractor shall develop, design, test and provide via DD 1149 (by 10/15/10) two flexhose assemblies utilizing commercial grade components for use as a temporary near-term corrective maintenance action to periodically restore the OGA recirculation loop Ph to near neutral and to preclude corrosion of the cell stack assembly's zirconium support screens and cell separator sheets and resultant colloial zirconium oxide particulates from occluding loop filters and flow passages. Data packages shall be delivered with the hardware and shall include material/cleanliness certifications, testing results and parts traceability data.

The contractor shall review and provide inputs to the Marshall Space Flight Center (MSFC) provided Maintenance Hazard Assessment (MHS) for the Safety Review Panel (SRP) for this hardware, and the Mission Operations Directorate (MOD) development of the crew and ground procedures needed to install and operate maintenance hardware within the OGA subsystem.

6.54 CREW QUARTER (CQ) SPARES (S/A 1657 – SSCN 12569)

The contractor shall perform a reliability and maintainability assessment and a sparing analysis on CQ components/ORUs and provide a recommendation on CQ spares/spares quantities required to support operations through 2020 (due April 2011).

6.55 DOCKING HUB SYSTEM (DHS) (S/A 1707 – SSCN 12371)

The contractor shall perform the following tasks in support of development of the Docking Hub System (DHS):

6.55.1 Preliminary Design, Integration and Delivery Concept

6.55.1.1 Perform preliminary analysis for the DHS mission concept of operations to determine the DHS required functionality, system architecture, and system requirements and develop configuration layouts and a test and verification approach (due January 2011).

6.55.1.2 Perform preliminary integrated analysis for all mission phases through docking hub delivery and ISS attached operations to establish natural and induced environments and to define Atlas V launch vehicle and ISS imposed environments constraints (due October 2010).

6.55.1.3 Develop a preliminary system architecture and constraints for the DHS, including constraints imposed by an Atlas V launch vehicle, delivery to the ISS and mated flight operations (due January 2011).

6.55.1.4 Produce a plan for upgrading the Node structural test article (STA) to flight status, including prelinary design of the docking hub (DH) primary structure based on the Node STA. The plan shall describe the repair and upgrade approaches (due January 2011).

6.55.1.5 Provide a technical evaluation of the enhanced payload attach fitting concept of the orbital transfer unit implementation and provide a ROM cost and schedule to implement the concept (due January 2011).

6.55.1.6 Develop a preliminary conceptual design for the interface ring between the DH and the orbital transfer unit (due January 2011), including the following:

- Structural interface concept based on the assessment of prelinary life cycle loads.

- Concept for a separation system and safety evaluation for separation operation.

- Concept for electrical interfaces with the DH and orbital transfer unit, including element and heater power, data, pyrotechnics and discrete signal wiring.

6.55.1.7 Develop risks and associated mitigation plans for the development of the Docking Hub System through ISS operations (due January 2011).

6.55.1.8 Provide a plan for long lead procurement of DHS components (due January 2011).

6.55.1.9 Generate data packages and resolve formal action items and comments for the following:

A. A preliminary requirements review (PRR) in October 2010 for the DH primary structure (PRR-1).

B. A PRR in January 2011 for the DHS.

C. An Incremental Design Review (IDR) in January 2011 for the DH primary structure preliminary design.

6.55.1.10 Generate a systems requirements review (SRR) data package for the DHS (due in April 2011), limited to the following items:

- System level concept of operations

- DH specification

- Launch mission kit (LMK) specification

- Centaur modification requirements

- Phase zero safety analysis

- Draft systems integration plan (including test and verification approach and technology readiness level (TRL) assessments)

- Conceptual design layouts of the DH

- Subsystem schematics

- Program schedule for development of the DHS

- Design reference mission description for DHS launch, assembly and on-orbit operations

- System level design for manufacturing, assembly, integration and test approaches.

6.56 SPACE SHUTLE CAMERAS (S/A 1713 – SSCN 12556)

The contractor shall perform the following tasks to allow use of the Space Shuttle Program (SSP) color TV cameras (CTVC) in the ISS external camera group (ETVCG):

- Revise the ETVCG drawings to allow use of the SSP CTVC part numbers (SSP CTVC P/N 3278890-508, 3278890-507) as an alternative to the International Space Station (ISS) CTVC within the ETVCG configuration.

- Revise the ETVCG Launch Configuration Drawing (LCD) to account for the SSP CTVC as an alternate part and establish two launch configurations: one with the ISS MLI blanket, lens hood & protective caps and one with just the CTVC with protective caps.

6.57 MULTIPLE VISITING VEHICLES ON NODE 2 (S/A 1736 – SSCN 12644 and SSCN 12693)

The contractor shall perform the following tasks to support the addition of a berthing port capability at Node 2 Zenith to support simultaneously berthed VVs at Node 2 Zenith and Nadir ports:

6.57.1 Hardware and Software Capabilities (S/A 1736 – SSCN 12693)

Provide the hardware and software capabilities required to support two different type visiting vehicles simultaneously on Node 2 Zenith and Nadir ports by December 2011.

6.57.2 ECLSS Capability Analyses, Testing & Implementation (S/A 1736 – SSCN 12693)

6.57.2.1 Perform analysis of ECLSS airflow using the following configurations to assess the airflow at the VV interface, identify issues and determine necessary work-arounds (by August 3, 2011)

- Existing Node 2 ECLSS configuration
- Use of Node 2 Forward fan with ducting to reroute IMV air to Zenith

6.57.2.2 Perform a test using available on-orbit hardware (Elephant trunk) to determine resultant cabin airflow to Node 2 Zenith. Develop procedures to implement this configuration on-orbit (by September 28, 2011).

6.57.2.3 Manifest 72 CBM controller panel assembly protective caps for use on-orbit crew to install a temporary vestibule outfitting kit (VOK) (by August 26, 2011).

6.57.3 Capability Envelope (S/A 1736 – SSCN 12693)

Perform subsystem analyses to define capability envelope for VVs at Node 2 Zenith and for dual VVs simultaneously berthed at Node 2 Nadir and Node 2 Zenith (by December 20, 2011).

6.57.4 Zenith Release and Departure Capability for Berthed Visiting Vehicles (SSCN 12961 – S/A 1810) (S/A 1886)

The contractor shall perform analyses required to implement the capability to support SSRMS release of visiting vehicles from the Node 2 Zenith port while Node 2 Nadir is occupied by another berthed vehicle and material outgassing/plume contamination analyses to support dual berth visiting vehicle capability for the HTV and Standard Cygnus on Node 2 Zenith.

- The analysis shall support implementation of this capability for HTV by February 2013.
- The analysis shall support implementation of this capability for Standard Cygnus by April 2013.

- The analysis shall support implementation of this capability for Orbital Enhanced Cygnus by August 2013.

6.58 WATER PROCESSER AND OXYGEN GENERATION SYSTEM TESTING (S/A 1734 – SSCN 12313)

The contractor shall perform the following tasks to complete testing and cycle life analysis for the Water Processer Assembly/Oxygen Generation Assembly (WPA/OGA) Pumps:

- Perform and complete life testing on the waste water pump (SV825431), water delivery pump (SV825619), and the OGA pump (SV825566).

- Provide report(s) for the waste water pump (SV825431), water delivery pump (SV825619), and the OGA pump (SV825566) containing cycle and continuous operation test data and life assessments to support sparing analysis (by December 2012).

6.59 GROUND HARDWARE AND TRAINING UNITS (S/A 1743 – SSCN 12810)

6.59.1 SPCU Heatexchanger (HX)

The contractor shall deliver (via DD 1149) a training unit of the SPCU HX Insulation Maintenance Kit deliverable item by April 2012.

6.59.2 WHC Piping Connection (S/A 1777 – SSCN 12637)

The contractor shall deliver (via DD 1149) a training unit of the Piping Unit ORU A2 Connector Plug deliverable item (ID 51597) by August 31, 2012.

6.59.3 Lab Window Shutter (S/A 1960 – SSCN 13324)

6.59.3.1 The contractor shall deliver ExPRESS Software which enables ground commanding of Lab Window Shutter System by May 2014 (S/A 1980 – SSCN 13324 Rev 1).

6.59.3.2 The contractor shall deliver (via DD 1149) 1 training unit of the Window Observational Research Facility (WORF) Window Shutter Mod Kit (DIL 32404) to JSC by August 2014.

6.59.4 AIRLOCK SHELL HEATER MODIFICATION (MOD 1989/SSCN 13501)

The contractor shall provide training hardware for the Airlock Shell Heater modification kits (DIL 32426) by June 2014.

6.59.5 ARFTA IN-PLACE FILL & DRAIN (S/A 2000 – SSCN 13197 Rev 1)

The contractor shall provide (via 1149) training hardware for the WRS-2 Rack modification kits (DIL 32397) which allow in-place filling and draining of the Advanced Recycle Filter Tank Assembly (ARFTA) by 03/02/15.

6.60 HARDWARE STUDIES (S/A 1765 – SSCN 12835)

6.60.1 Pressurized Elements On-Orbit installed Shell Heater

The contractor shall perform a study (by 03/07/12) to assess the technical feasibility of an on-orbit installed internal shell heater for USOS pressurized elements. The study shall include the following:

- Installation method.
- Operational use.
- Design and implementation approach.
- Pros, cons and risks associated with design concept(s).
- Cost of option(s)
- Recommendation.

6.60.2 EATCS DESIGN IMPROVEMENTS (SSCN 12878 – S/A 1789)

The contractor shall deelop concepts and associated costs for a dual pump and control valve package (PCVP) design and modular pump module (PM) with dual PCVPs design for the External Active Thermal Control System by September 27, 2012.

6.60.3 ATCS RADIATOR LIFE EXTENSION (SSCN 12833 – S/A 1818)

The contractor shall perform an assessment of the current Heat Rejection Subsystem Radiators (HRSRs) and photovoltaic radiators (PVRs) capabilities and requirements to develop a recommended strategic plan to support ISS operations through 2028. The study shall be a complete assessment to quantify and update the risk to the current radiator designs to better understand how that risk relates to future hardware needs for ISS life through 2028 (by September 2012).

6.60.4 AIRLOCK OXYGEN HIGH PRESSURE GAS TANK ASSESSMENT(S/A 1862 SSCN 13257)

The contractor shall provide a feasibility assessment of Airlock oxygen High Pressure Gas Tank (HPGT) recharge by compressing output gas from the Oxygen Generation Assembly (by July 1, 2012). Study results shall be defined to the feasibility and conceptual design level needed to support a decision on whether to pursue this option as a method of providing HPGT recharge on orbit and shall include:

1. OGA gas purity and composition of the non-oxygen components when operated at capacities needed to support ISS atmospheric regeneration as well as added capacity for HPGT recharge. As a minimum, water vapor and hydrogen concentrations in the output gas shall be defined; however, levels of any other trace gases that might be a limitation to ISS operations, safety or crew health shall be addressed if identified as present.

2. Definition of the interface parameters at the OGA outlet, including any unique requirements for isolating back pressure or accumulating gas to interface with a pump/compressor that will deliver compressed oxygen to the HPGT at approximately 2740 psia.

3. Impacts to OGA operations, reliability or maintenance requirements that result from additional run time or interface modifications.

4. Prediction of ISS resources required for operation.

5. Any unique conditioning required of OGA output gas such as removal of water vapor or thermal conditioning of recharge lines between the OGA and the Airlock.

6. Recommendation of where best in the ISS to locate any added equipment including gas conditioning systems and compressor equipment, including proposed hose/line routing.

7. A notional control method to coordinate OGA and recharge equipment operation and any anticipated need for computer-based (software) control.

8. Definition of any impacts to the OGA and its health as a result of high pressure 02 compression.

6.60.5 FEASIBILITY AND CONCEPTUAL DESIGN FOR SIMPLIFIED ACTIVE DOCKING SYSTEM (S/A 1864 – SSCN 13275)

The contractor assess the feasibility of implementing a simplified Soft Capture System (SCS) for the NASA Docking System and shall develop a concept to a level of maturity to allow NASA to determine technical and schedule risks associated with the alternate approach (by August 31, 2012). Requirements for the system include the following:

- The SCS shall be comparable with a passive or active APAS style SCS.
- Hard mate assembly/hard capture system shall be per the International Docking System Standard (IDSS)
- Must use Technology Readiness Level 6 or higher.
- Design, development, qualification and certification of a final design is required to be completed no later than June 2015.
- The design shall contain no proprietary features.
- Loads are as documented in IDSS Interface Definition Document, Rev A.
- The design shall be as simple and robust as possible (based on requirements).
- The design shall allow build-to-print capability by third parties (must use publically available processes and data).

6.60.6 INTEGRATION OF GALLE INTO NODE 1 (SSCN 13391 – S/A 1902)

The contractor shall perform a trade study to identify and assess options for relocating and consolidating galley hardware components into Node 1 (by May 2013). The study shall include:

- A list of subsystem impacts (including additional hardware and resources required).

- An assessment of options based on difficulty of implementation and crew time vs. benefits.

- Impacts to Node 1.

- Recommendation for implementation.

6.60.7 ADDITIONAL PRESSURIZED PAYLOAD ACCOMODATIONS (SSCN 13407 – S/A 1903)

The contractor shall perform a trade study to identify options to provide additional pressurized payload accommodations onboard the ISS for Expedite the Processing of Experiments to the Space Station (EXPRESS) Rack type payloads. The study shall define a set of architecture options, pros/cons associated with each option, and the relative complexity of implementing each option. The study shall assess the use of existing resources available onboard and on the ground to implement each option (by March 2013).

6.60.8 Identify Technology to Remove Organic Compounds Via the Water Processor Assembly (S/A 1907)

The contractor shall define and recommend options to remove organic compounds that are present in the ISS water recovery system and are not efficiently removed by the current design of the Water Process Assembly (WPA) Multifiltration Beds (by 9/2013). Compounds targeted for removal shall include dimethylsilanediol (DMSD), polydimethylsiloxanes (PDMS) and trimethylsilanol (TMS). The contractor shall also perform initial capacity assessment of up to 3 candidate media (2 for removal of DMSD/PDMS/TMS/Dimethylsulfone, 1 for replacement of 580-26 adsorbent) and provide for storage of the candidate sample media for future shelf life study

6.61 HIGH RATE DATA WIRELESS COMMUNICATIONS (S/A 1771 – SSCN 12443)

The contractor shall perform the following tasks:

6.61.1 Provide the capability for two way wireless high data rate communications between the EXPRESS Logistics Carrier (ELC) payload sites and the United States Laboratory using commercial-off-the-shelf (COTS) antenna(s) and wireless access point(s).

6.61.2 Provide the following non-flight components via 1149:

Component	Qty	Due Date
Lab Coax Cable Assembly – Lab Unit	2	4/06/11

FEU Antenna Assemblies – Lab Unit	2	4/06/11
WAP to Brick Power Cable – Qualification Units	2	5/25/12
Payload Antenna Assembly Coax Cable – Quantity Lab Units	14	5/25/12
COTS Linear Antennas – Lab Units	22	9/16/11
COTS Linear Antennas – Qualification Units	2	9/16/11
USL Linear Antennas – Lab Units	2	3/26/12
USL Linear Antennas – Qualification Units	2	3/26/12
USL Linear Antennas – Unmodified COTS Units	4	3/26/12
USL Payload Patch Antennas – Lab Units Due	10	5/25/12
Wireless Access Points (WAPs) – Lab Units	14	5/25/12
WAP – Qualification Units	2	5/25/12
WAP – Unmodified Units	18	5/25/12
Network Device – USB – Lab	16	5/25/12
Network Device – USE- Qualification Units	2	5/25/12
Network Device – USE – Unmodified COTS Units	20	5/25/12
WAP – Lab Units (for Huntsville PSIVF lab)	4	9/16/11
Network Device – USB – Lab Units (for Huntsville PSIFV lab)	4	9/16/11

6.62 ISS-BASED RELATIVE NAVIGATION SYSTEM (RNS) (SSCN 12957 – S/A 1784)

6.62.1 The contractor shall define and develop system design specifications and requirements Relative Navigation System (RNS) sensor package and conduct the System Requirements Review (SRR) by April 12, 2012.

6.63 LITHIUM-ION BATTERY PROJECT (SSCN 12202 – S/A 1792)

The contractor shall complete the following tasks to support the development and implementation of Lithium-Ion (Li-Ion) Battery Orbital Replacement Units on the ISS Vehicle:

- Provide software updates to support a new charge algorithm and account for instrumentation differences between the existing Ni-H2 battery and the new Li-Ion battery ORUs (by April 30, 2014 for PVCA R5 and by May 31, 2014 for PMCA R5).
- Provide one Li-Ion qualification unit to the Integrated Power Lab by September 15, 2014.
- Provide (via DD 1149) 55 GS Yuasa Cells and 65 Quallion Cells to NASA (by February 29, 2012).

6.64 RPCM FIRMWARE AID (SSCN 12984 – S/A 1800)

The contractor shall provide a Remote Power Controller Module (RPCM) standard maintenance firmware aid (by June 3, 2012) for use with existing on-orbit RPCM firmware and available

RPCM ground spares. The standard maintenance firmware aid shall:

1. Increase the time considered necessary after power connection during an RPCM hot mate installation to allow propert RT address acquisition;

2. Increase the size of the 1 kilohertz (kHz) current and voltage hindsight buffers to allow more data capture to improve troubleshooting when a circuit breaker trip occurs;

3. Have the capability to copy the Electrically Erasable Programmable Read Only Memory (EEPROM) to Static Random Access Memory (SRAM) on power-up, regardless of any EEPROM Cyclic Redundancy Check (CRC) errors detected;

4. Have the Input Undervoltage Trip Recovery function to default Inhibited rather than Enabled.

6.65 EXPRESS RACK MODIFICATIONS

6.65.1 Hardware Modifications

The contractor shall modify the following flight racks to replace the 10 baseT payload Ethernet hub bridges (PEHBs) with 100baseT improved Ipehg via on-orbit IVA modification kits:

- Four EXPRESS with ARIS racks by 6/19/14.
- One WORF rack by 4/4/14.
- Three EXPRESS without ARIS Racks (EXPRESS Rack 6, Galley Rack will not be modified) by 10/16/14.
- Two Human Research Facility (HRF) Racks by 11/27/14.

6.65.2 Software Modifications

The contractor shall modify the EXPRESS flight software to allow utilization of the iPEHGs, while retaining the capability to utilize the heritage PEHB by 03/06/2015.

6.65.3 Ground Facility Modifications

The contractor shall modify the Avionics Test Bed (ATB), the Rack Software Test Bed (RSTB) and the Payload Software and Integration Facility (PSIVF), to install ground iPEHGs, while maintaining the capability to utilize the heritage PEHBs by 03/07/2014.

6.65.4 Ground Hardware

The contractor shall provide the following ground hardware via 1149:

Hardware Description	**Part No.**	**Due Date**	**Use**
Wire Harness Assy – PWR/FO	683-98949-1	6/6/2013	Functional Checkout Unit (FCU)
Wire Harness Assy – PWR/FO	683-98949-2	06/06/2013	FCU
Wire Harness Assy – Ethernet/RS232	683-98968-1	07/10/2013	FCU
Ipehg Ground Unit	EAN64562-001-01	07/17/2013	Ground Facilities
Ipehg Ground Unit	EAN64562-001-01	07/22/2013	Ground Facilities
Ipehg Ground Unit	EAN64562-001-01	08/20/2013	Ground Facilities
Ipehg Ground Unit	EAN64562-001-01	08/27/2013	Ground Facilities
Ipehg Ground Unit	EAN64562-001-01	09/30/2013	Ground Facilities
Ipehg Ground Unit	EAN64562-001-01	10/07/2013	Ground Facilities
Ipehg Ground Unit	EAN64562-001-01	10/23/2013	HRF FPR ground rack
Wire Harness Assy – PWR/FO	683-98949-5	08/28/2013	HRF FPR ground rack
Wire Harness Assy – PWR/FO	683-98949-6	08/28/2013	HRF FPR ground rack
Wire Harness Ethernet/RS232	683-98968-1	08/28/2013	HRF FPR ground rack

6.66 CONTINGENCY EVA FAILURE SCENARIOS (BIG 12)

The contractor shall perform the following tasks to complete identification of required pre-failure and post-failure analysis and best "Next Worst Failure" configuration for the currently identified ISS Contingency Extra Vehicular Activity (EVA) Failure scenarios (Big 12):

6.66.1 EATCS pump module (PM) R&R

The contractor shall review the current EATCS PM Integrated Operations Product Template (IOPT), identify the following, and update the IOPT (by 2/2/12):

- Analyses and tasks required to support recovery of a PM failure.
- Analyses required to be performed in advance of the failure to minimize the time between occurrence of the failure and execution of recovery EVAs.
- The ISS system configuration which best mitigates impacts, in the event of the next worst failure and also protects EVA capability.

6.66.2 IOPT Completion

The contractor shall complete identification of all analysis and products required, identify analyses required to be performed in advance of the failure to minimize the time between occurrence of the failure and execution of recovery EVAs, identify the ISS system configuration which best mitigates impacts in the event of the next worst failure and also protects EVA capability, and document analysis required in a dedicated IOPT matrix for the following contingencies by 11/2013:

- R&R of FHRC,
- R&R of IFHX,
- R&R of SAW ECU,
- R&R of SAW BMRRM,
- R&R of ATA,
- R&R of NTA,
- R&R of MBSU,
- R&R of EXT MDM,
- R&R of DDCU S01A and DDCU S02B,

- R&R of external RPCMs SO1A_C, SO2B_C, S01A_A, S11A_D, S02B_A, P12B_D

6.66.3 NH3 Leak and MMOD Penetration

The contractor shall perform the following tasks for the NH3 leak isolation and recovery (by 11 /19 /12) contingency and the loss of module due to MMOD penetration contingency (by 2/13/13):

- Identify current capabilities to locate leak site and perform repairs.
- Identify tools and systems necessary to restore pressure and structural integrity for a repair to be performed EVA.
- Identify assumptions bounding the tool designs and usagae techniques.

6.66.4 Generic EVA Baseline

The contractor shall finalize Failure Response Assessment Team (FRAT) ISS generic contingency EVA baseline assumptions (by 10/06/11).

6.66.5 SEQUENTIAL SHUNT UNIT (SSU) R&R (SSCN 12769, REV 3; S/A 2010)

The contractor shall perform the following tasks in preparation for an SSU contingency:

- Prepare an SSU IOPT matrix identifying required analyses and products required to prepare for an SSU contingency and identify which analyses are needed prior to the contingency (by 01/2014).
- Perform an SSU power generation analysis (by 11/2013) for the SSU contingency. The analysis shall be performed at BGA angles of 270, 240, 30 and 65, to determine the electrical current at the SSU shunt plugs to determine if it violates the shunt plug maximum current limit.

6.67 UPDATE OF FLOATING POTENTIAL MEASUREMENT UNIT (FPMU) GROUND STATION HARDWARE AND DATA REDUCTION SOFTWARE (SSCN 13073 – S/A 1811)

The contractor shall establish a Ground Station (G/S) for the Floating Potential Measurement Unit (FPMU) in the contractor's facility (by May 2012). The FPMU G/S will

consist of a contractor furnished computer and contractor developed software tool that will convert the government-furnished FPMU video stream into raw ("Level 0") FPMU data required to perform ISS plasma hazard assessments.

6.68 MODIFICATION OF LIGHTWEIGHT ADAPTOR PLATE ASSEMBLY (LwAPA) (SSCN 13123 – S/A 1809)

The contractor shall modify the Lightweight Adaptor Plate (LwAPA) S/N 683-96104-013 to 683-96104-001 (by April 18, 2012).

6.69 RUSSIAN SEGMENT (RS) COMPONENT WITH THE SDIL (SSCN 12638 – S/A 1817)

6.69.1 SDIL UPGRADE

The contractor shall upgrade the SDIL RS simulator to contain the same hardware and software configuration as planned to be utilized in the RSC-E Ground Debugging and Development Complex (GDC), including the Multipurpose Logistics Module (MLM) rig (as documented in SDIL ICD SSP 50142, Part 1 and Part 2 (September '98' release)) by September 2013. An Acceptance Data Package on the simulator upgrade shall be delivered to NASA.

6.69.2 SDIL SUSTAINING DOCUMENTATION

The contractor shall provide documentation required to sustain the upgraded Service Module (SM) and MLM components by no later than September 30, 2015. The documentation includes training manuals, user's guides, and maintenance and operations procedures required to perform system operations, troubleshooting, and maintenance of the upgraded SM and MLM systems.

6.70 DEVELOPMENT OF GFE PORTABLE VELOCITY AIR METERS (SSCN 13057 – S/A 1822)

The contractor shall perform the following tasks in support of the development of GFE portable air velocity meters:

- Provide input into the development of requirements.
- Review, provide Review Item Dispositions (RIDs), and participate in design reviews to identify issues, concerns, and risks.
- Perform testing to establish flow characteristics through flow devices to aid in the on-orbit use of hardware (report due January 2013).

- Define the vehicle configuration around air diffusers and inlets to aid in the design of the hardware, by May 2012.

6.71 INTEGRATION OF CABIN AIR SEPARATOR FOR EVA OXYGEN (CASEO) (SSCN 12209 – S/A 1825 & 1932)

6.71.1 RESERVED

6.71.2 The contractor shall deliver the following parts for the GFE CASEO project:

NAME	NUMBER	FIDELITY	QTY	DUE DATE
Oxygen Coupling, Male, 3-point flange	N/A	Mock-up	1	12/16/2011* 1/6/12 (A)
Connector, Receptacle, Flanged, Power	N/A	Mock-up	1	12/16/2011* 1/6/12 (A)
Connector, Receptacle, Flanged, Power	NATC00T15N4PN	GSE	1	1/16/2012* 1/12/12 (A)
Pins for Connector J	NZGC-C-12PB	GSE	30	1/16/2012* 12/22/11 (A)
Sealing Plugs for Connector J	NZGSP-12	GSE	3	1/16/2012* 12/22/11 (A)
Connector, Plug, Power	NATC06G15N4SN	GSE	4	1/16/2012* 3/15/12 (A)
Backshell, 90 deg for Connector K	NZGA-JG-15-N-12	GSE	4	1/16/2012* 12/22/11 (A)
Backshell, 90 deg for Connector K	NZGA-LG-15-N-12	GSE	4	1/16/2012* 12/22/11 (A)

Sockets for Connector K	NZGC-C-12SB	GSE	100	1/16/2012 * 12/22/11 (A)
Sealing Plugs for Connector K	NZGSP-12	GSE	12	1/16/2012 * 12/22/11 (A)
Protective Cover for Connector K	NATC-PPC-N-15-0	GSE	4	1/16/2012 * 12/22/11 (A)
Backshell for Connector L	NZGA-SG-15-N-12	GSE	1	1/16/2012 * 12/22/11 (A)
*NOTE: Parts Delivered (1/16/11 should have been 1/16/12) **Parts on Order will be delivered into GOLD (Reference Debit/Credit Proposal).				
Pins for Connector L	NZGC-C-12PB	GSE	100	1/16/2012 * 12/22/11 (A)
Sealing Plugs for Connector L	NZGSP-12	GSE	12	1/16/2012 * 12/22/11 (A)
Protective Cover for Connector L	NATC-RPC-N-15-0	GSE	4	1/16/2012 * 12/22/11(A)
Connector, Plug, Power	NATC06G15N4SN	GSE	3	1/16/2011 * 12/22/11 (A)
Backshell for Connector M	NZGA-SG-15-N-12	GSE	3	1/16/2011 * 1/13/12 (A)
Sockets for Connector M	NZGC-C-12SB	GSE	80	1/16/2011 * 1/20/12 (A)

Sealing Plugs for Connector M	NZGSP-12	GSE	9	1/16/2011 * 12/22/11 (A)
Protective Cover for Connector M	NATC-PPC-N-15-0	GSE	3	1/16/2011 * 12/22/11 (A)
Oxygen Coupling Assy, Female, 3000 PSIA	683-15179-34	GSE	3	3/8/2012** 06/15/12 (A)
Pressure Plug	683-15179-61	GSE	3	3/8/2012* 12/22/11 (A)
Connector, Receptacle, Flanged, Power	NATC00T15N4PN	Spare (with build documentation)	1	1/16/2011 * 12/22/11 (A)
Pins for Connector J	NZGC-C-12PB	Spare (with build documentation)	20	1/16/2011 * 12/22/11 (A)
Sealing Plugs for Connector J	NZGSP-12	Spare (with build documentation)	3	1/16/2011 * 12/22/11 (A)
Connector, Plug, Power	NATC06G15N4SN	Spare (with build documentation)	1	1/16/2011 * 12/22/11 (A)
Backshell, 90 deg for Connector K	NZGA-JG-15-N-12	Spare (with build documentation)	1	1/16/2012 * 12/22/11 (A)
Backshell, 90 deg for Connector K	NZGA-LG-15-N-12	Spare (with build documentation)	1	1/16/2012 * 12/22/11 (A)
Sockets for Connector K	NZGC-C-12SB	Spare (with build documentation)	20	1/16/2012 * 12/22/11 (A)

Sealing Plugs for Connector K	NZGSP-12	Spare (with build documentation)	3	1/16/2012 * 12/22/11 (A)
Protective Cover for Connector K	NATC-PPC-N-15-0	Spare (with build documentation)	1	1/16/2012 * 12/22/11 (A)
Backshell for Connector L	NZGA-SG-15-N-12	Spare (with build documentation)	1	1/16/2012 * 12/22/11 (A)
Pins for Connector L	NZGC-C-12PB	Spare (with build documentation)	20	1/16/2012 * 12/22/11 (A)
Sealing Plugs for Connector L	NZGSP-12	Spare (with build documentation)	3	1/16/2012 * 12/22/11 (A)
Protective Cover for Connector L	NATC-RPC-N-15-0	Spare (with build documentation)	1	1/16/2012 * 12/22/11 (A)
Connector, Plug, Power	NATC06G15N4SN	Spare (with build documentation)	1	1/16/2012 * 1/13/12
Backshell for Connector M	NZGA-SG-15-N-12	Spare (with build documentation)	1	1/16/2012 * 1/20/12
Sockets for Connector M	NZGC-C-12SB	Spare (with build documentation)	20	1/16/2012 * 12/22/11 (A)
*NOTE: Parts Delivered (1/16/11 should have been 1/16/12) **Parts on Order will be delivered into GOLD (Reference Debit/Credit Proposal).				
Sealing Plugs for Connector M	NZGSP-12	Spare (with build documentation)	3	1/16/2012 * 12/22/11 (A)
Protective Cover for Connector M	NATC-PPC-N-15-0	Spare (with build documentation)	1	1/16/2012 * 12/22/11 (A)

Oxygen Coupling Assy, Female, 3000 PSIA	683-15179-34	Spare	1	3/8/2012* 12/22/11 (A)
Pressure Plug	683-15179-61	Spare	1	3/8/2012** 06/15/12 (A)
Connector, Receptacle, Flanged, Power	NATC00T15N4PN	Qualification (with build documentation)	1	1/16/2011 * 1/13/12 (A)
Pins for Connector J	NZGC-C-12PB	Qualification (with build documentation)	30	1/16/2011 * 12/22/11 (A)
Sealing Plugs for Connector J	NZGSP-12	Qualification (with build documentation)	3	1/16/2011 * 12/22/11 (A)
Connector, Receptacle, Flanged, Power	NATC00T15N4PN	Flight	2	5/18/2012 * 2/28/12
Pins for Connector J	NZGC-C-12PB	Flight	60	5/18/2012 * 12/22/11 (A)
Sealing Plugs for Connector J	NZGSP-12	Flight	6	5/18/2012 * 12/22/11 (A)
Protective Cover w/Tether for Connector J	NATC-RPC-N-15-6	Flight	2	5/18/2012 * 12/22/11 (A)
Oxygen Coupling Assy, Male, 3000 PSIA	683-15179-33	Flight	1	5/18/2012 ** 06/15/12 (A)
Protective Cover for Connector L	NATC-RPC-N-15-0	Spare (with build documentation)	1	1/16/2012 12/22/11 (A)
Connector, Plug, Power	NATC06G15N4SN	Spare (with build documentation)	1	1/16/2012 1/13/12 (A)

Backshell for Connector M	NZGA-SG-15-N-12	Spare (with build documentation)	1	1/16/2012 1/20/12 (A)
Sockets for Connector M	NZGC-C-12SB	Spare (with build documentation)	20	1/16/2012 12/22/11 (A)
*NOTE: Parts Delivered (1/16/11 should have been 1/16/12) **Parts on Order will be delivered into GOLD (Reference Debit/Credit Proposal).				

6.71.3 The contractor shall provide training hardware of each component contained in the Boeing Airlock Mod Kit (DIL number 32242) by October 2012.

6.71.4 The contractor shall perform a sparing assessment to determine required spares to support operations through both 2020 and 2028 for all Boeing-provided hardware contained in the Airlock Modification Kit for CASEO by August 2011.

6.72 ATCS AMMONIA LEAK DETECTION SENSOR

6.72.1 Systems Requirement Review

The contractor shall provide the following data for the Ammonia Leak Locator SRR by November, 2012:

- Requirements for the hardware, including ISS interface definition, contamination/materials compatibility requirements, and SPDM/OTCM and IVA power/data checkout power allocations.

- Scan procedures (grid spacing, orientation angles, general and homing routines, etc.) to define the required operations to find an ammonia leak.

- Definition and recommendation of an experimental procedure to verify the operation of the leak locator package using ISS vent locations.

6.72.2 Ammonia Leak Locator Development (S/A 1998; SSCN 13504)

The contractor shall provide the following input to the GFE Ammonia Leak Locator (ALL) development:

- Update the draft On-Orbit Test Plan, including the following sections by October 2013.
  - Proximity detection curves of predicted vent pressure
  - On-orbit vent characterization, including pressure and mass flow rate, for selected vent or vents
  - Test grid prediction tables
  - Demonstration scan constraints

- Interpret and correlate ground characterization test data as it compares/contrasts to on-orbit leak scenarios and integrate the interpretation into the On-Orbit Test Plan by October 2013.

- Develop detailed scan procedures (grid spacing, orientation angles, general and homing routines, etc.) to define the required operations to find an ammonia leak by October 2013.

- Participate in Delta System Requirements Review (June 2013) to discuss initial results of the ground characterization test and updates to the On-Orbit Test Plan.

6.72.3 AMMONIA LEAK LOCATOR ACCEPTANCE, INTEGRATION AND ON-ORBIT ACTIVATION (S/A 2069 – SSCN 13504R1)

The contractor shall perform the following tasks in support of the acceptance, integration and on-orbit activation and testing of the Ammonia Leak Locator (ALL) payload (launch in February 2015):

- Provide contamination/materials compatibility requirements verification (by January 2014).

- Perform Remote Terminal Validation testing on the ALL payload to demonstrate compliance with MIL-STD-1553B, Notice 2, by February 2014.

- Perform ISS controllability assessment with mass properties timelines (GFD) for ALL robotics activities associated with the on-orbit Tech Demo by June 2014.

- Perform ASTM E1559 outgassing rate testing of 5 ALL materials in support of outgassing induced contamination assessment by February 2014.

- Complete development of the On-Orbit Test Plan, including final updates of the following sections (by January 2014).
  - Proximity detection curves of predicted vent pressure
  - On-orbit vent characterization, including pressure and mass flow rate, for selected vent or vents
  - Test grid prediction tables
  - Demonstration scan constraints

- Finalize detailed scan procedures (grid spacing, orientation angles, general and homing routines, etc.) to define the required operations to find an ammonia leak. Procedures and techniques to be recorded in On-Orbit Test Plan (by January 2014).

- Provide status of all tasks at the ALL (PDR/CDR) combined Design Review TIM.

- Present contamination and material controls to the PSRP for approval.

6.73 SUPPORT TO GFE FINE WATER MIST PORTABLE FIRE EXTINGUISHER (PFE) (S/A 1856 – SSCN 13190; S/A 2019 – SSCN 13639)

The contractor shall perform the following tasks for the GFE FWM PFE development:

6.73.1 DEVELOPMENT THROUGH CRITICAL DESIGN REVIEW (CDR) (S/A 1856 – SSCN 13190; S/A 2019 – SSCN 13639)

The contractor shall perform the following tasks for the GFE Fine Water Mist (FWM) Portable Fire Extinguisher (PFE) development through CDR:

- Review design data and participate in design and safety reviews through CDR, to identify issues and concerns with physical interface and stowage of the FWM PFE into the ISS system (CDR planned for February/March 2013).

- Execute 10 tests (identical to tests being run on the FWM PFE) of the Developmental (DEV) CO2 PFE unit to determine how the CO2 PFE performs compared to the FWM PFE (by December 2012). Tests shall also evaluate and reactivate the CO2 PFE fill and discharge carts to determine the current operating condition of the carts.

6.73.2 COMPLETION OF DEVELOPMENT AND CERTIFICATION (S/A 2019 – SSCN 13639)

The Contractor shall perform the following tasks in support of the GFE Water Mist (WM) Portable Fire Extinguisher (PFE) final development and certification:

- Perform a risk assessment of the feasibility of using a WM PFE for a laptop lithium ion battery fire in the Lab open cabin, including integrated hazard identification by 6/20/14.

- Update SSP 30262:10, “Space Station Program Portable Fire Extinguisher Standard Interface Control Document,” to include the WM PFE. Deliver updated ICD no later than 6/20/14.

- Perform an integrated hazard assessment on stowage of the WM PFE on-orbit by 6/20/14.

- Review design data and participate in Phase 3 Safety Review and System Acceptance Review (SAR) to identify issues and concerns with physical interface and stowage of the WM PFE into the ISS system by 6/20/14.

6.74 ROBOTIC OPERATION OF ORUS ON FSE (S/A 1857 – SSCN 13232)

6.74.1 The contractor shall conduct analysis of the following FSE to determine modifications required to prepare the FSE for Special Purpose Dexterous Manipulator (SPDM) operations (by December 2012):

1. Main Bus Switching Unit (MBSU) FSE.

2. Direct Current Switching Unit (DCSU) FSE.

3. Battery Charge Discharge Unit (BCDU) FSE (both FRAM based and S6 truss based).

4. Pump and Flow Control Subassembly (PFCS) FSE (P6 truss based).

6.75 COMMON COMMUNICATION FOR VISITING VEHICLES (C2V2) INTEGRATION (SSCN 12639 – S/A 1860) (SSCN 13928 – S/A 2071)

The contractor shall perform all activities required to integrate the Common Communication Visiting Vehicle (C2V2) Government Furnished Equipment (GFE) (including the laser retro reflectors on the antenna assemblies) with the ISS systems to support on-orbit operation by March 2015, including the following:

6.75.1 INTERFACE CONTROL DOCUMENTS

Prepare and release the following Interface Control Documents (ICDs) and Preliminary Interface Revision Notice (PIRNs):

- ISS to C2V2 ICD,

- SSP 41175-39, "Software Interface Control Document Station Management and Control to International Space Station (ISS), Commercial Orbital Transportation Services (COTS) Free Flyer Common Interface", PIRNs

- ISS C2V2 Ethernet ICD.

6.75.2 SDIL SIMULATION CAPABILITIES

Update the Software Development Integration Laboratory (SDIL) with the hardware and software capabilities necessary to support test and verification activities for the C2V2 system.

6.75.3 TEST SUPPORT

Provide SDIL Hardware Software Integration (HSI), Remote Terminal (RT), Ethernet, and ISS Power Laboratory (IPL) testing to support C2V2 system development and verification.

6.75.4 OPERATIONS SUPPORT

Provide real-time performance evaluation and response to off-nominal conditions during on-orbit installation, activation and check-out of the C2V2 system.

6.75.5 SUSTAINING ENGINEERING TRANSITION

Transition sustaining engineering (SE) from the C2V2 Transceiver Processor Assembly (CTPA) contractor within 30 days after delivery of Mod Kit (Ref. DIL ID 32379).

6.75.6 FITCHECK ACTIVITIES (S/A 2003; SSCN 13789)

The contractor shall perform the following fit checks prior to launch to mitigate the risk of issues during on-orbit installation (by 4/15/14):

- Mechanical fit check between the C2V2 communications unit (GFE) and the MSS-2 rack shelf assembly to confirm prooper mating of the mechanical interfaces between the Communication Unit boxes and the MSS-2 rack C2V2 mod kit cold plate.

- Interface to interface fit check of the EVA Radio Frequency (RF) cables between the C2V2 antenna assemblies (GFE) and the C2V2 external RF cable assemblies to confirm component fit/form and mitigate risk of problems during EVA installation on-orbit.

6.75.7 COMMUNICATION UNIT 1553 INTERFACE TESTING (S/A 2003; SSCN 13789)

The contractor shall provide the following in support of the C2V2 Communication Unit (GFE) 1553 interface testing:

- One (1) GFE provided MADE (MDM Application Development Environment) loaded with CCS simulation software to the C2V2 Communication Unit provider via 1149 by 8/15/13.

- A MADE User's Guide by 8/15/13 and MADE product training to the C2V2 Communication Unit provider by 9/15/13.

- MADE help desk support until the last C2V2 Comm Unit Flight Equivalent Unit (FEU) is delivered (contract delivery date of 8/25/14).

6.75.9 ETHERNET CAPABILITY (S/A 2049 – SSCN 13854)

- The contractor shall validate the capability to perform data dumps/data loads solely through Ethernet without impacting the 1553 path (by October 2014).

- The contractor shall develop and baseline an International Space Station (ISS) to Visiting Vehicle (VV) Ethernet Interface Control Document (ICD) by April 2014.

6.75.10 GSE FOR VV RADIO DEVELOPMENT (S/A 2068 – SSCN 13975)

The contractor shall deliver (via 1149) three (3) MDM Application Development Environments (MADEs) to simulate the ISS Command and Control hardware/software interface, for use by Visiting Vehicle providers in the development and testing of radios and communications systems required to be compatible with the ISS and C2V2 system:
- One (1) MADE to be delivered by June 17, 2014 .
- One (1) MADE to be delivered by August 15, 2014.
- One (1) MADE to be delivered by September 30, 2014 .

6.76 SOFTWARE INTEGRATION OF RADIATION ASSESSMENT DETECTOR (RAD) (SSCN 13235– S/A 1866)

The Contractor shall perform software integration of the Radiation Assessment Detector (RAD) with the ISS Core Systems for on-orbit operation by September 2015.

6.77 ANALYSIS OF ISS ASSETS FOR ALTERNATE MISSIONS (S/A 1895)

The contractor shall perform the following tasks to determine the feasibility of using specific ISS assets and design for alternate ISS missions:

1. Evaluate the Node module with a single rack bay configuration and structure to determine the feasibility for launch on the Space Launch Systems (SLS) atop a Russian provided ISS module. Complete this evaluation by February 2013.

2. Evaluate the Node with NASA Docking System (NDS) to determine what standoffs are required to dock a Cygnus type vehicle to the Starboard / Port interfaces. Complete this evaluation by March 2013.

3. Perform an assessment of the Multi-Purpose logistics module (MPLM) to determine its compatibility with SLS launch loads as well as the feasibility of installing another hatch on the Aft End Cone. Complete this assessment by March 2013.

4. Evaluate module outfitting design concepts which result in the ability to install / replace equipment at the sub rack level. Complete this evaluation by February 2013. Include conceptual designs for power and thermal utilities, Environmental Control and Life Support Systems (ECLSS), command and control, communications systems, and options for electrical power and attitude control.

5. Develop radiation design concepts for improving radiation protection for crew members given the existing structural and system designs. (December 2012).

6.78 MAIN BUS SWITCHING UNIT MAINTENANCE (S/A 1900)

The contractor shall develop and deliver [by 07/17/13] the capability to perform intermediate level (I-Level) maintenance repair on the Main Bus Switching Unit (MBSU) for failures that require Circuit Card Assembly (CCA) replacement. The contractor shall provide:

- Interconnect Test Cable to the MBSU.
- Development & certification of Flight Software Command Test Scripts to interface with existing Flight Test Software for the MBSU.
- Post maintenance test procedures for crew execution.
- Logistics source data (text and illustration) for crew procedures.

6.79 MAJOR CONSTITUENT ANALYZER (MCA)

6.79.1 Development (S/A 1896)

The contractor shall define requirements and develop a specification for a replacement Major Constituent Analyzer (MCA) for use on the ISS and the NASA Orion Multi-purpose Crew Vehicle and conduct a System Requirements Review (SSR) (by March 2013). The replacement MCA shall result in reduced upmass and crew time required to monitor the MCA.

6.79.2 Non-Flight Unit Conversion (S/A 1963, CD 13528)

6.79.2.1 The contractor shall determine issues and concerns associated with installing and operating non-flight Circuit Card Assembly (CCA) P/N 184A641-1 in the flight MCA ORU 01 and make a recommendation regarding the use of this hardware in flight hardware by October 2013.

6.79.2.2 The contractor shall refresh CCA P/N 184A641 UVPROM, verify functionality and workmanship, install the CCA in MCA ORU 01, and perform protoflight Acceptance Testing of the ORU by October 2013. The delivered MCA ORU 01 shall contain firmware version 4.25.

6.79.2.3 The contractor shall determine issues and concerns associated with operating non-flight IBM EDP CCA part number 155A420-1, S/N 00010 in a flight environment and make a recommendation regarding the suitability of this CCA for use in a flight environment by November 2013.

6.79.2.4 The contractor shall refresh CCA P/N 155A420-1 and verify functionality and workmanship by November 2013.

6.80 REPAIR TOOLS FOR IN-FLIGHT MAINTENANCE CAPABILITY FOR CARBON DIOXIDE REMOVAL ASSEMBLY (CDRA) AIR SELECTOR VALVE (ASV) (SSCN 13326 S/A 1915)

The contractor shall deliver (via DD 1149) four tools: (1) PSMC63900868, Bearing Compression Tool, (2) PMSC63900869, Cartridge Removal Tool, (3) PMSC63900870, Torque Adapter, and (4) ST7422122, Spline Socket, by November 2012.

6.81 RUSSIAN INTEGRATION INTERFACE (SSCN 13473 – S/A 1923)

The contractor shall provide an interface between NASA and the Russian International Partner (IP) in Russia to better understand the Russian ISS systems, elements, and vehicles (Soyuz, Progress) and communicate issues, concerns, risks and status to NASA from January 1, 2013 – December 31, 2014. Functions include the following:

- Acts on behalf of IP Russia in the Mission Action Report ("Chit") system, coordinating chit input and responses in a timely manner to support Station operations.
- Functions as the ISS Management Center (IMC) agent in MCC-M, and negotiates with the Russian side on their behalf regarding changes in the Increment Requirements Document for each ISS Increment.
- Communicates and collaborates with the operations team in the Houston Support Group (HSG) on issues, concerns, risks, status, etc.
- Functions as an agent in Moscow for the ISS Vehicle Office and other JSC technical organizations as required to manage and facilitate the exchange of technical information for the ISS Program between U.S. and Russian specialists.
- Participates in Technical Interchange Meetings (TIMs), General Design Reviews, and teleconferences to assure required NASA representation, and ensures closure of action items.
- Manages efforts to actively track and research the status of the ISS Russian Segment and Russian space vehicles (Soyuz and Progress), including tracking modifications, anomalies, repairs and re-work, and makes reports as required to the ISS program.

- Responsible for acceptance activities on flight hardware and software being developed in Russia by Russian entities under contract to NASA.

- Functions as an agent for the ISS Mission Integration and Operations Office in Moscow, and is responsible for all NASA flight hardware and software to be delivered to the ISS aboard Russian vehicles while it is in Moscow and Baikonur, Kazakhstan.

- Oversees the integration of U.S. cargo on Soyuz and Progress vehicles in Baikonur, Kazakhstan and acts as the USOS representative at the Russian State Commission for Progress launches.

- Responsible for shipping nominally stowed flight hardware after each Soyuz landing and other hardware as needed throughout the year.

- Supports dynamic events from TsUP (Mission Control Center—Moscow).

- Maintains MTLO internal documents and websites updated on a regular basis.

6.82 FLIGHT SUPPORT EQUIPMENT AND CARRIERS

6.82.1 SpaceX Deployable Carrier

The contractor shall define requirements and develop a specification for a Deployable Carrier for use on the SpaceX Dragon and conduct a System Requirements Review (SRR) (by November 2013).

6.82.2 FRAM FSE (S/A 2061 – SSCN 12869)

- The contractor shall modify two (2) existing PFRAM Installation Kits (P/N 1J00520-011) into one (1) P/N 1J00520-005 PFRAM Installation Kit and one (1) P/N 1J00520-001 PFRAM Installation Kit and deliver via DD11149 by 5/14/13.

6.83 EXTERNAL HIGH DEFINITION VIDEO (S/A 1984/SSCN 13149)

6.83.1 The contractor shall integrate the External High Definition Video (EHDV) Camera Assembly with the ETVCG and the ISS system for on-orbit operation by August 30, 2014.

6.83.2 The contractor shall provide (via 1149) one training external power cable (for DIL 51739) for the EHDV camera to ETVCG by December 2013.

6.83.3 The contractor shall provide planning and implementation activities, including documentation capture, to transition authority and control of Sustaining Engineering (SE) from NASA to Boeing for the Camera Assembly and Camera Assembly attachment mechanism within 30 days after the on-orbit installation and activation (transition complete October 1, 2014).

6.84 RUSSIAN SCIENCE POWER MODULE (SPM) (S/A 1988; SSCN 13787)

6.84.1 SPM LOCATION (S/A 1988; SSCN 13787)

The contractor shall provide all data required for NASA to determine the preferred Science Power Module (SPM) docking location, including:

- Known areas of concern and issues for docking the SPM at Russian Node starboard, Russian Node port side, Russian Node Aft, and SM Zenith (without MRM2) by 6/14/13.

- Additional issues and areas of concern as identified by subsystem team analysis and a low fidelity cost estimate of work required to clear or mitigate all identified issues and concerns (by 12/2013).

6.85 CCAA HX ORU FSE ENCLOSURE (S/A 1994; SSCN 13773)

The contractor shall perform the following activities to support integration of a FSE enclosure for launch and return of a CCAA HX ORU:

- Safety, foam and structural assessments to confirm the Common Cabin Air Assembly (CCAA) Heat Exchanger (HX) ORU FSE, modified by DIL 51845, will allow the survivable launch and return of the ORU (by September 2013).

- Modification of the FSE (Birdcage) to support the CCAA HX ORU for flight, by 10/7/13.

6.86 DISPOSITION OF ELC AND EXPCA RESIDUAL ASSETS (S/A 2022; SSCN 13704)

The contractor shall inspect and disposition 7 pallets of GFE Goddard Space Flight Center residual material (piece parts) and assets (tooling) for the ELC and ExPCA located at Huntsville, Alabama (by March 2014).

6.87 INTEGRATION OF COMMMERCIAL CREW INTEGRATED CAPABILITY (CCiCap) VEHICLES (S/A 2027; SSCN 13554)

The contractor shall perform the following activities in support of integration of CCiCap Visiting Vehicles (VVs) with the ISS:

6.87.1 Review technical data for CCiCap VVs (SpaceX, Boeing, and Sierra Nevada) to determine ISS interface requirement compliance, identify areas of incompatibility and risk, and obtain necessary data for authorized technical integration activities. The contractor shall participate in reviews for this data and provide input to the resolution of issues and actions.

6.87.2 Perform ISS plume loads analyses for three CPC VVs (Boeing, SpaceX, and Sierra Nevada) docked at two Node 2 Ports (Zenith and Forward) locations to determine ISS interface requirement compliance and identify areas of incompatibility and risk by May 2014. The contractor shall participate in reviews for this data and provide input to the resolution of issues and actions.

6.87.3 Provide inputs for hardware interface control requirement definition for three CPC VVs (SpaceX, Boeing, and Sierra-Nevada). The contractor shall identify and document any CPC VV-unique software interface requirements required to integrate the CPC VVs to ISS. This effort includes defining Instrumentation Program and Command List (IP&CL) requirements for the CPC VVs by May 2014. The requirements shall be to the CDR level of maturity.

6.87.4 The contractor shall review the following CPC VV technical data, provide input to resolve issues and concerns, and support Technical Interchange Meetings (TIMs) to resolve comments (by May 2014):

- Human certification plans to ensure interface requirement compliance,
- Phase 1 Hazard reports to determine ISS interface requirement compliance and identify areas of incompatibility and risk,
- Verification/validation plans to determine ISS interface requirement compliance and identify areas of incompatibility,
- Alternate Standards to determine ISS interface requirement compliance and compatibility with existing ISS standards.

6.88 HIERARCHICAL MODELS FOR PAYLOADS (S/A 2030; SSCN 13759)

The contractor shall develop hierarchical models for non-Boeing sustained Payloads Facilities (PF) hardware, listed in SOW Appendix L, to identify hardware functions to be assessed for Functional Availability (FA), including up-mass and crew time estimations to support the Payload Facilities through 2028 (to support an Aug 2014 delivery of FA analysis).

6.89 FUNCTIONAL AVAILABILITY ANALYSIS FOR FGB (S/A 2030; SSCN 13759)

The contractor shall conduct Probability of Sufficiency (POS) analyses for the Functional Cargo Block (FGB) hardware, listed in SOW Appendix M, to include onetime only sparing recommendations for each identified item (by July 2014).

6.90 Direct Current to Direct Current Converter Unit (DDCU) Firmware Update (S/A 2035, CD 13822)

The contractor shall provide a DDCU firmware update to reduce the risk of a transient overload in the USOS EPS system which can result in losing power to critical avionics equipment (by April 2014).

6.91 ETHERNET IMPLEMENTATION ON EXTERNAL MDMS (S/A 2047 – SSCN 13305)

6.91.1 The contractor shall provide an Ethernet interface for External (EXT) Multiplexers/Demultiplexers (MDMs) to use as an alternate path for additional system and trending data requests from the Structural Dynamics Measurement System (SDMS), Active Thermal Control Systems (ATCS) and Structures and Mechanisms (Struc and Mech) subsystems. The system shall be activated on-orbit by April 2015.

6.91.2 The contractor shall deliver the following hardware via DD1149 in support of the Ethernet implementation:

- Quantity two (2) Ethernet cables for connectivity of the SDIL lab EFEU and prototype MDMS to JSL (by December 22, 2013).
- Quantity three (3) modified prototype MDM covers with features necessary to implement Ethernet connectivity (by December 22, 2013).
- Quantity one (1) spare Enhanced MDM cover for crew training at NBL by 01/30/14.

6.92 DELAY TOLERANT NETWORKING (DTN) IMPLEMENTATION ON JSL (S/A 2051 – SSCN 13799)

The contractor shall perform the following activities to support the implementation of Delay Tolerant Networking (DTN) service capability for ISS laptops and ground equipment to improve operational efficiency for ISS payloads (by April 2015):

- Integrate, test, and document DTN nodes which shall operate in virtual machines within two ISS servers (Casablanca 1 and Casablanca 2).

- Test, document, and incorporate DTN capability on ExPRESS Laptop Computer (ELC), Remote Advanced Payload Test Rig (RAPTR), Rack Software Test Bed (RSTB) and Payload Software Integration and Verification (PSIV) ground test systems software loads.

- Develop documentation to assist users on integrating to DTN on ISS.

- Provide necessary ground equipment for SDIL testing and remote payload testing.

6.93 DEVELOPMENT OF GFE PANEL FOR AIRLOCK 1F1 LOCATION (S/A 2073 – SSCN 13914)

The contractor shall update the Avionics Rack Product Structure to include a new GFE panel to replace Avionics Rack panel 683-52026-2 at the Airlock 1F1 location, allowing access without the use of tools to the hardware in the rack (April 2014).

6.94 EXTERNAL MDM (S/A 2075 – SSCN 13641)

The contractor shall install the Chotherm gasket into the External MDM (DIL 51827) at the conclusion of the Post Software Load Confidence Tests (PSLCT) for each of the 3 EPIC cards that are to be loaded and tested with the EXT R9 flight software (November 2014).

7.0 REQUIREMENTS FOR NEW HARDWARE DEVELOPMENT (S/A 1660)

The contractor shall develop new hardware, modified hardware and spares necessary to maintain or enhance operatons of the International Space Station (via change request). For hardware being developed under this contract, the following requirements apply:

7.1 REQUIREMENTS AND PROCESSES (S/A 1660)

The contractor shall develop, design, manufacture and verify new or modified hardware that meet the requirements of the contract applicable documents list in contract attachment J-6, "Applicable Documents List". The contractor shall follow Program processes documented in the contract applicable documents list (J-6).

7.2 DATA (S/A 1660)

The contractor shall

a. Prepare, maintain and submit engineering drawings in accordance with DR F-VE-09.

b. Capture and deliver engineering and safety data needed for Vehicle integration and operations in the VMDB. Scope, content, and functionality shall be in accordance with DR VE32.

c. Provide data on the certified performance of ORUs (DR F-PM-02).

d. Determine and provide requirements applicable to pre-launch and post-landing processing of the new hardware.

e. Provide safety and reliability data per DRs F-SA-04 (hazard reports) and F-SA-05 (FMEAs/CILs).

f. Identify and document all mishaps associated with manufacturing, test, and operations of hardware/software developed (DR SM03).

g. Identify and document material identification usage lists and material usage agreements (DRs VE09 and VE10).

7.3 ELECTRICAL POWER (EP) (S/A 1660)

For new electrical power comsuming equipment designs, Common Mode Noise requirements are to be developed for incorporation into SSP-52051 User Power Quality Specification.

7.4 ACCEPTANCE DATA PACKAGES (S/A 1660)

7.4.1 The contractor shall assemble and provide acceptance data packages (ADPs) in accordance with DR PC08 for new hardware.

7.4.2 For modification kits, the contractor shall provide modification package acceptance data packages in accordance with DR PC18, time compliance technical instructions in accordance with DR PC19 and modification kit unique engineering drawings and associated list in accordance with DR F-VE-09.

7.5 SOFTWARE (S/A 1660)

The contractor shall develop, test, verify and deliver software modifications and requirements to include software configuration management for documents and software code. All post DD250 flight software modifications will be developed and delivered in accordance with SSP 41170,

CM Requirements, as data per DR SE02. Also, included is technical inputs and assessments for integration of simulations within the MBF.

8.0 PAYLOAD INTEGRATION (S/A 1547) (SSCN 12516 – S/A 1793)

The Contractor shall provide technical and programmatic functions to implement the ISS payload integration tasks into all phases of the ISS Program.

8.1 CONFIGURATION MANAGEMENT (S/A 1547)

The Contractor shall provide the configuration status accounting and verification functions consistent with the requirements in SSP 41170 except for the flight by flight as-built reconciliation of on-orbit payload hardware. This is applicable for Boeing-built payload hardware/software, payloads within Boeing-built payload hardware, all US or IP furnished facilities/payloads located in the U.S. Lab, all U.S. furnished facilities/payloads located in IP labs, unpressurized U.S. payloads, and IP payloads mounted on U.S. attached locations. Payload hardware will be tracked at the following levels:

- Facility Class – ORU level that comprises the primary interface to the Station subsystems
- Aisle Deployed – top assembly/stowage kit level
- Subrack – top assembly/stowage kit level
- Subpallet – top assembly level

8.2 UTILIZATION LAUNCH PACKAGE READINESS (S/A 1547)

The Contractor shall ensure the readiness of the Utilization launch package to support all major integration milestones, including cargo integration reviews, bench reviews, transportation carrier integration, MPLM/orbiter integration, launch, and on-orbit operation.:

8.3 SUPPORT TO DESIGN REVIEWS (S/A 1547) (SSCN 12516 – S/A 1793)

The contractor shall provide payload integration technical support to the design reviews for payloads and new transportation vehicles.

8.4 BOARD AND PANEL SUPPORT (S/A 1547) (S/A 1962)

The contractor shall Co-Chair the following NASA payload boards and panels:

- Payload Mission Integration Team (PMIT)
- Payload Engineering Control Panel (PECP)
- Payload Software Control Panel (PSCP).

8.5 MISSION INTEGRATION (S/A 1547)

8.5.1 STAGE AND INCREMENT INTEGRATION

Develop, document and implement the processes required to integrate payloads into the ISS Stages and Increments for facility (pressurized/truss attached), aisle deployed, subrack and subpallet payload classes. Processes shall address documentation of payload requirements, resource allocations, schedule, roles and responsibilities, and issue resolution.

8.5.2 PAYLOAD DEVELOPER (PD) SUPPORT (S/A 1547)

The contractor shall provide Payload Developers a primary point of contact and advocate for coordination of integration and operations activities and issue resolution.

8.5.3 RESERVED

8.5.4 PAYLOAD SAFETY (S/A 1547)

8.5.4.1 SAFETY DATA PACKAGE REVIEW (S/A 1547)

The contractor shall review and analyze the EXPRESS subrack Payload (facility/ rack/ pallet/ subrack/ subpallet) Safety Data Packages (PSDPs) to ensure adequate payload hazard identification and controls. The contractor shall update and submit the integrated EXPRESS rack PSDPs for changes required based upon the EXPRESS subrack payload PSDOs.

8.5.4.2 PAYLOAD SAFETY REVIEW PANEL (PSRP).PARTICIPATION (S/A 1547)

The contractor shall participate in the Payload Safety Review Panel (PSRP) and respond to actions from the PSRP.

8.5.5 COFR PROCESS MANAGEMENT (S/A 1547) (S/A 1962)

The contractor shall provide input to the stage and flight specific CoFR process as defined in SSP 52054, "ISS Program Payloads Certification of Flight Readiness Implementation Plan, Generic," including:

a) Define and integrate the technical set of payload requirements to which the payloads community performs their certification.

b) Collect, disposition and track payload requirements.

8.6 PAYLOAD ENGINEERING INTEGRATION (S/A 1547)

8.6.1 PAYLOAD DEVELOPER VERIFICATION (S/A 1547) (SSCN 12516 – S/A 1793)

The contractor shall coordinate with payload developers on the planning and execution of PD verification activities; provide status of these activities and present integrated results at ISS program reviews. The contractor shall provide technical support to the US payload test or analysis activities at KSC or at PD locations for complex payloads to resolve and close interface or verification issues.

8.6.2 HUMAN FACTOR VERIFICATION (S/A 1547) (SSCN 12615 – S/A 1793)

The contractor shall perform human factors verification for payloads (racks, subracks, UOPs).

8.6.3 PAYLOAD DEVELOPER EXCEPTIONS AND ISSUES DISPOSITION (S/A 1547)

The contractor shall evaluate, coordinate, and provide approval/disapproval recommendations for NASA closure of proposed payload interface exceptions and payload developer issues.

8.6.4 OPERATIONS AND MAINTENANCE REQUIREMENTS AND SPECIFICATIONS DOCUMENT (OMRSD) REVIEW (S/A 1547)

The contractor shall review the OMRSD for inclusion of the necessary payload requirements and identify discrepancies.

8.6.5 EXPRESS RACK VERIFICATION (S/A 1547)

The contractor shall develop and maintain models to support verification coupled loads analyses for EXPRESS Racks on Shuttle flights.

8.6.6 VACUUM SYSTEM COMPATIBILITY (S/A 1547)

The contractor shall perform analysis that payload vacuum exhaust gases are compatible with the vacuum systems of the US lab and JEM.

8.6.7 EXTERNAL WIRELESS COMMUNICATIONS (S/A 1771 – SSCN 12443)

The contractor shall provide early integration and final pre-flight wireless high rate data communication testing for payloads.

8.6 PAYLOAD SOFTWARE INTEGRATION & FLIGHT PRODUCTION (S/A 1547)

8.7.1 SOFTWARE IDENTIFICATION (S/A 1547)

The contractor shall assign and manage the payload allocation of application process identifiers (APIDs), subset IDs, and program unique identifiers (PUIs) for the program.

8.7.2 ANCILLARY DATA SETS (S/A 1547)

The contractor shall develop and maintain payload unique ancillary data sets.

8.7.3 SOFTWARE FACILITY SUSTAINING (S/A 1547)

Provide hardware and software sustaining engineering for the Payload Software Integration and Verification Facility (PSIVF), Payload Development Laboratory (PDL), and the Mission Integration Software Tool (MIST) (MIST will not be supported post P/2010).

8.7.4 PAYLOAD SOFTWARE TOOL SUSTAINING (S/A 1731 – SSCN 12649)

The contractor shall sustain the following software tools:

- Payloads Verification Tool

8.7.5 PAYLOAD LAPTOPS ANTI-VIRUS SCANNING (SSCN 12836 – S/A 1786)

The contractor shall test the virus definition files against the EXPRESS and WORF laptop configurations on the ground prior to on-orbit update.

8.7.6 STELLA (SSCN 13175 – S/A 1848)

The contractor shall provide the Software Toolkit for Ethernet Lab-Like Architecture (STELLA) (reference FAR 52.227-14 RIGHTS IN DATA – GENERAL (JUNE 1987)

as modified by NASA FAR Supplement 1852.227-14 (OCT 1995), Alternate III), to U.S. and International Partner Payload Developers, including provision of unique payload configuration files, startup script development, verification testing, user training, real-time operations support, and Help Desk support.

8.8 HARDWARE AND SOFTWARE SUSTAINING ENGINEERING (S/A 1547) (S/A 1696 – SSCN 12539) (S/A 1944 – SSCN 12837) (S/A 1947 – SSCN 12916)

The contractor shall provide sustaining engineering for

- Delivered EXPRESS and EXPRESS derivative ground and flight software and hardware.
- Payload ground support equipment.
- Active and Passive Rack Isolation (ARIS and PaRIS) hardware as defined in Appendix A.
- Automation software tool to track the initiation, review and approval process for the NASA Payloads office CEF (change evaluation form CEF) tracking and integration software (CETI)).
- ISS increment research plan spreadsheet.
- Payload Workflow Tool (including provide training and technical support to the Payload Workflow Tool user community on the use of the tool).
- Remote Advanced Payload Test Rig (PARTR)

The contractor shall provide sustaining engineering for delivered EXPRESS and EXPRESS derivative ground and flight software and hardware, Payload ground support equipment, and Active and Passive Rack Isolation (ARIS and PaRIS) hardware as defined in Appendix A.

8.9 STRATEGIC PAYLOAD INTEGRATION (S/A 1594)

The contractor shall provide strategic payload integration management for payloads in the integration process prior to the Increment -16 months timeframe, and accelerated integration of payloads under the purview of the ISS National Lab Office.

8.10 ISS NATIONAL LAB

8.10.1 ISS NATIONAL LAB PAYLOAD INTEGRATION (S/A 1601/1706/1744 (SSCN 12840)

The contractor shall identify potential research opportunities for the ISS National Lab Program, contact potential investigators, develop plans for utilization of the payloads on the ISS, and establish and provide corresponding metrics through September 30, 2011.

8.10.2 ISS NATIONAL LAB MANAGEMENT MODEL (S/A 1669)

The contractor shall develop a management organization model for the ISS National Lab by September 24, 2010 which shall include identification of:

- Possible users of the ISS National Lab
- Capabilities required in an organization managing the National Lab mission, including
  - Resources necessary to provide the required capabilities.
  - A strategy for providing the necessary resources.
  - Identification of the capabilities which must be in place on startup and which can be added over time.
    - Options for organizational structures including key roles and responsibilities of the members.

8.11 EXTERNAL FRAM BASED PAYLOAD REQUIREMENTS (S/A 1624)

The contractor shall develop (by May 7, 2010) and maintain an external Flight Releasable Attachment Mechanism (FRAM) based common Payload Interface Requirements Document (IRD), to provide for HTV or CRS transport of FRAM based payloads and to provide FRAM based payloads a common set of transport requirements to design to and, as a result, allow flexibility in manifesting. (S/A 1624)

Appendix A-1
Hardware Responsibility

APPENDIX A – HARDWARE TO BE SUSTAINED UNDER CONTRACT

Component Name	Component Number	Sustaining Role
All hardware delivered under NAS15-10000 shall be fully sustained under this contract except for more limited role as defined below and addition of GFE and NAS8-50000 items.		
Boeing manufactured common hardware provided to IP/P as GFE shall be fully sustained under		
this contract. Boeing manufactured common hardware procured commercially is not covered		
under this contract except as defined in NASA/NASDA Common Spares Pool (CSP)		
agreements for repair or in this Appendix.		
Racks		
ISPR	683-50243	S, SE-Pri
Systems Racks: Integrated Rack Level	(ALL except CheCS)	S, SE-Pri
CheCS:Integrated Rack Level		SE-Sec
Rack Assembly – CheCS		S, SE-Pri
Payload Racks: (Integrated Level)		
ARIS and ARIS Kits	683-61590 683-61600	S, SE-Pri
PaRIS	1J00900-1	S, SE-Sec
PRCUs	683-21419	S, SE-Sec
WORF Rack	683-83999	S, SE-Sec
HRF Rack	683-46051-2	S, SE-Sec
BRP Rack	683-46710	S, SE-Sec
EXPRESS Rack/ with ARIS (ALL EXP RACKS INCLUDED)	683-46052-001	S, SE-Sec
EXPRESS Rack/ without ARIS (ALL EXP RACKS INCLUDED)	683-46052-002	S, SE-Sec
EXPRESS Transportation Rack	683-46059-1	S, SE-Pri
ScS-EXPRESS	683-46360-3	S, SE-Pri*
ScS-EXPRESS	683-46360-4	S, SE-Pri*
HHR Rack	683-42644-1	S, SE-Sec
ISIS Drawers (Stowage Drawers)	683-43656-1	SE-Sec
ISIS Drawers (Powered Drawers)	683-43650-1, -3 683-43660-3	S, SE-Sec
EXPRESS Functional Checkout Unit (FCU)	683-46055-1	S, SE-Pri
BRP HHR Qual Rack	683-46710	S, SE-Pri
HRF FPR Rack	683-4605-1	S
EXPRESS Rack Trainer	683-46053	S (Common H/W)
WORF Ground Rack	683-83660	S

Appendix A-1
Hardware Responsibility

WORF ScS	683-46360-4	S
BRP ScS	683-30195-1	S
BRP PHD (Payload Handling Device)	683-83573	S (Common H/W)
BRP HFSS	683-83591-1, -2	S (Common H/W)
STEPs	683-21440	S, SE-Pri*
Node 3 / Advanced ECLSS Hardware (Through Advanced ECLSS / Rack Integrated Assembly DD-250)		SE-Sec
Advanced ECLSS / Rack Integrated Assembly: Water Recovery System Top Assembly, Rack 1	96M11540	S, SE-Pri
Advanced ECLSS / Rack Integrated Assembly: Water Recovery System Top Assembly, Rack 2	96M11800	S, SE-Pri
Advanced ECLSS / Rack Integrated Assembly: Oxygen Generation Assembly Rack Top Assembly	96M11500	S, SE-Pri
Advanced ECLSS Assembly: Water Processor Assembly, Rack 1	SV827250	SE-Sec
Advanced ECLSS Assembly: Water Processor Assembly, Rack 2	SV826250	SE-Sec
Advanced ECLSS Assembly: Oxygen Generation Assembly Rack	SV825600	S, SE-Pri
Advanced ECLSS Assembly: Urine Processor Assembly Top Assembly	96M11821	SE-Sec
Advanced ECLSS Assembly: Power Supply Module Top Assembly	96M11700	SE-Sec
Crew Quarters (CQs)	P/N SEG32109500-301, -302	S, SE-Pri
Note: * S, SE-PRI ends May 2014 (after RAPTR delivered) ** S, SE-PRI ends September 2014 (5 months after RAPTR delivered)		
Integration Hardware		
APCU	tbd	S, SE-Pri
GFE		
PEEK		S, SE-Pri
Russian Source Adapter	SEG33112678-301	S, SE-Pri
Russian Chassis Ground Cable	SEZ39134181-301	S, SE-Pri
28V Power Extension Cable, 10 foot	SEG33112266-301	S, SE-Pri
28V Power Extension Cable, 20 foot	SEG33112266-303	S, SE-Pri
120V Power Extension Cable, 10 foot	SEG33112596-301	S, SE-Pri
120V Power Extension Cable, 20 foot	SEG33112596-303	S, SE-Pri
120V Power Extension Cable, 40 foot	SEG33112596-305	S, SE-Pri
28V Express Rack Adapter Cable	SEG33112598-301	S, SE-Pri
Handrail Assy 8.5 LG	SEG33117290-301	SE-PRI

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Handrail Assy 21.5 LG	SEG33117290-303	SE-PRI
Handrail Assy 41.5 LG	SEG33117290-305	SE-PRI
Oxygen Recharge Compressor Assy (ORCA)	SEG29100906	S
Portable Breathing Apparatus Assy, Emergency	SEG33105002	S
ON-ORBIT ANDROGYNOUS PERIPHERAL ASSEMBLY SYSTEM (APAS)		
APAS on PMA-1	MC621-0087-7001	SE-PRI
APAS on PMA-2 and PMA-3	MC621-0087-8001	SE-PRI
FSE & Carriers		
All NAS15-10000 delivered FSE		S, SE-PRI
All NAS15-10000 delivered Carriers		S, SE-PRI
WATER TRANSFER HARDWARE:		
Hose Adapter	528-20870-2	S, SE-Pri
US/RSA-A Hose	528-20870-5	S, SE-Pri
US/RSA-B Hose	528-20870-6	S, SE-Pri
Microbial Check Valve	SED42100926-305/-306	S, SE-Pri
Contingency Water Dispenser	SED48101607-306	S, SE-Pri
3102 Yellow/Yellow (Y/Y) Assy.	10108-20045-04	S, SE-Pri
Yellow/Red Hose	528-20870-01	S, SE-Pri
3102 Yel/3142 Red Adapter Assy	10108-20175-01	S, SE-Pri
Iodine Removal Hose Assy	528-21022-1	S, SE-Pri
Actex (activated carbon ion exchange) Hose Assembly	528-21026-1	S, SE-Pri
Blue/Blue Hose (Shuttle Only)	10108-20043-01	S, SE-Pri
Contingency Waste Water Dump Line Filter (CWWDLF)	SED39123946-301	S, SE-Pri
CWC Contingency Hose Assy	10108-10089-02	S, SE-Pri
Flexible Wand Extender	SED39121808-302	S, SE-Pri
PBA/PHA:		
Portable Breathing Apparatus Kit (PBA)	SEG33105002	S, SE-Pri
Pre-breathe Hose Assy Kit	SJG33112241-301	S, SE-Pri
Pre-breathe Hose Spares Kit	SJG33112747-301	S, SE-Pri
Mount Assembly, Cylinder, PBA, PEP	SEG33105050-301/-303	S, SE-Pri
Quick Disconnect Assy, ECLSS, PBA, PEP	SEG33105312-301	S, SE-Pri
Quick Disconnect Assy, ECLSS, PBA, PEP	SEG33105312-303	S, SE-Pri
Mask Holder Assembly, PBA, PEP	SEG33105316-301/-303	S, SE-Pri
Extension Hose/Tee Kit (-303/-305)	SJG33104995-301/303/-305	S, SE-Pri
HAND HELD MICROPHONE:		
Hand Held Microphone (HHM)	SED16101310 -311	SE-Pri, FT
HHM Interface Cable, ISS	SED16101310-705	SE-Pri, FT
COLOR TELEVISION CAMERA:		

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Color Television Camera (CTVC)	3278890-507 & -508	SE-Pri, FT
Lens Shield Assembly	SED39129392-302	SE-Pri, FT
EHDV CAMERA:		
EHDV Camera Assembly	TBD	SE-Pri*
EHDV Camera Assembly Attachment Mechanism	TBD	SE-Pri*
*SE PRI begins 30 days after EHDV on-orbit installation and activation (SE PRI begins Oct 1, 2014).		
Telemetry Monitoring System		
Radio Telemetry Device TA-948.04	ИЮ2.158.024-04	PAS
Transmitter ША 262С	ИЮ2.010.039-14	PAS
Transmitter ША 262И	ИЮ2.010.039-08	PAS
Local Switch TA203M	ЦХ2.148.004	PAS
Temperature Measuring System СИТ 9Л	ИЮ2.148.054 СП	PAS
Static Memory Device СЗУ-ЦУ8	ЦВИЯ.467666.013	PAS
Distribution Unit TA044	ИЮ2.393.506	PAS
Time Transducer ЮА059 М1	ИЮ3.097.680	PAS
Sawtooth Voltage Sensor ДПН9	ИЮ3.263.001 СП	PAS
Local Switch TA 204M	ИЮ2.148.063	PAS
Cross Connection Unit TA601	ИЮ2.148.060 СП	PAS
Cross Connection Unit TA604	ИЮ3.027.014 СП	PAS
EPS/OCCS		
Set of Cables	TBD	PAS
Power Distribution Unit	11M156M	PAS
Main Bus Assembly	БСШ – 2	PAS
Filter Unit	БФ -2	PAS
Power Distribution Unit	11M156M/FGB2	PAS
Main Bus Assembly	БСШ – 2/FGB2	PAS
Filter Unit	БФ -2/ FGB2	PAS

NOTE: FT – Functional Testing of the hardware will be done at the ISIL prior to delivery to next level integrator. No repair capability exists for this hardware.

Item	Component Name	Component Number	Sustaining Role
	ATCS		
01	Non-Intrusive Flow Meter Kit	SJG33117585	S, SE-Pri $^{++}$ (Note: the ground unit is yellow tagged as an incomplete kit)
02	Coolant Quality Monitoring Kit (CQMK)	SEG46118274-303, & 305	H, SE-Pri $^{++}$
	Water Transfer Hardware		
03	WPA Water Supply Hose Assembly	SEG33119485-301	H, SE-Pri $^{++}$

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04	Potable Water Reservoirs (PWR)	SEG46117689-301 & 302	S, SE-Pri ++
05	Silver Biocide Syringe Kit	SED46111879-301	S, SE-Pri ++
06	Mineral Syringe Kit	SED46109306-301	S, SE-Pri ++
07	Sample / Purge Kit	SED46111870-303	S, SE-Pri ++
08	CWC Water Sample Bag	SED46113541-302	H, SE-Pri ++
09	Purge Bags	KLSJ320189-301	H, SE-Pri ++
10	20 – Micron Filter (i.e. Condensate Filter)	SEG33117584-301	S, SE-Pri ++
11	CWC-to-3/4" Female QD Adapter	SEG33119914-301	H, SE-Pri ++
12	Contingency Water Container, CWC (-305)	SEG33113140-305	H, SE-Pri ++
13	Iodine Sampling Adapter	WLSJ320219-303	H, SE-Pri ++
	REGEN ECLSS FLUID HARDWARE (REFH) Hardware		
14	WPA H2O Common Transfer Hose	SEG33119491-301, -302 (Short 6', Long 12')	S, SE-Pri ++
15	Actex Adapter	SEG33119492-301	S, SE-Pri ++
16	PTU Transfer Hose	SEG33121250-301	S, SE-Pri ++
17	Pre-treated Urine T-Valve	SEG33121260-304	S, SE-Pri ++
Item	**Component Name**	**Component Number**	**Sustaining Role**
18	Hygiene Water Dispenser	SEG33121270-301	S, SE-Pri ++
19	Water "Y" Hose	SEG33121280-301	S, SE-Pri ++
	Other ECLS		
20	Portable Fire Extinguisher Cover Assembly	SEG33112741-301/-302	S, SE-Pri ++
21	LiOH Cartridge Cover	V070-613593-001	S, SE-Pri ++
25	Odor Absorber (Charcoal Filter used in conjunction with the Portable Fan Assembly)	MC623-0016-5000 and SV783970-2	SE-Pri ++
26	Acoustic Suppression Kit, Russian Airlock Depress Pump	SEG33110959	SE-Sec ++ (Note: NASA performs SE-Pri w/ Energia)
27	Russian Depress Pump (TCY-A)	321ГК.52Ю 5081А	SE-Sec ++ (Note: NASA performs SE-Pri w/ Energia)
28	Electronic Commutator	ЕПЖА 468347.044	S, SE-Sec ++ (Note: NASA performs SE-Pri w/ Energia)
29	Cables W1, W2, W3, W4, W5	321ГК.210Ю 1812-100, -200, -310, -320, & -330	SE-Sec ++ (Note: NASA performs

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			SE-Pri w/ Energia)
30	Ambient Temperature Catalytic Oxidizer	SV774230-1	H, SE-Pri ++
31	STS Hydrazine Canister	MC621-0008-0060 SV791197	H, SE-Pri ++
32	STS ARS (LiOH) Canister	MC621-0008-0409 SV755510-4	S, SE-Pri ++
33	CQ Hygiene Liner	SEG33120906-301	S, SE-Pri ++
34	CQ Blanket Covers	SEG32112288-301, SEG32112289-301, SEG32112290-301/302, SEG32112291-301/302, SEG32112292-301/302, SEG32112293-301, SEG32112294-301/302/303/304	S, SE-Pri ++
35	OGA Conductivity Meter	SEG33122633-301, -302	S, SE-Pri ++
37	OGA Loop Remediation Hose ASSY/Pump to ACTEX	SV825600CT014	SE-Pri++ (Note: Delivered to NASA on DD 1149, if future requisition is required it will be delivered on DD 1149)
Item	**Component Name**	**Component Number**	**Sustaining Role**
38	OGA Loop Remediation Hose Assembly	SEG33123190-301	SE-Pri++ (Note: Delivered to NASA on DD 1149, if future requisition is required it will be delivered on DD 1149)
39	OGA Remediation Adapter	SEG33122706-301, -302	SE-Pri ++
40	Flared Fitting Seal Bag Assembly	SEG33123126-301	SE-Pri ++
41	WPA Catalytic Reactor Sample Adapter	SEG33122581-301	SE-Pri++ (Note: Yellow tagged on orbit for incomplete certification)
42	Pre-Treat Urine Sample Kit	SEG33122501-301	S, SE-Pri ++
43	IMV Cone Screen	SEG11101191-301	H, SE-Pri ++
44	A/L IMV Panel Screen	SEG11101193-301	H, SE-Pri ++
45	A/L IMV Jumper Duct Screen	SEG11101192-301	H, SE-Pri ++
46	CO2 Removal Kit (CRK)	SEG33113733	H, SE-Pri ++
47	LiOH Canister Adapter Assembly	SED33107619-303	SE-Pri ++

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++ **Full Sustaining begins 4/19/2013 post transition (CD 13267).**

HARDWARE TRANSFERRED FROM CARGO MISSION CONTRACT (Sustaining effective on January 1, 2011 except as noted)

Pressurized Equipment		
Resupply Stowage Platform Stowage System – SE-PRI begins on 7/31/11	SJG33111610-901 to 958	S, SE-PRI
Resupply Stowage Rack– SE-PRI begins on 7/31/11	683-60554	S, SE-PRI
External Carriers		
External Stowage Platform #1	9070407	S, SE-PRI
Universal Trunnion Attachment System	1J00330	S, SE-PRI
External Stowage Platform #2	1283222	S, SE-PRI
Active ESPAD	26900-10001	S, SE-PRI
Enhanced Universal Trunnion Attachment System	683-97051	S, SE-PRI
Passive ESPAD	26900-10002	S, SE-PRI
Modified Airlock FRGF Blanket	26900-20117	S, SE-PRI
External Stowage Platform #3	3555470	S, SE-PRI
Ground Equipment		
Passive FRAM Alignment Fixture	683-97110	S, SE-PRI
Active FRAM Alignment Fixture	683-97111	S, SE-PRI
Passive FRAM Drill Template	1J00517	S, SE-PRI
Active FRAM Drill Template	1J00503	S, SE-PRI
Active/Passive FRAM Alignment Pin Alignment Fixture Assembly	683-97114	S, SE-PRI
FRAM Thermal Vacuum Test Stand	SK683-80504	S, SE-PRI
FRAM Vib Standoffs	SK683-97082	S, SE-PRI
PFRAM Connector Alignment Tooling Kit	683-97340	S, SE-PRI
EUTAS Vib Test Fixture	1J00415	S, SE-PRI
TUS RA FSE Assembly Restraint Fixture	SK68396909	S, SE-PRI
"Generic" Active FRAM Qual Unit	683-97083	S, SE-PRI
Passive FRAM Qual Unit	SK1J01207	S, SE-PRI
FRAM Engineering Development Unit	SK00422	S, SE-PRI
Square Grid Simulator	SK1J01210	S, SE-PRI
ARD Test Plate	SK683-97148	S, SE-PRI
Shipping Containers for FSE		
SAPH ARM Assembly GSE	9008398	S, SE-PRI
SAPH Body Assembly GSE	9008399	S, SE-PRI
Unpressurized Flight Support Equipment		
Flight Releasable Attachment Mechanism (FRAM) Family		S, SE-PRI
Active FRAM Mechanism	1J00422	S, SE-PRI
Small Adapter Plate Assembly (SAPA) – SE-PRI begins on 3/31/2011	683-96004	S, SE-PRI
Medium Adapter Plate Assembly (MAPA)) – SE-PRI	683-96604	S, SE-PRI

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begins on 3/31/2011		
Large Adapter Plate Assembly (LAPA)) – SE-PRI begins on 3/31/2011	683-96504	S, SE-PRI
Light-weight Adapter Plate Assembly (LwAPA)) – SE-PRI begins on 3/31/2011	683-96104	S, SE-PRI
Columbus External Payload Adapter (CEPA)) – SE-PRI begins on 3/31/2011	683-97464	S, SE-PRI
ExPA Adapter Plate Assembly) – SE-PRI begins on 3/31/2011	683-97494	S, SE-PRI
EVA FRAM (EFRAM)) – SE-PRI begins on 3/31/2011	683-97404	S, SE-PRI
Passive FRAM) – SE-PRI begins on 3/31/2011	1J00520	S, SE-PRI
6B Box Class ORU Protective Cover	1J00100	S, SE-PRI
MDM-Lower ORU Protective Cover	24700-10015	S, SE-PRI
BMRRM ORU Protective Cover	24700-90012	S, SE-PRI
Stanchion Mount Class ORU Protective Cover	24700-90011	S, SE-PRI
FLAP ORU Protective Cover	24700-10014	S, SE-PRI
Ammonia Tank Assembly FSE for ELC) – SE-PRI begins on 3/31/2011	683-99273	S, SE-PRI
Ammonia Tank Assembly FSE for ICC	683-97547	S, SE-PRI
Battery Assembly FSE Installation Kit	683-96603	S, SE-PRI
Battery FSE Installation Kit	SJG33120130	S, SE-PRI
BCDU FSE Installation Kit	683-96103	S, SE-PRI
Cargo Transportation Container (CTC)) – SE-PRI begins on 3/31/2011	T1470000000	S, SE-PRI
CMG FSE Installation Kit	683-96703	S, SE-PRI
DCSU FSE, Adapter Plate Assy	1J00539	S, SE-PRI
FHRC Assembly FSE Installation Kit	1F22060	S, SE-PRI
HRS Radiator FSE	SGG33121421	S, SE-PRI
LDU FSE Installation Kit	683-96803	S, SE-PRI
MBSU FSE Installation Kit	683-96403	S, SE-PRI
MDM FSE Installation Kit	1F15250	S, SE-PRI
MT/TUS Reel FSE Installation Kit	683-96903	S, SE-PRI
Nitrogen Tank Assembly (NTA) FSE	683-97573	S, SE-PRI
PCU FSE Installation Kit	683-96003	S, SE-PRI
Pump Flow Control Subassy (PFCS), Installation	9070417	S, SE-PRI
Pump Module FSE Installation Kit	683-96503	S, SE-PRI
SASA Blanket Kit) – SE-PRI begins on 3/31/2011	1F98549	S, SE-PRI
SASA FSE) – SE-PRI begins on 3/31/2011	SJG33120819	S, SE-PRI
SGANT FSE Installation Kit	683-97164	S, SE-PRI
Special Purpose Dexterous Manipulator (SPDM) FSE	9008243	S, SE-PRI
Stanchion Support Structure (SSS)	29300-10001	S, SE-PRI
UTA FSE Installation Kit	683-96210	S, SE-PRI
UTAS Anti-Rotation Device	28500-10001	S, SE-PRI
Express Logistics Carrier (ELC) Interface Hardware Kit	Boeing should put in a number TBD	S

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SMDP to GAS Beam Adapter Plate Assembly	9008441	S, SE-PRI
6A Launch Deployment Platform	97M19650	S, SE-PRI
SASA FSE and side wall carrier (5A GAS Beam)	9008275	S, SE-PRI
PFCS FSE and side wall carrier (5A GAS Beam)	9008276	S, SE-PRI
DCSU FSE and side wall carrier (5A GAS Beam)	9008277	S, SE-PRI
6A Passive FRAM Adapter Plate Assembly	1J00530	S, SE-PRI
Integrated Photovoltaic Radiator FSE Assembly	9070664	S, SE-PRI
PMA FSE	9007974	S, SE-PRI
Crosstie, ribbed, short; SE-PRI to beign 10/01/10	9008369	S, SE-PRI
Crosstie, flat, long; SE-PRI to beign 10/01/10	9008368	S, SE-PRI
Crosstie, flat, long, drilled; SE-PRI to begin 10/01/10	9008371	S, SE-PRI
Adapter Plate, Passive FRAM; SE-PRI to beign 10/01/10	9008367	S, SE-PRI
Fuse Box; SE-PRI to beign 10/01/10	1J00528	S, SE-PRI
Cable Assy. ; SE-PRI to beign 10/01/10	9008373	S, SE-PRI
Bracket, Test Connector; SE-PRI to beign 10/01/10	9008386	S, SE-PRI
UF-2 Staging Assembly	5000380	S, SE-PRI
6A Staging Assembly	5000362	S, SE-PRI
LMC FSE; SE-PRI to beign 10/01/10	9008365	S, SE-PRI
HDRR Junction Box Assembly; SE-PRI to beign 10/01/10	9004345	S, SE-PRI
Adapter Plate/Crosstie Support Drill Template; SE-PRI to beign 10/01/10	9008375	S, SE-PRI
7A Staging Assembly	5000371	S, SE-PRI
UF-1 Staging Assembly	5000378	S, SE-PRI
⅜" Passive UTAS	1J00351	S, SE-PRI
⅝" Passive EUTAS	1J00674	S, SE-PRI
Ammonia Tank Assembly FSE for LMC	683-97511	S,SE-PRI
CMG FSE MLI Cinch Strap Assembly	SDG33118117	S, SE_PRI
SASA MLI Assembly	9008288	S, SE-PRI
DDCU-HP CHIA	RH000002	S, SE-PRI
MBSU FSE MLI	1F15305, 1F153112	S, SE-PRI
BCDU FSE MLI	1F15301, 1F153022	S, SE-PRI
PCU FSE MLI	1F15306, 1F153072	S, SE-PRI
Battery FSE MLI	1F15312, 1F15313	S, SE-PRI
ECOM to LMC Adapter Plate; SE-PRI to beign on 10/01/10	9070733	S, SE-PRI
45 Degree ECOM Adapter Bracket; SE-PRI to beign on 10/01/10	683-97788	S, SE-PRI
Crosstie, Flat, Frame 3; SE-PRI to beign on 10/01/10	683-97787	S, SE-PRI
Ballast Plate Assembly; SE-PRI to beign on 10/01/10	9008403	S, SE-PRI
Active ESPAD Mod Kit (Guide Vane)	26900-20149	S, SE-PRI
Passive ESPAD Mod Kit (Bolt Shield)	26900-20146	S, SE-PRI
ESPAD – Loose Items Kit (A)	26900-20135	S, SE-PRI

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PFRAM Mod Kit (PFRAM S/Ns 0005 – 0007) (A)	683-97142	S, SE-PRI
Heat Exchanger ORU FSE Assembly	SEG33117665	S, SE-PRI
Mounting Assembly, Right	SEG33114745	S,SE_PRI
6B OAK (EVSU)	T1474110100	S,SE_PRI
DDCU OAK	T1474110500	S,SE_PRI
RPCM OAK; SE-PRI to begin on 3/31/11	T1474110900	S,SE_PRI
CRPCM OAK; SE-PRI to begin on 3/31/11	T1474111300	S,SE_PRI
ACU OAK; SE-PRI to begin on 3/31/11	T1474111900	S,SE_PRI
VDU OAK; SE-PRI to begin on 3/31/11	T1474111200	S,SE_PRI
Mounting Assembly, Left	SEG33114744	S,SE_PRI
Knee Brace Set Equipment Rack	683-50249	S,SE_PRI
ATA FSE MLI Straps	SDG33120160	SE, SE-PRI
DCU FSE Installation Kit	SJG33119821	SE, SE-PRI
HPG Adaptor Assembly Interface Plate Kit, SE-PRI begins on 3/31/11.	SJG33120793	SE, SE-PRI
SPDM Arm Integrated Assembly Kit, SE-PRI begins on 3/31/11	SJG33120778	SE, SE-PRI
SAPH Arm Beta Cover, SE-PRI begins on 3/31/11	SEG33121506	SE, SE-PRI
SAPH Beam Beta Covers, SE-PRI begins on 3/31/11	SEG33121507	SE, SE-PRI
HRS Kit	SJG33121419	SE, SE-PRI
PFCS FSE Assembly	9070418	SE, SE-PRI
TUS RA FSE Coarse Alignment Knob Assembly	SEG33119805	SE, SE-PRI
Battery FSE Reconfiguration Kit	SJG33121058	SE, SE-PRI
DCSU FSE MLI Assembly	9008290	SE, SE-PRI
Deployment Hardware	9008468	SE, SE-PRI
Cable Harness Strap, SE-PRI begins on 10/01/10	9S04731	SE, SE-PRI
Heater and Harness Installation Kit, SE-PRI begins on 3/31/11.	SJG33120872	SE, SE-PRI
Contingency Pin Kit, SE-PRI begins 10/1/10	SJG33120170	SE, SE-PRI
Kinematic Bolt Kit – Vertical Shim, SE-PRI begins 3/31/11.	SDG33120148	SE, SE-PRI
HPGT Tension Slide, SE-PRI begins 3/31/11	SDG33121038	SE, SE-PRI
Kinematic Bolt Kit – Square Ring, SE-PRI begins 3/31/11.	SDG33120871	SE, SE-PRI
Kinematic Bolt Kit – Retainer Pin, SE-PRI begins 3/31/11.	SDG33120518	SE, SE-PRI
Kinematic Bolt Kit – Block Retainer, SE-PRI begins	SDG33120146	SE, SE-PRI

3/31/11.		
Kinematic Bolt Kit – Shear Bushing, SE-PRI begins 3/31/11.	SDG33120888	SE, SE-PRI
Kinematic Bolt Kit – Slide Block, SE-PRI begins 3/31/11.	SDG33120141	SE, SE-PRI
Kinematic Bolt Kit – Shear Slide, SE-PRI begins 3/31/11.	SDG33120887	SE, SE-PRI
Kinematic Bolt Kit – Block Washer, SE-PRI begins 3/31/11.	SDG33120147	SE, SE-PRI
Kinematic Bolt Kit – Mount to Deck Shim, SE-PRI begins 3/31/11.	SDG33120149	SE, SE-PRI
Kinematic Bolt Kit – Slide Nut, SE-PRI begins	SDG33120143	SE, SE-PRI
Common Hardware		
CAM, CR and LSG piece parts that were brought onto the Sustaining Engineering contract via change request 010537 (Attachments B, D, E and F) will be tracked via GOLD and will not be shown in the following list of CAM, CR and LSG hardware.		
CAM, CR and LSG HW		
Area Smoke Detector Assy AKA Analog Smoke Sensor	2351510-2-1	S, SE-Pri
Audio Terminal Unit	3000001-301	S, SE-Pri
Baseplate/Ballast Assy	219011	S, SE-Pri
C&W Malfunction Panel	1F51710-1	S, SE-Pri
CCAA – Common Cabin Air Assembly	SV806610-4	S, SE-Pri
CCAA – Cabin Air Inlet ORU Assembly	SV811840-6	S, SE-Pri
CCAA – Electrical Interface Box	SV806488-3	S, SE-Pri
CCAA – Heat Exchanger	SV813900-2	S, SE-Pri
CCAA – Inlet Fan Group	SV811840-4	S, SE-Pri
CCAA – Inlet Temp Sensor Assy	SV813923-1	S, SE-Pri
CCAA – Liquid Sensor, HX	SV806609-1	S, SE-Pri
CCAA – Temp Control Check Valve	SV805626-1	S, SE-Pri
CCAA –Water Separator	SV813920-2	S, SE-Pri
Electrical Interface Assembly Fixture	SV806488CT003	S, SE-Pri
Cabin Air Inlet ORU Assembly Fixture	SV811840CT003	S, SE-Pri
Cabin Air Heat Exchanger ORU Fixture	SV813900CT007	S, SE-Pri
Water Separator Assembly ORU Fixture	SV813920CT003	S, SE-Pri
Temperature Sensor ORU Fixture	SV813923CT001	S, SE-Pri
Intermodule Ventilation Fan Assembly Fixture	SV809111CT003	S, SE-Pri

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Spacer Assembly	PPRV-1-980	S, SE-Pri
Coldplate – 1 (for DDCU)	2351410-2-1	S, SE-Pri
Coldplate – 1	683-56045-1 (2351410-1-1)	S, SE-Pri
Coldplate – 4 (for ATU)	2351440-2-1	S, SE-Pri
Coldplate – 4	683-56045-4 (2351440-1-1)	S, SE-Pri
Coldplate – 6 (for SPDA)	2351460-3-1	S, SE-Pri
Coldplate – 6	683-56045-6 (2351460-1-1)	S, SE-Pri
Coldplate – 7 (for PEHG)	2351470-3-1	S, SE-Pri
Coldplate – 7	683-56045-7 (2351470-1-1)	S, SE-Pri
Coldplate – 8 (for MDM)	2351480-2-1	S, SE-Pri
Coldplate – 8	683-56045-8 (2351480-1-1)	S, SE-Pri
DDCU-Int	R076500-221	S, SE-Pri
Emerg Egress – Lighting Strip (36”)	683-26007-3	S, SE-Pri
Emerg Egress – Lighting Strip (57”)	683-26007-2	S, SE-Pri
Emerg Egress – Power Supply	683-26007-1	S, SE-Pri
External Power Cable Outline	2365470-2-1	S, SE-Pri
External Signal Cable Outline	2365460-1-1	S, SE-Pri
Gen Light – Lamp Housing Assy (-10 & -11)	219010	S, SE-Pri
Headset (LSG)	683-28015-1	S, SE-Pri
IMV Fan Assy	SV809111-6	S, SE-Pri
Intra Vehicular Antenna Assy	683-28005-1	S, SE-Pri
Long Duration Foot Restraint (LDFR)	G11F5000-1	S, SE-Pri
Short Duration Foot Restraint (SDFR)	G11F5001-1	S, SE-Pri
Foot Anchor Restraint Assembly	G11F5002-1	S, SE-Pri
Torso Restraint Assembly	G11F5030-1	S, SE-Pri
Equipment Seat Track Anchor Assembly	G11F5120-1	S, SE-Pri
Equipment Handrail Anchor Assembly	G11F5121-1	S, SE-Pri
Articulation Post Assembly	G11F5122-1	S, SE-Pri
Tether Assembly	G11F5140-1	S, SE-Pri
Fixed Length Tether Assembly	G11F5140-2	S, SE-Pri
Equipment Bag Assembly	G11F5160-1	S, SE-Pri
Handrail Assembly, 21.5”	G11F5200-2	S, SE-Pri
Handrail Assembly, 8.5”	G11F5200-3	S, SE-Pri
Foot Plate Assembly (SRU)	G11F5005-1	S, SE-Pri
Foot Plate Assembly (SRU)	G11F5001-2	S, SE-Pri
Foot Loop Assembly (SRU)	G11F5006-1	S, SE-Pri
Left Hand Brace Assembly (SRU)	G11F5007-1	S, SE-Pri
Left Hand Brace Assembly (SRU)	G11F5007-2	S, SE-Pri
Rail Assembly (SRU)	G11F5008-1	S, SE-Pri

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Foot Plate (SRU)	G11F5002-2	S, SE-Pri
Belt Sub Assembly	G11F5031-1	S, SE-Pri
Extension Rod Assembly	G11F5032-1	S, SE-Pri
Retractable Tether Assembly	G11F5033-1	S, SE-Pri
MDM CAM	8258906-929	S, SE-Pri
Microbial Check Valve	80508-RT	S, SE-Pri
Non-Airlock Pressure Control Panel Duct Outline	2355606-1-1	S, SE-Pri
PEHB (Payload Ethernet Hub Bridge) (LSG)	AN-60611-001-01	S, SE-Pri
PEHB (Payload Ethernet Hub Bridge) (CR)	C21D281014-1	S, SE-Pri
PEHB (Payload Ethernet Hub Bridge) (NON-FLT) (CR)	C21D281714-1	S, SE-Pri
PEHG (Payload Ethernet Hub Gateway)	AN60231-001-03	S, SE-Pri
Portable Fire Extngr Assy	683-10050-1 (2351510-2-1)	S, SE-Pri
Pressure Control Panel	2351290-4-1	S, SE-Pri
Pressure Control Panel	2351290-2-1	S, SE-Pri
Pressure Control Panel	2351290-1-1	S, SE-Pri
Rack Flow Control Assy	683-56186-1 (2353180-1-1)	S, SE-Pri
Rack Power Switch	683-50370-3	S, SE-Pri
Remote Control System – On/Off	219006-2	S, SE-Pri
RPCM Type V – Int	R077419-51	S, SE-Pri
RPCM Type V – Int	R077419-71	S, SE-Pri
RPCM Type VI - Int	R077420-31	S, SE-Pri
RPCM Type VI – Int	R077420-51	S, SE-Pri
SPCU Heat Exchanger	2351350-2-1	S, SE-Pri
Temp Sensor (stand alone)	2365430-1-1	S, SE-Pri
Terminator (for IAA) (SRU)	683-28005-4	S, SE-Pri
Thermowell	2366305-1	S, SE-Pri
Utility Outlet Panel	683-27710-5	S, SE-Pri
Utility Outlet Panel	683-27710-6	S, SE-Pri
Utility Rail 4 Position	2F01001-1	S, SE-Pri
Valve – 3-Way (.125")	B40204-12	S, SE-Pri
Valve – IMV	2353024-4-1	S, SE-Pri
Valve – Negative Pressure Relief	683-16322-3	S, SE-Pri
Valve – N2 Isolation Valve	2353052-2-1	S, SE-Pri
Valve – Positive Pressure Relief	683-16321-11	S, SE-Pri
Valve – Three-Way Mix	683-56185-1 (2365504-1-1)	S, SE-Pri
Valve – Vent Relief	2353026-1-1	S, SE-Pri
Video Switching Unit (Harris)	3000008-301	S, SE-Pri
Shell Patch Heater (External, 30 Watt Each)	1F97615-1	S, SE-Pri
Shell Patch Heater (Internal, 30 Watt Each)	1F97605-1	S, SE-Pri

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Cargo Track-Equipment Rack	683-50222-1	S, SE-Pri
Portable Seat Track Adapter	683-60110-1	S, SE-Pri
RMA Attach Plate	683-60114-1	S, SE-Pri
Rack Handle Assembly	683-60120-1	S, SE-Pri
10GB-SSMSD (CR)	320101	S, SE-Pri
BRP SSPCM (NON FLT)	9070328-509	S, SE-Pri
BRP SSPCM (NON FLT)	9070328-505	S, SE-Pri
CENTRIFUGE RACK INTERFACE CONTROLLER	683-83612-1	S, SE-Pri
Cupola HW		SE-Sec
PCBM	S683-28943	S, SE-Pri
Audio Terminal Unit	3000001-301	S, SE-Pri
Utility Operating Panel	683-27710	S, SE-Pri
Pressure top pane (window)	683-11591	S, SE-Pri
Pressure side pane (window)	683-11592	S, SE-Pri
Debris top pane (window)	683-11587	S, SE-Pri
Debris side pane (window)	683-11588	S, SE-Pri
Scratch top assembly (window)	683-11577	S, SE-Pri
Scratch side assembly (window)	683-11577	S, SE-Pri
PCBM to Element IVA Seal Kit	683-13660-2	S, SE-Pri
MPLM HW		SE-Sec
IMV Shut Off Valve	B404823-2	S, SE-Pri
Cabin Fan Assembly	SV81951-4	S, SE-Pri
Duct Smoke Detector	2119814-3-1	S, SE-Pri
Manual Pressure Equalization Valve	Part of Hatch	S, SE-Pri
Total Pressure Sensor	SV822093-1	S, SE-Pri
Quick Disconnect (Air Revitalization System)	683-19485-3	S, SE-Pri
Multiplexer De-Multiplexer (MDM) (Flight)	8266726-903	S, SE-Pri
MATE (Ground Test)	8265700-905	S, SE-Pri
FEU (Ground Test)	8266937-901	S, SE-Pri
General Luminaire Assembly	219003-1	S, SE-Pri
Lamp Housing Assembly	219010	S, SE-Pri
Baseplate Ballast Assembly	219011	S, SE-Pri
Remote Control Assembly	219006-1	S, SE-Pri
Emergency Egress Lighting Power Supply	683-26007-1	S, SE-Pri
Passive Common Berthing Mechanism	683-13471-19	S, SE-Pri
Hatch / Track Assembly	683-13100-11	S, SE-Pri
Positive Pressure Relief Assembly	B40484	S, SE-Pri
Negative Pressure Relief Assembly	B40483-1	S, SE-Pri
Depress Assembly	B40481-1	S, SE-Pri
Trace Gas Sample Line Shut Off Valve	C11949-1	S, SE-Pri
Payloads		SE-Sec
AAA Fan	SV809992	S, SE-Pri
CVIUs	3000028	S, SE-Pri

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Coldplates	683-56045	S, SE-Pri
Smoke Detector	2351520-1-1	S, SE-Pri
Rack Pivots	683-20100-1	S, SE-Pri
Rack Pivots	683-20100 -2	S, SE-Pri
Rack Pivots	683-61711-31	S, SE-Pri
Rack Pivots	683-61711-32	S, SE-Pri
Rack Pivots	683-61711-33	S, SE-Pri
Rack Pivots	683-61711-37	S, SE-Pri
Payload MDM FEU	683-30169	S, SE-Pri
SFCA	683-27557	S, SE-Pri
RFCA	683-27541	S, SE-Pri
KBARs	683-62201-1	S, SE-Pri
KBARs	683-62201-2	S, SE-Pri
KBARs	683-62201-3	S, SE-Pri
KBARs	683-62201-7	S, SE-Pri
Payload Ethernet hub Gateway (PEHG)	AN60231-001-03	S, SE-Pri
MATE-3	8264900	S, SE-Pri
MATE-4	8270902	S, SE-Pri
Payload Ethernet Hub Bridge (PEHB)	683-46328-1	S, SE-Pri
BRIC	683-83614-1	S, SE-Pri
RIC	683-46323-1	S, SE-Pri
SSPCM	683-6314-1	S, SE-Pri
BSSPCM	683-46313-1	S, SE-Pri
BEMU	683-42584-1	S, SE-Pri
SSPCM Unit Tester	907184-1, -501	S, SE-Pri
RIC Test Sets	683-4216 683-42665	S, SE-Pri
Avionics Test Bed	683-36037	S, SE-Pri
Rack Software Test Bed	683-40350	S, SE-Pri
Payload Software Integration/Verification Facility	683-21420	S
Node 2 HW		SE-Sec
MDM CONNECTOR MOUNTING PLATE	NRP-A-MP8A3F	S, SE-Pri
VESTIBULE AVIONICS JUMPER SET (N2 TO JEM)	1F46290-1	S, SE-Pri
VESTIBULE AVIONICS JUMPER SET (N2 TO CAM)	1F46321-1	S, SE-Pri
VESTIBULE AVIONICS JUMPER SET (N2 TO APM)	1F46348-1	S, SE-Pri
VESTIBULE AVIONICS JUMPER SET (N2 TO MPLM)	1F46379-1	S, SE-Pri
VESTIBULE AVIONICS JUMPER SET(N2 TO LAB)	1F46392-1	S, SE-Pri
BULKHEAD AVIONICS SET (N2 to PMA2)	1F46423-1	S, SE-Pri

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UMBILICAL JAM NUT CONNECTOR KIT AFT DEBRIS SHIELD	1F46431-1	S, SE-Pri
Gore Panel to Umbilical Stanchion Harness Connector Kit (Fwd & Aft)	1F46432-1	S, SE-Pri
VESTIBULE AVIONICS SET (N2 to ELM)	1F46434-1	S, SE-Pri
CAUTION AND WARNING PANEL	1F51710-1	S, SE-Pri
Vestibule Avionics Jumper Set (N1 to N2)	1F90006	S, SE-Pri
1553 Drag Through Jumper	683-22011	S, SE-Pri
1553 Drag Through Jumper	683-22018	S, SE-Pri
MDM WEDGE CLAMP KIT	1F97458-1	S, SE-Pri
AUDIO TERMINAL UNIT	3000001-301	S, SE-Pri
AUDIO BUS COUPLER	3000005-301	S, SE-Pri
VIDEO SWITCH UNIT	3000008-301	S, SE-Pri
COMMON VIDEO INTERFACE UNIT	3000028-301	S, SE-Pri
BULKHEAD AVIONICS FEED THRU KIT (AFT)	683-11628-1	S, SE-Pri
BULKHEAD AVIONICS FEED THRU KIT (FWD)	683-11628-2	S, SE-Pri
BULKHEAD AVIONICS FEED THRU KIT (STRBD)	683-11628-3	S, SE-Pri
BULKHEAD AVIONICS FEED THRU KIT (PORT)	683-11628-4	S, SE-Pri
BULKHEAD AVIONICS FEED THRU KIT (NADIR)	683-11628-5	S, SE-Pri
BULKHEAD AVIONICS FEED THRU KIT (ZENITH)	683-11628-6	S, SE-Pri
GORE PANEL AVIONICS FEED THRU KIT (Fwd & Aft)	683-11638-1	S, SE-Pri
INTRA VEHICULAR ANTENNA ASSEMBLY (PATCH)	683-28005-1	S, SE-Pri
IVA ANTENNA TERMINATOR	683-28005-4	S, SE-Pri
IVA ANTENNA COUPLER	683-28005-7	S, SE-Pri
FIBER OPTIC ATTENUATOR	683-50357-1	S, SE-Pri
ELECTRICAL CONNECTOR, STRAIGHT PLUG	683-50901-1	S, SE-Pri
SPDU HARNESS KIT	683-52013-2	S, SE-Pri
MDM-16 (N2-1) also delivered 1 ea CCU-IOCU P/N 8260920-904, S/N 97030134	8258906-928	S, SE-Pri
MDM-16 (N2-1) also delivered 1 ea CCU-IOCU P/N 8260920-904, S/N 98060169	8258906-931	S, SE-Pri
Internal Video camera I/F Port	NATC07T25N20SN	S, SE-Pri
MULTI CONDUCTOR AUDIO CABLE	T6145-0002-004	S, SE-Pri

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RACK POWER SWITCH, RH W/LED	683-50370-3	S, SE-Pri
ABSOLUTE PRESSURE TRANSDUCER (0-20 PSIA)	1F08013-1	S, SE-Pri
CABIN AIR LINEAR DIFFUSERS	1F70841-1	S, SE-Pri
CONTROL ASSEMBLY,VAVDA	1F89998-1	S, SE-Pri
O-RING	2-248S0604	S, SE-Pri
O-RING	2-255S0604	S, SE-Pri
AREA SMOKE DETECTOR	2351520-2-1	S, SE-Pri
IMV VALVE ASSEMBLY	2353024-2-1	S, SE-Pri
IMV VALVE ASSEMBLY	2353024-3-1	S, SE-Pri
IMV VALVE ASSEMBLY	2353024-4-1	S, SE-Pri
IMV VALVE ASSEMBLY	2353024-5-1	S, SE-Pri
IMV VALVE ASSEMBLY	2353024-6-1	S, SE-Pri
IMV VALVE ASSEMBLY	2353024-7-1	S, SE-Pri
IMV VALVE ASSEMBLY	2353024-8-1	S, SE-Pri
PORTABLE FIRE EXTINGUISHER ASSEMBLY	683-10050-1(E4482)	S, SE-Pri
CCAA MOUNTING HARDWARE KIT	683-11644-1	S, SE-Pri
IMV DIFFUSER ASSEMBLY	683-15011-1	S, SE-Pri
IMV DIFFUSER ASSY	683-15011-2	S, SE-Pri
IMV DUCT (NODE 2)	683-15012-2	S, SE-Pri
IMV SCREEN ASSEMBLY (NODE 2)	683-15013-1	S, SE-Pri
IMV CAP	683-15016-6	S, SE-Pri
IMV CAP	683-15016-8	S, SE-Pri
CABIN AIR SUPPLY DIFFUSER ASSEMBLY	683-15110-4	S, SE-Pri
VARIABLE AIR VOLUME DAMPER ASSEMBLY	683-15144-3	S, SE-Pri
IMV RETURN GRILLE (NODE 2)	683-15196-1	S, SE-Pri
POSITIVE PRESSURE RELIEF VALVE	683-16321-11	S, SE-Pri
NEGATIVE PRESSURE RELIEF VALVE	683-16322-3	S, SE-Pri
NITROGEN INTERFACE ASSEMBLY	683-16353-1	S, SE-Pri
SAMPLE PROBE KIT	683-19370-1	S, SE-Pri
VALVE, THREE WAY, 0.125 INCH	683-19446-1	S, SE-Pri
WASTE WATER CHECK VALVE	683-52817-1	S, SE-Pri
IMV FAN SILENCER ASSEMBLY	683-56036-1	S, SE-Pri
MANUAL VALVE, 0.125 INCH	B40496-1	S, SE-Pri
IMV V-BAND CLAMP (CAP CLAMPS)	MS27115-21R	S, SE-Pri
IMV V-BAND CLAMP (INTERNAL CLAMPS)	MS27115-21R	S, SE-Pri
IMV V-BAND CLAMP (CAP CLAMPS)	MS27115-21R	S, SE-Pri
Resistor, Variable Composition	R4SAYSD501E	S, SE-Pri
ELECTRICAL INTERFACE ASSY	SV806488-3	S, SE-Pri
LIQUID SENSOR	SV806609-1	S, SE-Pri
CABIN AIR BACTERIA	SV806630-2	S, SE-Pri

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FILTER/HOUSING		
IMV FAN ASSEMBLY	SV809111-6	S, SE-Pri
CABIN AIR INLET	SV811840-4	S, SE-Pri
CABIN AIR INLET	SV811840-6	S, SE-Pri
HEAT EXCHANGER	SV813900-2	S, SE-Pri
WATER SEPARATOR	SV813920-2	S, SE-Pri
TEMPERATURE SENSOR	SV813923-1	S, SE-Pri
WS/CHX 2-HOSE SET	SV828085-1	S, SE-Pri
PORTABLE SEAT TRACK ADAPTER	683-60110-1	S, SE-Pri
RESTRAINT ASSY.,FOOT-SHORT DURATION	G11F5001-1	S, SE-Pri
RESTRAINT ASSY.,FOOT-ANCHOR	G11F5002-1	S, SE-Pri
RESTRAINT ASSY, TORSO NODE 2	G11F5030-1	S, SE-Pri
ANCHOR ASSY., EQUIPMENT-SEAT TRACK (To KSC)	G11F5120-1	S, SE-Pri
ANCHOR ASSY., EQUIPMENT-HANDRAIL (To KSC)	G11F5121-1	S, SE-Pri
POST ASSY., ARTICULATING (To KSC)	G11F5122-1	S, SE-Pri
ADJUSTABLE LENGTH TETHER ASSY	G11F5140-1	S, SE-Pri
FIXED LENGTH TETHER ASSEMBLY	G11F5140-2	S, SE-Pri
HANDRAIL ASSEMBLY, 41.5 INCHES	G11F5200-1	S, SE-Pri
HANDRAIL ASSEMBLY, 21.5 INCHES	G11F5200-2	S, SE-Pri
HANDRAIL ASSEMBLY, 8.5 INCHES	G11F5200-3	S, SE-Pri
BULKHEAD FLUID FEED THRU KIT (AFT)	683-11627-1	S, SE-Pri
BULKHEAD FLUID FEED THRU KIT (FWD)	683-11627-2	S, SE-Pri
BULKHEAD FLUID FEED THRU KIT (STARBOARD)	683-11627-3	S, SE-Pri
BULKHEAD FLUID FEED THRU KIT (PORT)	683-11627-4	S, SE-Pri
BULKHEAD FLUID FEED THRU KIT (NADIR)	683-11627-5	S, SE-Pri
BULKHEAD FLUID FEED THRU KIT (ZENITH)	683-11627-6	S, SE-Pri
MPLM VESTIBULE OUTFITTING KIT	683-13783-1	S, SE-Pri
N2 VESTIBULE OUTFITTING KIT	683-13787-1	S, SE-Pri
APM VESTIBULE OUTFITTING KIT	683-13790-1	S, SE-Pri
JEM VESTIBULE OUTFITTING KIT	683-13791-1	S, SE-Pri
CAM VESTIBULE OUTFITTING KIT	683-13794-1	S, SE-Pri
PDGF CONNECTOR CAP KIT	1F46433-1	S, SE-Pri
GENERAL LUMINAIRE LAMP HOUSING ASSY	219010	S, SE-Pri
GENERAL LUMINAIRE BASEPLATE BALLAST ASSY	219011	S, SE-Pri

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UTILITY RAIL (1F97009-1)	1F97009-1	S, SE-Pri
UTILITY RAIL (1F97036-1)	1F97036-1	S, SE-Pri
UTILITY RAIL (1F97039-1)	1F97039-1	S, SE-Pri
UTILITY RAIL (1F97042-1)	1F97042-1	S, SE-Pri
UTILITY RAIL (1F97048-1)	1F97048-1	S, SE-Pri
REMOTE POWER ON/OFF SWITCH	219006-2	S, SE-Pri
REMOTE POWER SOURCE, EEL	683-26007-1	S, SE-Pri
EMERGENCY EGRESS LIGHTING, LIGHT STRIP(57")	683-26007-2	S, SE-Pri
UTILITY OUTLET PANEL	683-27710-1	S, SE-Pri
UTILITY OUTLET PANEL	683-27710-2	S, SE-Pri
RACK POWER SWITCH, RH W/O LED	683-50370-4	S, SE-Pri
RPCM MOUNTING BRACKETS	R0703894-1	S, SE-Pri
RPCM MOUNTING BRACKETS	R073894-1 G255	S, SE-Pri
DC TO DC CONVER UNIT INTERNAL (DDCU-1) 6.25KW	R076500-1	S, SE-Pri
REMOTE POWER CONTROLLER MODULE (RPCM) 3.5 AMP TYPE V	R077419-51	S, SE-Pri
REMOTE POWER CONTROLLER MODULE (RPCM) 3.5 AMP TYPE V	R077419-71	S, SE-Pri
REMOTE POWER CONTROLLER MODULE (RPCM) 25 AMP TYPE VI	R077420-31	S, SE-Pri
SHIELD ASSEMBLY KIT – FWD ENDCONE	683-11642-1	S, SE-Pri
HATCH ASSY, AXIAL	683-13105-1	S, SE-Pri
HATCH ASSY, RADIAL	683-13105-2	S, SE-Pri
PCBM CONTAMINATION COVER KIT	683-13612-1	S, SE-Pri
CBM RING/SEAL KIT (ACTIVE) – AXIAL	683-13910-1	S, SE-Pri
CBM RING/SEAL KIT (ACTIVE) – RADIAL	683-13910-2	S, SE-Pri
CBM RING/SEAL KIT (AFT), PASSIVE	683-13912-1	S, SE-Pri
CBM MECHANISM KIT (STARBOARD), ACTIVE	683-13914-1	S, SE-Pri
CBM MECHANISM KIT (NADIR) – ACTIVE	683-13914-2	S, SE-Pri
CBM MECHANISM KIT (PORT) – ACTIVE	683-13914-3	S, SE-Pri
CBM MECHANISM KIT, (ZENITH) ACTIVE	683-13914-4	S, SE-Pri
CBM MECHANISM KIT, ACTIVE (FORWARD)	683-13914-5	S, SE-Pri
CBM MECHANISM KIT (AFT), PASSIVE	683-13916-1	S, SE-Pri

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ACTIVE CBM M/D HARDWARE KIT-AXIAL	683-13918-1	S, SE-Pri
ACTIVE CBM M/D HARDWARE KIT – RADIAL	683-13918-2	S, SE-Pri
RADIAL PORT CLOSEOUT SHIELD KIT	683-13918-3	S, SE-Pri
RACK STRUCTURE	683-50243-3	S, SE-Pri
Washer W/Tag DD 1149 HSV9285-006	683-55276-2	S, SE-Pri
MLI BERTHING MECHANISM (Blankets)	683-58007-3	S, SE-Pri
MLI ASSEMBLY LABA , BERTHING	683-58007-7	S, SE-Pri
MLI BERTHING MECHANISM	683-58007-8	S, SE-Pri
KNEE BRACE KIT	683-60728-1	S, SE-Pri
GROUND STUD, ALTERED ITEM	683-60738-1	S, SE-Pri
ARIS PIVOT PINS – Left Hand	683-61711-31	S, SE-Pri
ARIS PIVOT PINS – Right Hand	683-61711-32	S, SE-Pri
KBAR ATTACHMENT	683-62201-1	S, SE-Pri
KBAR ATTACHMENT	683-62201-2	S, SE-Pri
KBAR CAPTURE MECHANISM	683-62201-5	S, SE-Pri
KBAR CAPTURE MECHANISM	683-62201-6	S, SE-Pri
RETAINING RING	991W04-1BP	S, SE-Pri
ZERO-G STORAGE RACKS	9K70002	S, SE-Pri
ZERO-G STORAGE RACKS	9K70002-501	S, SE-Pri
ZERO-G STORAGE RACKS	9K70002-503	S, SE-Pri
Active CBM Bracket Mod Kit (Port)	TBD	S, SE-Pri
Active CBM Bracket Mod Kit (Starboard)	TBD	S, SE-Pri
Active CBM Bracket Mod Kit (Forward)	TBD	S, SE-Pri
COLLAR, ANTI-DEPRESSION, QUICK DISCONNECT	1F00799-509	S, SE-Pri
NH3/H20 HEAT EXCHANGE ORU (HIGH LOAD)	1F28940-1	S, SE-Pri
NH3 LINE QD'S (NODE 2 HALF, 1" MALE)	1F45540-517	S, SE-Pri
NH3 LINE QD'S (NODE 2 HALF, 1" FEMALE)	1F45541-517	S, SE-Pri
NH3 QD CAPS	1F45580-505	S, SE-Pri
NH3/H20 HEAT EXCHANGE ORU (LOW LOAD)	1F96060-1	S, SE-Pri
SUIT PROCESSING COOLING UNIT (SPCU)	2351350-1-1	S, SE-Pri
PUMP PACKAGE ASSY	2353170-1-1	S, SE-Pri
RACK FLOW CONTROL ASSEMBLY	2353180-1-1	S, SE-Pri
SYSTEM FLOW CONTROL ASSY	2353190-1-1	S, SE-Pri
TEMPERATURE SENSOR	2365430-1-1	S, SE-Pri
MANUAL FLOW CONTROL VALVE ASSEMBLY	2366110-1-1	S, SE-Pri
GORE PANEL FLUID FEED THRU KIT	683-11637-1	S, SE-Pri

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Pressure Cap	683-16348-806	S, SE-Pri
NH3/H2O HX HEATER/TEMP SENSOR ASSY	683-20193-2	S, SE-Pri
NH3/H2O HX HEATER/TEMP SENSOR ASSY	683-20193-3	S, SE-Pri
NH3/H20 HX HEATER/TEMP SENSOR ASSY	683-20193-TBD	S, SE-Pri
COLD PLATE – 1	683-56045-1	S, SE-Pri
COLD PLATE – 4	683-56045-4	S, SE-Pri
COLD PLATE – 6	683-56045-6	S, SE-Pri
COLD PLATE – 8	683-56045-8	S, SE-Pri
ITCS COOLANT SAMPLING TOOL (1/2 in)	683-56147-1	S, SE-Pri
3-WAY MIX VALVE	683-56185-1	S, SE-Pri
WELDED T RECEPTICLE 1.0”	683-66711-111	S, SE-Pri
WELDED T RECEPTICLE 0.75 “	683-66711-113	S, SE-Pri
WELDED T RECEPTICLE, 0.50 “	683-66711-115	S, SE-Pri
EVA CLAMP 1”	NCCS EI-D-A-22-1	S, SE-Pri
PLATE,IDENTIFICATION	TBD	S, SE-Pri
Node 3 HW		
RPCM TYPE II – INTERNAL	R077417-71	SE/SE- Pri
DDCU 6.25 KW	R076500-221	SE/SE-Pri
RPCM 25 AMP TYPE VI	R077420-31	SE/SE- Pri
RPCM 50 AMP TYPE III	R077418-31	SE/SE-Pri
RPCM 3.5 AMP TYPE V	R077419-51	SE/SE- Pri
RPCM 25 AMP TYPE II	R077417-31	SE/SE-Pri
RPCM 3.5 AMP TYPE V	R077419-51	SE/SE- Pri
WS/CHX 2-HOSE	SV8010029-2	SE/SE-Pri
WS/CHX 2-HOSE	SV8010031-2	SE/SE- Pri
LCZ-1 ESSMDM	8259015-915	SE/SE-Pri
LCZ-2 ESSMDM	8259015-915	SE/SE- Pri
CAUTION AND WARNING PANEL	1F51710-1	SE/SE-Pri
HEAT EXCHANGER ASSEMBLY	1F28900-920	SE/SE- Pri
HEAT EXCHANGER ASSEMBLY	1F28940-1	SE/SE-Pri
S0 TO N3 JUMPERS (AVIONICS)	1F77578-1	SE/SE- Pri
AVIONICS INSTALL KIT (NODE 1 TO NODE 3)	1F90008-1	SE/SE-Pri
NODE 3-1 SSMDM	8258906-926	SE/SE- Pri
NODE 3-2 SSMDM	8258906-927	SE/SE-Pri
UTILITY RAIL ASSEMBLY, TYPE A	1F51998	SE/SE- Pri
UTILITY RAIL ASSEMBLY, TYPE B	1F51991	SE/SE-Pri
UTILITY RAIL ASSEMLBY, TYPE C	1F51994	SE/SE- Pri
COLDPLATE -6	2351460-3-2	SE/SE-Pri
COLDPLATE -1	2351410-2-2	SE/SE- Pri
MDM CONNECTOR MOUNTING PLATE	NRP-A-MP8A3F	SE/SE-Pri

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COUPLING QD, FLUID SELF-SEALING, INTERNAL (MALE)	683-16348-181	SE/SE- Pri
COUPLING QD, FLUID SELF-SEALING, INTERNAL (MALE)	683-16348-182	SE/SE-Pri
COUPLING QD, FLUID SELF-SEALING, INTERNAL (MALE)	683-16348-302	SE/SE- Pri
COUPLING QD, MALE, AMMONIA EXTERNAL (1 IN.)	1F45540-517	SE/SE-Pri
COUPLING QD, FEMALE, .125 INCH, FEEDTHROUGH-MTD.	683-19485-3	SE/SE- Pri
COUPLING QD, DISCONNECT, FLUID, SELF-SEALING, INTERNAL (MALE CAP)	683-16348-806	SE/SE-Pri
COUPLING QD, DISCONNECT, FLUID, SELF-SEALING, INTERNAL (MALE CAP)	683-16348-808	SE/SE- Pri
NON PROPULSIVE VENT (NPV) ASSEMBLY	683-60453-3	SE/SE-Pri
COUPLING QD, FLUID SELF-SEALING, INTERNAL (MALE)	683-16348-303	SE/SE- Pri
OUTLINE, CABLE, SIGNAL MOTOR/ACTUATOR, VENT AND RELIEF VALVE	2365460-3-1	SE/SE-Pri
OUTLINE, CABLE, POWER, PRESSURE CONTROL VENT AND RELIEF VALVE	2365470-4-1	SE/SE- Pri
DUCT, NON-AIRLOCK	2355606-1-1	SE/SE-Pri
METAL SEALS, SPECIAL (SPARES)	220F01200-001	SE/SE- Pri
NUT, FLANGED HEX, TYPE NATC, SIZE 13	683-95089-3	SE/SE-Pri
NUT, FLANGED HEX, TYPE NATC, SIZE 13	683-95089-2	SE/SE- Pri
NUT, FLANGED HEX, TYPE NATC, SIZE 13	683-95089-1	SE/SE-Pri
CONNECTOR	NATC06G25N35SC	SE/SE- Pri
CONNECTOR	NATC06G13N35SB	SE/SE-Pri
CONNECTOR	NATC06G2519SD	SE/SE- Pri
BACKSHELL	NZGA-SG-13-N-12	SE/SE-Pri
BACKSHELL	NZGA-SG-13-N-16	SE/SE- Pri
BACKSHELL	NZGA-SG-13-N-24	SE/SE-Pri
BACKSHELL	NZGA-SG-25-N-24	SE/SE- Pri
BACKSHELL	NZGA-SX-25-N-16	SE/SE-Pri
BACKSHELL	NZGA-SX-25-N-20	SE/SE- Pri
BACKSHELL	NZGA-SX-33-N-36	SE/SE-Pri
GORE PANEL FEEDTHROUGH	FTH14705-43-E	SE/SE- Pri
GAMAH FITTING	683-16347-7	SE/SE-Pri
PIN	220F01187	SE/SE- Pri
EXTERNAL VENT FLANGE ASSY	220F01107-003	SE/SE-Pri
ARS RACK (INCLUDES -4 COLDPLATE)	683-53000-3	SE/SE- Pri
COLDPLATE -4	683-56045-4	SE/SE-Pri
COLDPLATES -10	683-56045-10	SE/SE- Pri

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IMV VALVE	B42630-3	SE/SE-Pri
IMV VALVE	B42630-5	SE/SE- Pri
IMV VALVE	B42630-6	SE/SE-Pri
IMV VALVE	B42630-8	SE/SE- Pri
ACTIVE CBM M/D HARDWARE (RADIAL)	683-13948-1	SE/SE-Pri
IMV VALVE	B42630-7	SE/SE- Pri
NH3/H20 HX HEATER/TEMP SENSOR ASSY (SCD)	683-20193-19	SE/SE-Pri
NH3/H20 HX HEATER/TEMP SENSOR ASSY (SCD)	683-20193-20	SE/SE- Pri
NH3/H20 HX HEATER/TEMP SENSOR ASSY (SCD)	683-20193-21	SE/SE-Pri
NH3/H20 HX HEATER/TEMP SENSOR ASSY (SCD)	683-20193-22	SE/SE- Pri
MCA VENT ASSEMBLY KIT – EXTERNAL	683-11659-1 (S/N 000001 & 000002)	SE/SE-Pri
COLDPLATE -1	683-56045-1	SE/SE- Pri
RACK STRUCTURE (4-POST)	683-50243-3	SE/SE-Pri
RACK STRUCTURE (6-POST)	683-50243-2	SE/SE- Pri
RPDA (1-SLOT)	683-27100-1	SE/SE-Pri
AAA FAN	SV809992-6	SE/SE- Pri
AREA SMOKE DETECTOR	2351520-2-1	SE/SE-Pri
RPDA (2-SLOT)	683-27100-2	SE/SE- Pri
UTILITY OUTLET PANEL	683-27710-5	SE/SE-Pri
GENERAL LUMINAIRE LAMP HOUSE ASSY	219010	SE/SE- Pri
EMERGENCY LIGHTING POWER SUPPLY	683-26007-1	SE/SE-Pri
EMERGENCY EGRESS LIGHT SYSTEM – 36”	683-26007-3	SE/SE- Pri
EMERGENCY EGRESS LIGHT SYSTEM – 57”	683-26007-2	SE/SE-Pri
AUDIO TERMINAL UNIT	3000001-301	SE/SE- Pri
SYSTEM REMOTE ON/OFF CONTROL	219006-1	SE/SE-Pri
AUDIO BUS COUPLER	3000005-301	SE/SE- Pri
VIDEO SWITCH UNIT	3000008-301	SE/SE-Pri
AUDIO INTERFACE UNIT	3000002-301	SE/SE- Pri
COMMON VIDEO INTERFACE UNIT (CVIU)	3000028-301	SE/SE-Pri
3 WAY SAMPLE VALVE	B40204-12	SE/SE- Pri
SAMPLE PROBE KITS	683-19370-1	SE/SE-Pri
CO2 VENT AND VALVE	B40202-1	SE/SE- Pri
WASTE WATER CHECK VALVES	683-52817-1	SE/SE-Pri
PRESSURE CONTROL ASSEMBLY (PCA)	2351290-2-1	SE/SE- Pri
MANUAL ISOLATION VALVE	B40496-1	SE/SE-Pri
IMV FAN ASSEMBLY	SV809111-6	SE/SE- Pri
IMV VALVE	2353024-2-1	SE/SE-Pri

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VARIABLE AIR VOLUME DAMPER ASSEMBLY	683-15144-3	SE/SE- Pri
COMMON CABIN AIR BACTERIA/FILTER ASSY	SV806630-2	SE/SE-Pri
PORTABLE FIRE EXTINGUISHER	E4482 OR 683-10050-1	SE/SE- Pri
N2 INTERFACE ASSEMBLY	683-16353-1	SE/SE-Pri
RACK FLOW CONTROL ASSEMBLY	683-56186-1	SE/SE- Pri
PUMP PACKAGE ASSEMBLY	2353170-1-1	SE/SE-Pri
INTERNAL REGENERATIVE HEAT EXCHANGER (SPCU)	2351340-1-1	SE/SE- Pri
SYSTEM FLOW CONTROL ASSEMBLY	683-56187-1	SE/SE-Pri
PASSIVE CBM MECHANISM	683-13946-1	SE/SE- Pri
ACTIVE CBM RING AND SEAL KIT (RADIAL)	683-13940-2	SE/SE-Pri
PASSIVE CBM RING AND SEAL (RADIAL)	683-13942-1	SE/SE- Pri
HATCH ASSY KIT (AXIAL)	683-13105-1	SE/SE-Pri
ACTIVE CBM MECHANISM KIT	683-13944-1	SE/SE- Pri
HATCH ASSY KIT (RADIAL)	683-13105-2	SE/SE-Pri
RACK POWER SWITCH, RH WITH LED (ECLSS)	683-50370-3	SE/SE- Pri
RACK POWER SWITCH, RH WITH LED (W&HC)	683-50370-3	SE/SE-Pri
RPDA (1-SLOT)	683-27100-1	SE/SE- Pri
AREA SMOKE DETECTOR	2351520-2-1	SE/SE-Pri
MANUAL FLOW CONTROL VALVE	2366110-1-1	SE/SE- Pri
IVA ANTENNA	683-28005-1	SE/SE-Pri
COLDPLATE -6	683-56045-6	SE/SE- Pri
COLDPLATE -7	683-56045-7	SE/SE-Pri
COLDPLATE -8	683-56045-8	SE/SE- Pri
GENERAL LUMINAIRE BASEPLATE BALLAST ASSY	219011	SE/SE-Pri
IMV VALVE	2353024-7-1	SE/SE- Pri
FEEDTHRU CONNECTORS	683-16347-205	SE/SE-Pri
FEEDTHRU CONNECTORS	683-16347-214	SE/SE- Pri
VENT RELIEF VALVE	2353026-1-1	SE/SE-Pri
ACTIVE CBM M/D HARDWARE (AXIAL)	683-13948-2	SE/SE- Pri
ACTIVE CBM MECHANISM KIT	683-13944-2	SE/SE-Pri
ACTIVE CBM MECHANISM KIT	683-13944-3	SE/SE- Pri
ACTIVE CBM MECHANISM KIT	683-13944-4	SE/SE-Pri
ACTIVE CBM MECHANISM KIT	683-13944-5	SE/SE- Pri
ACTIVE CBM RING AND SEAL KIT (AXIAL)	683-13940-1	SE/SE-Pri
K BAR ATTACHMENT	683-62201-1	SE/SE- Pri
K BAR CAPTURE MECHANISM	683-62201-27	SE/SE-Pri
K BAR ATTACHMENT	683-62201-2	SE/SE- Pri

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K BAR CAPTURE MECHANISM	683-62201-28	SE/SE-Pri
RACK POWER SWITCH	683-50370-3	SE/SE- Pri
CO2 VALVE	B40202-1	SE/SE-Pri
PUMP PACKAGE BYPASS VALVE	2351169-1-1	SE/SE- Pri
N3 CONTINGENCY THERMAL JUMPER	683-56836-341	SE/SE-Pri
N3 CONTINGENCY THERMAL JUMPER	683-56836-342	SE/SE- Pri
GROUND STUD, ALTERED ITEM	683-60738-1	SE/SE-Pri
RETAINING RING	991W04-1BP	SE/SE- Pri
SYSTEM REMOTE ON/OFF CONTROL ASSY UPGRADE	219006-2	SE/SE-Pri
UTILITY OUTLET PANEL	683-27710-5	SE/SE- Pri
MOD KIT UTILITY OUTLET PANEL	683-28289-1	SE/SE-Pri
K BAR ASSY MOD KIT – LEFT	683-62201-33	SE/SE- Pri
K BAR ASSY MOD KIT – RIGHT	683-62201-34	SE/SE-Pri
RPDA 2 SLOT KIT	683-27100-2	SE/SE- Pri
VENT RELIEF KIT – INTERNAL	683-11647-1	SE/SE-Pri
IMV DIFFUSER ASSEMBLY	683-15011-1	SE/SE- Pri
IMV TRANSITION DUCT	683-15012-2	SE/SE-Pri
IMV SCREEN ASSEMBLY	683-15013-1	SE/SE- Pri
IMV RETURN GRILLE	683-15196-1	SE/SE-Pri
THREADED FLUID FITTING	683-16347-109	SE/SE- Pri
THREADED FLUID FITTING	683-16347-151	SE/SE-Pri
THREADED FLUID FITTING	683-16347-173	SE/SE- Pri
THREADED FLUID FITTING	683-16347-185	SE/SE-Pri
THREADED FLUID FITTING	683-16347-205	SE/SE- Pri
THREADED FLUID FITTING	683-16347-214	SE/SE-Pri
THREADED FLUID FITTING	683-16347-73	SE/SE- Pri
THREADED FLUID FITTING	683-16347-74	SE/SE-Pri
WASHER	683-55276-5	SE/SE- Pri
CLAMP ASSEMBLY, KIT MODEL	1F97458-1	SE/SE-Pri
IMV VALVE (HONEYWELL)	2353024-2-1, S/N D0006	SE/SE- Pri
WELD TEE FITTING, TEMP SENSOR RECEPTACLE	683-66711-113	SE/SE-Pri
BONDING STRAP, KT MODEL	1F97459-1	SE/SE- Pri
IMV FAN SILENCER ASSEMLBY	683-56036-1	SE/SE-Pri
CLAMP, ROUND, V-BAND	5737A-712-A	SE/SE- Pri
CLAMP, RECTANGULAR, V-BAND	VC1626	SE/SE-Pri
IMV CAP	683-15016-1	SE/SE- Pri
IMV CAP	683-15016-6	SE/SE-Pri
IMV CAP	683-15016-8	SE/SE- Pri
SHIELD ASSEMBLY KIT – FWD ENDCONE	683-11642-1	SE/SE-Pri
PCBM CONTAMINATION COVER KIT	683-13612-1	SE/SE- Pri
RADIAL PORT CLOSEOUT SHIELD KIT	683-13918-3	SE/SE-Pri
PCBM M/D SHIELD KIT	683-13948-3	SE/SE- Pri

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MLI BERTHING MECHANISM (BLANKET)	683-58007-3	SE/SE-Pri
MLI ASSEMBLY LAB A BERTHING	683-58007-7	SE/SE- Pri
ARIS PIVOT PIN (LEFT)	683-61711-31	SE/SE-Pri
ARIS PIVOT PIN (RIGHT)	683-61711-32	SE/SE- Pri
MLI INSTALLATION HARDWARE KIT	683-11658-1	SE/SE-Pri
THREADED FLUID FITTING	683-16347-841	SE/SE- Pri
THREADED FLUID FITTING	683-16347-845	SE/SE-Pri
COAXIAL LOOP BACK ASSEMBLY	683-26053-1	SE/SE- Pri
DEAD FACE CONNECTOR ASSEMBLY	1F46318-1	SE/SE-Pri
CABLE 1553 TERMINATION ASSEMBLY	683-26050-1	SE/SE- Pri
CABLE 1553 TERMINATION ASSEMBLY	683-26051-1	SE/SE-Pri
ANTENNA COUPLER (SCD)	683-28005-5	SE/SE- Pri
LINEAR DIFFUSER ASSEMBLY	1F70841-1	SE/SE-Pri
CONTROL ASSEMBLY – DAMPER VALVE, VARIABLE AIR VOLUME	1F89998-1	SE/SE- Pri
PLATE, MOUNT AVIONICS AIR COOLING	683-15334-1	SE/SE-Pri
RPS BRACKET ASSEMBLY	683-50371-6	SE/SE- Pri
THREADED FLUID FITTING	683-16347-7	SE/SE-Pri
EVA CLAMPS	NCCS-EI-D-A-24-1	SE/SE- Pri
CAUTION LABEL	683-14049-1	SE/SE-Pri
Station-Shuttle Transfer System (SSPTS)		
SSPTS Z-1 Truss Cable Mod Kit	1F15395-1	SE-Pri
SSPTS PMA2 Cable Mod Kit	1F15396-1	SE-Pri
Advanced ECLSS Racks HW		SE-Sec
Boeing delivered common hardware provided GFE for Advanced ECLSS Racks	Tbd	S, SE-Pri
Avionics Equipment		
Wireless Access Point Kit	1F15938	N
Ethernet Cable Repair Kit	1F15939	N
Ethernet User Cable Kit	1F15940	N
EVR	See Appx A-2	SE-Integ
REGEN ECLSS **Oxygen Generation Assembly**		
Water	SV827690-1	S, SE-Pri*
Inlet Deionizing Bed	SV825569-1	S, SE-Pri*
Hydrogen ORU	SV825526-1	S, SE-Pri*
Pump	SV825565-1	S, SE-Pri*
Oxygen Outlet	SV825582-1	S, SE-Pri*
Hydrogen Sensor	SV826167-1	S, SE-Pri*
Nitrogen Purge ORU	SV828110-1	S, SE-Pri*
Power Supply Module	96M11700	SE-Integ*
Oxygen Generation Assembly Power Supply Module (OGA PSM)	96M11700	SE-PRI, H
Process Controller	SV826025-1	S, SE-Pri*

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OGA Hydrogen ORU Calibration Kit (HOCK):		
• Manifold	SV1016277-2	S, SE-Pri
• EMI Filter	SV1014546-1	S, SE-Pri
• Shorting Plug	SV1016060-1	S, SE-Pri
• Wire Harness	SV1014926-1	S, SE-Pri
• Adapter Harness	SV1015833-1	S, SE-Pri
OGA Hydrogen Sensor ORU Purge Adapter (HOPA):	528-38602-1 (ASSY DWG)	S, SE-Pri
• Evacuation Tool	SV1013141-1	S, SE-Pri
• Inlet Tool	SV1013102-1	S, SE-Pri
• Outlet Tool	SV10131145	S, SE-Pri
Water Delivery System (WDS):		
• Controller	96M22020-1	S, SE-Pri
• ORU Power Cable	96M23040-1	S, SE-Pri
• ORU Data Cable	96M23041-1	S, SE-Pri
• Control Power Cable	96M23039-1	S, SE-Pri
Thermal Expansion Device (TED) & Hoses:		
• Pump ORU Inlet Expansion Hose	96M12549-1	S, SE-Pri
• Pump ORU Inlet Expansion Hose	96M12549-3	S, SE-Pri
• Pump ORU Inlet Expansion Hose	96M12549-5	S, SE-Pri
• Pump ORU Inlet Expansion Hose	96M12549-7	S, SE-Pri
• Pump ORU Inlet Expansion Hose	96M12549-9	S, SE-Pri
Hydrogen ORU TED Assembly	96M35019-1	S, SE-Pri
OGS Utility Panel Closeout Assembly	96M35015-1	S, SE-Pri
* SE PRI begins October 1st, 2008		
Urine Processor Assembly		
Separator Plumbing Assy	96M12250	SE-Integ*
Firmware Controller Assy	96M13115	SE-Integ*
Wastewater Storage Assy	96M12280	SE-Integ*
Recycle Filter Tank Assy	96M12320	SE-Integ*
Recycle Filter Tank Assemblies	96M12320-1	S, SE-Integ*
Distillation Assy	96M12360	SE-Integ*
Fluids Control & Pump Assy	96M11900	SE-Integ*
Pressure Control Pump Assy	96M11900	SE-Integ*
Condensate Transfer Pump Power Cable (EXPRESS Rack)	5A2.963.016 (Russian) 96M23055-3	S, SE-Pri
Condensate Transfer Pump Power Cable (KU Band PS)	96M23055-1	S, SE-Pri
Condensate Transfer Pump Power Cable (WHC)	96M23055-5	S, SE-Pri
Russian Compressor Power Cables (KU	96M23056-1	S, SE-Pri

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Band)		
Russian Compressor Power Cables (WHC)	96M23056-3	S, SE-Pri
SPA Bypass Hose	96M12568-9	S, SE-Pri
Cooling Jacket Purge Assembly	96M12559-1	S, SE-Pri
RFTA Depress Flexline Assembly	96M12568-7	S, SE-Pri
WSTA Bypass Manifold Assembly	96M12585-1	S, SE-Pri
* SE INTEG begins October 1st, 2008		
Water Processing Assembly		
Catalytic Reactor	SV825455-1	S, SE-Pri*
Water Delivery	SV825449-1	S, SE-Pri*
Wastewater	SV825412-1	S, SE-Pri*
Pump/Separator	SV825426-1	S, SE-Pri*
Separator Filter	SV825438-1	S, SE-Pri*
Particulate Filter	SV825442-1	S, SE-Pri*
Multifiltration Bed #1	SV825452-1	S, SE-Pri*
Sensor	SV825447-1	S, SE-Pri*
Water Storage	SV825502-1	S, SE-Pri*
Microbial Check Valve	SV825499-1	S, SE-Pri*
Process Controller	SV826000-1	S, SE-Pri*
Ion Exchange Bed	SV825493-1	S, SE-Pri*
Reactor Health Sensor	SV826302-1	S, SE-Pri*
Gas Separator	SV825487-1	S, SE-Pri*
Oxygen Filter	SV828118-1	S, SE-Pri*
WPA T Hose:		
• Product T Hose	96M12550-1	S, SE-Pri
• Sample Door Plate Assembly	96M12553-1	S, SE-Pri
WPA Check Valve	SV1015439-1	S, SE-Pri
Water Transfer Pump – low speed	96M12316-3	S, SE-Pri
Water Transfer Pump – high speed	96M12316-1	S, SE-Pri
Water Transfer Pump power cables (WHC)	96M23074-1	S, SE-Pri
Manifold – Condensate Transfer	96M12317-1	S, SE-Pri
Manifold – CWC Transfer	96M12317-3	S, SE-Pri
Manifold – Microbial Shock Kit:		
• Manifold	96M12317-5	S, SE-Pri
• Station Pump Assembly	96M12316-3	S, SE-Pri
• Flex Line Assembly	96M12568-1,	S, SE-Pri
• Flex Line Assembly	96M12568-3,	S, SE-Pri
• Flex Line Assembly	96M12568-5	S, SE-Pri
• Check Valve Assembly	96M35021-1	S, SE-Pri
WPA Vent Hose	96M12568-11	S, SE-Pri
WPA waste tank bypass assembly (not hose)	96M35031-1	S, SE-Pri
ECLS purge hose C (WPA purge Assembly 1/4” syringe fill)	96M35027-1	S, SE-Pri

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ECLS purge hose D (WPA purge Assembly 1/4" syringe fill)	96M35027-3	S, SE-Pri
ECLS purge hose E (WPA purge Assembly 1/2" syringe fill)	96M35028-1	S, SE-Pri
ECLS purge hose F (WPA purge Assembly 1/2" syringe fill)	96M35028-3	S, SE-Pri
WPA Shutoff valve assembly	96M35035-1	S, SE-Pri
WRS1 Utility Panel Closeout Assembly	96M35017-1	S, SE-Pri
WRS2 Utility Panel Closeout Assembly	96M35018-1	S, SE-Pri
WRS Water transfer fuse	FM09A-3A	S, SE-Pri
WRS Manifold tubing	96M12588-1	S, SE-Pri
WRS Manifold filter (RFTA exit filter)	96M12564-1 *Note: Exit Filter is a source control drawing that is a borrowed component from the RFTA ORU and as such is still a MSFC design controlled component so no drawing will be provided except for a PDF.	S, SE-Pri
WRS manifold tubing clamp	9579K65 CAGE: OKVE6	S, SE-Pri
* SE PRI begins October 1st, 2008		
Other Items		
Russian built ACY/HC	TBD	SE-Pri,
Russian Built Electronic Commutator	Part Number ЕИЖА468347.044, serial number1272742220	S
Crew Quarters	TBD	SE-Integ*
TOCA2	TBD	SE-Integ*
Galley ExPRESS rack	TBD	SE-Integ*
Food Warmer	TBD	SE-Integ
Hot water dispenser	TBD	SE-Integ*
MERLIN fridge	TBD	SE-Integ*
ARS Utility Panel Closeout Assembly	96M35016-1	S, SE-Pri
Portable Fan Assembly	96M52440-1	S, SE-Pri
Internal Sampling Adapter	97M55830-1	S, SE-Pri
External Sampling Adapter	97M54015-1	S, SE-Pri
Internal Sampling Adapter Pressure Probe	1525,760MMHGA/30PSIA	S, SE-Pri
CRK Conical Adapter Assembly	96M52563	S, SE-Pri
Face Seal	96M52566	S, SE-Pri
LiOH Top Flange	96M52567	S, SE-Pri
Portable Fan Subassembly	96M68020	S, SE-Pri
Flight Bag Parts Assembly:		
• O-Ring	96M33012-1	S, SE-Pri

Appendix A-1
Hardware Responsibility

• O-Ring	96M33012-7	S, SE-Pri
• O-Ring	96M33012-9	S, SE-Pri
• Filter	SV828518-1	S, SE-Pri
• Screen	SV828413-1	S, SE-Pri
• Shorting Plug Assembly	SV1016060-1	S, SE-Pri
• Connector Adapter EMI Filter	SV1014546-1	S, SE-Pri
• Water Transfer Fuse	96M33012-17	S, SE-Pri
• Separator Pump Shorting Plug	96M23054-1	S, SE-Pri
• Shorting Plug Assembly, WDC	96M23042	S, SE-Pri
Wire Harness Assembly, RIP to Laptop 1553, OGS	96M23038	S, SE-Pri
Wire Harness Assembly, RIP to Laptop 1553, WRS	96M23046	S, SE-Pri
Wire Harness Assembly, DM to Laptop RS-422, WRS	96M23047	S, SE-Pri
Wire Harness Assembly, Russian Compressor Power, WRS	96M23053	S, SE-Pri
* SE Integ begins October 1st, 2008		
COMMERCIAL HARDWARE		
MHI O-Ring, Outside Active/Passive (QTY 1)	683-13530-15	S, SE-PRI
MHI O-Ring, Inside Passive (QTY 1)	683-13520-1	S, SE-PRI
"H" – LIMITED HRFF		
WHC Dry Components		
Inserts ACY (kit)	A8-9060-400	H
Wipes (kit)	A8A-9060-750	H
Solid Waste Container Lid	11F615.8720A55-10	H
Solid Waste Container Body	11F615.8720A55-20	H
Urine Receptacle	A8-9060-800-04	H
Insert Filter	10182.5514.000	H
Fan	A8-9060-1500	H
Pump Separator	H50.2.428.01.000	H
Air Filter	A8-9060-250-01	H
Electronic Unit of Pretreat Indicator	5B2.390.934-01	H
ACY Control Panel #2	A8-9060-1800-01	H
Pump-Separator blocker and cables	H50.2.584.00.000	H
ACY Control Panel #2 and cables	10361.6269.00.000	H
Filter (kit)	10463.6610.000	H
Liquid Indicator	A8A-9060-900	H
Solid Waste Receptacle	A8-9060-3600	H
Hose	A8A-9060-1470	H

Appendix A-1
Hardware Responsibility

Hose	A8A-9060-1480	H
Hose	A8A-9060-1490	H
Hose	A8-9060-3400-23.10	H
T-Adapter	A8A-9060-180	H
Corner Fitting	A8-9060-220	H
Piping	10166.5182.000-03	H
Urine and Water EDV	11F615.8711-OA15-1	H
Wring Collector	11F615.8711-0A15-3	H
HARDWARE TRANSFERRED FROM GODDARD SPACE FLIGHT CENTER (Sustaining effective on May 1, 2011)		
Express Logistics Carriers	2091050	S, SE Pri
ELC Payload Test Equipment		
ELC Suitcase Simulator	2115115	S, SE Pri**
ELC Simulator	2121556	S, SE Pri
ELC Functional Equivalent Unit (FEU)	2092664, 2121594	S, SE Pri
ASIST Workstation	NASA 079053 (asset tag number)	S, SE Pri
ESP3 Passive CAS	2066480	S, SE Pri
Note: ** S, SE PRI ends September 2014 (5 months after RAPTR delivered)		
Legend:		
S: Sustaining, which is repair, retest, and acceptance for flight		
SE: Sustaining engineering, which includes anomaly resolution, engineering for Post Production		
SE-Pri: Primary sustaining engineering, responsible for overall anomaly resolution at this part level. Where it is not shown, it indicates that the prime responsibility resides outside the 10K contract.		
SE-Sec: Secondary sustaining engineering, responsible for supporting overall anomaly resolution at this part level, buy only for the specified subassembly or function.		
SE-Integ: Sustaining engineering integration, responsible for integration or compatibility issues of the specified hardware only.		
H: Perform Limited Hardware Ready for Flight processing which is cleaning to "visually clean", inspecting, correcting minor non-conformances, and packing for shipment to the next level integrator. Repair of minor non-conformances are limited to repairs that do not require special tests or ground support equipment.		
N: No sustaining engineering, maintenance or logistics responsibility after hardware delivery.		

APPENDIX A-2
EVR HARDWARE RESPONSIBILITY

Hardware	Part #	Institution	Vehicle Segment Sustaining	Assembly Complete Element Assignment																		Hdw Qty	Grasp Fixtures								Targets					
				S0	S1	P1	S3	P3	Z1	S4	P4	S5	P5	S6	P6	N1	USL	A/L	PMA	MBS	SPDM		Grasps /ORU	*Flanged MCF*	*Std MCF*	*Mod Micro*	*Mod MCF*	*H-Fixture*	***Total Fixtures***	***Fixture Provider***	*Boeing DHT*	*Boeing Trunc Cone*	*MTC-001*	*MTC-002*	***Total Targets***	***Target Provider***
SPDM Compatible																																				
ACBSP	10033177		SE-Integ		1	1																2	1	2					2	GFE					***0***	***N/A***
Battery	RE1804, RE3308		SE-Integ							12	12			12	12							48	2			96			96	Boeing	96				96	Boeing
BCDU	RE1807, RE3309		SE-Integ							6	6			6	6							24	2			48			48	Boeing	48				48	Boeing
DCSU	R072610		SE-Integ							2	2			2	2							8	2			16			16	Boeing	16				16	Boeing
DDCU-E	R076522		SE-Integ	4	1	1				2	2			2	2							14	2			28			28	Boeing	28				28	Boeing
ECU	R072341		SE-Integ							2	2			2	2							8	1			8			8	Boeing	8				8	Boeing
ESSMDM (MDM-16)	8259065		SE-Integ	2																		2	1	2					2	GFE					N/A	N/A
ETVCG	10033194		SE-Integ		2	2																4	1	4					4	GFE					N/A	N/A
EVCPDS (GFE)	SEG16102821		SE-Integ	1																		1	1	1					1	GFE			2		2	GFE
Video Switch	10033180		SE-Integ	3																		3	1	3					3	GFE					N/A	N/A
MBSU	R072591		SE-Integ	4																		4	2			8			8	Boeing	8				8	Boeing
MDM-4	8260500		SE-Integ		2	2	2	2														8	1	8					8	GFE					N/A	N/A
MDM-10	8259056		SE-Integ	2	1	1																4	1	4					4	GFE					N/A	N/A
MT Stop	1F83270		SE-Integ				1	1														2	1	2					2	GFE			2		2	GFE
PFCS	RE2814, RE3310		SE-Integ							2	2			2	2							8	4			32			32	Boeing	32				32	Boeing
PVCU	R071818, R071826		SE-Integ							2	2			2	2							8	1				8		8	Boeing		8			8	Boeing
RJMC-TRRJ	5842400		SE-Integ		2	2																4	1	4					4	GFE					N/A	N/A
RPCM TYPE II	R077417		SE-Integ	4	1	1	2	2														10	1				10		10	Boeing		10			10	Boeing
RPCM TYPE III	R077418		SE-Integ	2																		2	1				2		2	Boeing		2			2	Boeing
RPCM TYPE IV	R072702		SE-Integ	4	4	4	2	2														16	1				16		16	Boeing		16			16	Boeing
RPCM TYPE V	R077419		SE-Integ	10	7	7	4	4	2													34	1				34		34	Boeing		34			34	Boeing
RPCM TYPE VI	R077420		SE-Integ	1					2													3	1				3		3	Boeing		3			3	Boeing
SSU	RE1806		SE-Integ							2	2			2	2							8	1			8			8	Boeing	8				8	Boeing
S0 Bay 3 SPDA Door	1F77163, 1F77164		SE-Integ	2																		2	1		2				2	GFE			2		2	GFE
TDRSS Transponder	10033177		SE-Integ		1	1																2	1	2					2	GFE					N/A	N/A
Tether Shuttle Stop	1F85039, 1F85075		SE-Integ				1	1														2	1					2	2	GFE			2		2	GFE
H Fixture Assembly	Various		SE-Integ	5	4	4	3	3	3	6	6			6	6							N/A							46	GFE			46		46	GFE
Robotic Offset Tool	RH000020		SE-Integ																		1	1	1					1	1	Boeing					N/A	N/A
Offset Tool Holster	RH000451		SE-Integ																		1	1						N/A	N/A			1		1	GFE
6B MTC Target Installs	Various		SE-Integ	22	27	27	6	6														N/A							N/A	N/A				88	88	GFE
Berthing Mechanisms																																				
RTAS	Various		SE-Integ						1	1	1	2	2	1	1							9														
CBM	683-13914, -13916		SE-Integ						1							6	2	1	3			13														
MBM	683-55226		SE-Integ						1													1														
MTSAS/LCA	SP-M-595		SE-Integ	1													1					2														
SSAS	222057		SE-Integ	2	2	2	1	1														8														
CAS	Various		SE-Integ				4	2														6														
MCAS	1F95894		SE-Integ																	1		1														
Grapple Fixtures																																				
GF Installations	Various		SE-Integ	1	1	2	2	2	1					4	4		2	1	2			22														
SAAGFA	RH000100		SE-Integ																			4	NOTE: All hardware delivered under NAS15-10000 shall be fully sustained under this contract as													
PVRGF	RH000043		SE-Integ									1	1									2	defined in Appx A-1. This Appx A-2 defines the EVR Integration responsibility only.													
Adjustable Grapple Bar	1F82020		SE-Integ																			2														
Fixed Grapple Bar	1F82000		SE-Integ																			2														
HRS Radiator Grapple Bar	1F81220		SE-Integ																			2														
Miscellaneous																																				
EBCS target bracket and doubler	1F70182, 1F70185		SE-Integ				4	2												1		7														
MSS Extension Cable and Stowage Bag Assembly	1F71200		SE-Integ																	1		1														
Early Ammonia Servicer	RH000186		SE-Integ												1							1														
Mobile Transporter	SP-M-129		SE-Integ	1																		1														
TUS	1F45284, 1F45285		SE-Integ	2																		2														
Robotic Test Articles																																				
Battery and Worksite			SE-Integ																			1														
PCU and Worksite			SE-Integ																			1														
PVCU and Worksite			SE-Integ																			1														
ROST and Holster Dev Units			SE-Integ																			2														
RPCM and Worksite			SE-Integ																			1														
SSU			SE-Integ																			1														
ECU			SE-Integ																			1														
Beta Gimbal Worksite			SE-Integ																			1														

APPENDIX B – SOFTWARE TO BE SUSTAINED UNDER THIS CONTRACT

This appendix contains tables of CSCI products for the U.S. portion of the ISS program, by software developer. All of the information is based on the program understanding at the time of the document release. Appendix B-1, SVF Software, lists the SVF CSCIs. Appendix B-2, Flight Software CSCI and Major CSC, contains the Flight Software CSCIs and shared CSCs. Shared CSCs are those produced by a Tier 1 Subcontractor other than the CSCI Owner. Appendix B-3, Ground Software including MBF, lists the Ground Software CSCIs, including MBF, Appendix B-4, GSE/TSE Software, lists the GSE/TSE software CSCIs, and Appendix B-5, Test Software Including Simulations, lists the test software, including flight software simulations for use in FQT.

APPENDIX B-1 SVF SOFTWARE

CSCI Name	Provider	Capability
SVF Output CSCIs		
Base Support	B-HOU	Non-real time support
Real Time Process Control Support Services	B-HOU	Non-real time support
Real Time Display Support Services	B-HOU	Non-real time support
Post Processing Support Services	B-HOU	Non-real time support
Session Setup and Staging Support Services	B-HOU	Non-real time support
TDCS Capture	B-HOU	Test data capture
TDCS Retrieval	B-HOU	Test data capture
TDCS Data Acquisition	B-HOU	Test data capture
SVF Input CSCIs		
CES Command and Control Environment Simulation	B-HOU	Simulation
NES Node 1 Control Environment Simulation	B-HOU	Simulation
ETCS Simulation	B-HB	Simulation
GN&C Simulation	B-HB	Simulation
EXT Simulation	B-HB	Simulation
SARJ Simulation	B-HB	Simulation
SDMS Simulation	B-HB	Simulation
Secondary Electrical Power System Simulation	B-CP	Simulation
Power Management Control Application MATE Simulation	B-CP	Simulation
Photovoltaic Control Application MATE Simulation	B-CP	Simulation
Integrated Lab Simulation through 8A	B-HSV	Simulation
Integrated Lab & Node 2 Simulation through 15A	B-HSV	Simulation
Integrated Lab& Node 2 Simulation through 14A	B-HSV	Simulation
Integrated Lab, Node 2, and Node 3 through 20A	B-HSV	Simulation
Lab Power & Switching	B-HOU	Simulation

APPENDIX B-2: FLIGHT SOFTWARE CSCI AND MAJOR CSC

Location	CSCI Acronym	1st Flt	CSCI/ CSC	CSCI Name	Devel-oper	Host MDM	Lang Used
			CSC	SMDM Utilities	B-HB/HI	FGB-1,-2	Ada/ Asm
FGB, S1, Node 1, Lab, P1, Node 2, , AL, S3, P3, S4, P4, S6, P6, PMA1, S0,	SMDMBF	1A	CSCI	Standard MDM Boot and Diagnostics FC	B-HB/HI	PVCU-1-4[a], PVCU-1-4B, S0-1,-2, S1-1,-2, P1-1,-2, S3-1,-2, P3-1,-2, , N1-1,-2, AL-1, STR-1, FGB-1,-2, PTR-1, N2-1,-2, LA-1,-2,-3	Ada/ Asm
FGB, S1, Node 1, Lab, P1, Node 2, , AL, S3, P3, S4, P4, S6, P6, PMA1, S0,	SPD 1553	1A	CSCI	Serial/Parallel Data Card 1553 Firmware	B-HB/HI	All MDMs	Asm
PMA1	NCS	2A	CSCI	Node 1 Control Software (Release 1)	B-HOU	N1-1,-2	Ada
			CSC	SMDM Utilities	B-HB/HI	N1-1,-2	Ada/ Asm
Node 1, JEM, Lab, Node 2,	CBMMLC	2A	CSCI	Common Berthing Mechanism Master/Latch Controller	B-HSV	FC	C
Node 1, JEM, Lab, Node 2,	CBMBC	2A	CSCI	Common Berthing Mechanism Bolt Controller	B-HSV	FC	C

APPENDIX B-2: FLIGHT SOFTWARE CSCI AND MAJOR CSC (Continued)

Location	CSCI Acronym	1st Flt	CSCI/ CSC	CSCI Name	Devel-oper	Host MDM	Lang Used
Node 1, AL, Lab, Z1, S1, P1, Node 2, S0, , S3/S4, P3/P4,	RPCM	2A	CSCI	Sec. Power Control Application FC	B-CP	FC	Asm
PMA1	NCS R2	2A.1	CSCI	Node 1 Control Software (Release 2)	B-HOU	N1-1,-2	Ada
			CSC	SMDM Utilities	B-HB/HI	N1-1,-2	Ada/ Asm
P1, S1	ACBSP	3A	CSCI	S-Band Baseband Signal Processor FC	B-HB	FC	C
P1, S1	ACRFG	3A	CSCI	S-Band RF Group FC	B-HB	FC	Ada
P1, S1	XPDR	3A	CSCI	Standard TDRSS Transponder FC	B-HB	FC	C
Z1	SG TRC	3A	CSCI	Ku-Band Transmitter/Receiver Controller FC	B-HB	FC	Ada
Z1	PCU	3A	CSCI	Plasma Contactor Unit FC	B-CP	FC	Asm
P4, S4, P6, S6	PVCA	4A	CSCI	Photovoltaic Controller Application	B-CP	PVCU-1-4A, PVCU-1-4B	Ada
			CSC	SMDM Utilities	B-HB/HI	PVCU-1-4A, PVCU-1-4B	Ada/ Asm
PV	ECU BGA	4A	CSCI	Electronic Controller Unit/Beta Gimbal Assembly FC	B-CP	FC	Asm
PV	ECU SAW	4A	CSCI	Electronic Controller Unit/Solar Array Wing FC	B-CP	FC	Asm
PV, S0	LDI	4A	CSCI	Local Data Interface FC	B-CP	FC	Asm
Lab, S0, S1, P1, Node 2, ,	DDCU	4A	CSCI	DC/DC Converter Unit FC	B-CP	FC	Asm
S0	SCA	4A	CSCI	Switch Gear Controller Assembly FC	B-CP	FC	Asm

APPENDIX B-2: FLIGHT SOFTWARE CSCI AND MAJOR CSC (Continued)

Location	CSCI Acronym	1st Flt	CSCI/ CSC	CSCI Name	Devel-oper	Host MDM	Lang Used
Lab, S0,	EMDMBF	5A	CSCI	Enhanced MDM Boot and Diagnostics FC	B-HB/HI	C&C-1,-2,-3, GN&C-1,-2, PL-1,-2, INT-1,-2, EXT-1,-2, PMCU-1,-2	Ada/ Asm
Lab, S0	HRDL	5A	CSCI	High Rate Data Link Firmware	B-HB/HI	C&C-1,-2,-3, GN&C-1,-2, PL-1,-2, INT-1,-2, EXT-1,-2, PMCU-1,-2	Ada/ Asm
Lab, AL,	PCA	5A	CSCI	Pressure Control Assembly	B-HSV	FC	Ada/ Asm
Lab	GN&C	5A	CSCI	GN&C MDM	B-HB	GN&C-1,-2	Ada
			CSC	EMDM Utilities	B-HB/HI	GN&C-1,-2	Ada/ Asm
Lab	SGS HRFM	5A	CSCI	Ku-Band High Rate Frame MUX FC	B-HB	FC	C
Lab	SGS HRM	5A	CSCI	Ku-Band High Rate Modem FC	B-HB	FC	C
Lab, , Node 2,	PPMC	5A	CSCI	Pump Package Motor Controller	B-HSV	FC	C
Lab	VBSP	5A	CSCI	Ku-Band Video Baseband Signal Processor FC	B-HB	FC	Ada
Lab	CCS	5A	CSCI	Command & Control Software	B-HOU	C&C-1,-2,-3	Ada
			CSC	EMDM Utilities	B-HB/HI	C&C-1,-2,-3	Ada/ Asm
			CSC	Timeliner UIL Kernel and Adapter	CSDL*	C&C-1,-2,-3	
Lab	PMCA	5A	CSCI	Manage Electric Power Systems	B-CP	PMCU-1,-2	Ada
			CSC	EMDM Utilities	B-HB/HI	PMCU-1,-2	Ada/ Asm
			CSC	Control Solar Alpha Rotary Joint	B-HB	PMCU-1,-2	Ada
Lab	LSYS1	5A	CSCI	LAB Systems 1	B-HSV	LA-1	Ada
			CSC	SMDM Utilities	B-HB/HI	LA-1	Ada/ Asm
Lab	LSYS2	5A	CSCI	LAB Systems 2	B-HSV	LA-2	Ada

APPENDIX B-2: FLIGHT SOFTWARE CSCI AND MAJOR CSC (Continued)

Location	CSCI Acronym	1st Flt	CSCI/ CSC	CSCI Name	Devel-oper	Host MDM	Lang Used
			CSC	SMDM Utilities	B-HB/HI	LA-2	Ada/ Asm
Lab	LSYS3	5A	CSCI	LAB Systems 3	B-HSV	LA-3	Ada
			CSC	SMDM Utilities	B-HB/HI	LA-3	Ada/ Asm
Lab	PEP	5A	CSCI	Payload Executive Processor	B-HSV	PL-1,-2	Ada
			CSC	EMDM Utilities	B-HB/HI	PL-1,-2	Ada/ Asm
			CSC	Timeliner UIL Kernel and Adapter	CSDL	PL-1,-2	
LAB	INTSYS	5A	CSCI	Internal Systems	B-HSV	INT-1,-2	Ada
			CSC	EMDM Utilities	B-HB/HI	INT-1,-2	Ada/ Asm
			CSC	SEPS – Control and Monitor RPCMs	B-CP	INT-1,-2	Ada
Lab,	AMP	5A	CSCI	Audio Management Processor	B-HSV	FC	Ada/ Asm
Lab, AL, Node 2, JEM, APM, ,	ATU	5A	CSCI	Audio Terminal Unit	B-HSV	FC	C / Asm
Lab,	AIUA	5A	CSCI	Audio Interface Unit Audio	B-HSV	FC	C / Asm
Lab	TP	5A	CSCI	Tone Processor	B-HSV	FC	C / Asm
Lab,	BMP	5A	CSCI	Bus Management Processor	B-HSV	FC	C / Asm
Z1	CMG	5A	CSCI	CMG Control FC	B-HB	FC	Asm
Lab,	AIUC	5A	CSCI	Audio Interface Unit Command	B-HSV	FC	C / Asm
Lab	SCU	5A	CSCI	Sync and Control Unit	B-HSV	FC	C / Asm
Lab,	MCA	6A	CSCI	Major Constituent Analyzer	B-HSV	FC	Ada/ Asm
Lab	HCOR	6A	CSCI	High Rate Communications Outage Recorder	B-HB/ SEAKR	FC	Ada
Airlock	ALSYS1	7A	CSCI	Airlock Systems 1	B-HSV	AL-1	Ada
			CSC	SMDM Utilities	B-HB/HI	AL-1	Ada/ Asm
Node 2, S0, Lab	EVSU	8A	CSCI	External Video Switch FC	B-HB	FC	Ada

APPENDIX B-2: FLIGHT SOFTWARE CSCI AND MAJOR CSC (Continued)

Location	CSCI Acronym	1st Flt	CSCI/ CSC	CSCI Name	Devel-oper	Host MDM	Lang Used
S0	EXT	8A	CSCI	External MDM (Release 1)	B-HB	EXT-1,-2	Ada
			CSC	EMDM Utilities	B-HB/HI	EXT-1,-2	Ada/ Asm
			CSC	SEPS – Control and Monitor RPCMs	B-CP	EXT-1,-2	Ada
Lab	GN&C	8A	CSCI	GN&C MDM	B-HB	GN&C-1,-2	Ada
P3/P4, S0, S3/S4, S1, P1	IMCA	8A	CSCI	Integrated Motor Controller Assy FC	B-HB	FC	Asm
S0	RG	8A	CSCI	Rate Gyro FC	B-HB	FC	Asm
S0	EXT R2	9A	CSCI	External MDM (Release 2 – Adding TRRJ, EATCS & Complete DSM)	B-HB	EXT-1,-2	Ada
			CSC	EMDM Utilities	B-HB/HI	EXT-1,-2	Ada/ Asm
			CSC	SEPS – Control and Monitor RPCMs	B-CP	EXT-1,-2	Ada
S1, P1	MPS	9A	CSCI	Pump Module Assembly FC	B-HB	FC	Ada / C
S1, P1	S1/P1	9A	CSCI	S1/P1 MDM	B-HB	S1-1,-2, P1-1,-2	Ada
			CSC	SMDM Utilities	B-HB/HI	S1-1,-2, P1-1,-2	Ada/ Asm
S1, P1	STR/PTR	9A	CSCI	STR/PTR MDM	B-HB	STR-1,-2, PTR-1,-2	Ada
				SMDM Utilities	B-HB/HI	STR-1,-2, PTR-1,-2	Ada/ Asm
Node 2	N2SYS1	10A	CSCI	Node 2 Systems 1	B-HSV	N2-1	Ada
			CSC	SMDM Utilities	B-HB/HI	N2-1	Ada/ Asm
Node 2	N2SYS2	10A	CSCI	Node 2 Systems 2	B-HSV	N2-2	Ada
			CSC	SMDM Utilities	B-HB/HI	N2-2	Ada/ Asm
S0	S0	10A	CSCI	S0 MDM	B-HB	S0-1,-2	Ada
			CSC	SMDM Utilities	B-HB/HI	S0-1,-2	Ada/ Asm
S0	EXT R3	12A	CSCI	External MDM (Release 3 – Adding SARJ & CAS)	B-HB	EXT-1,-2	Ada
			CSC	EMDM Utilities	B-HB/HI	EXT-1,-2	Ada/ Asm

APPENDIX B-2: FLIGHT SOFTWARE CSCI AND MAJOR CSC (Continued)

Location	CSCI Acronym	1st Flt	CSCI/ CSC	CSCI Name	Devel-oper	Host MDM	Lang Used
			CSC	SEPS – Control and Monitor RPCMs	B-CP	EXT-1,-2	Ada
S3, P3	S3/P3	12A	CSCI	S3/P3 MDM	B-HB	S3-1,-2, P3-1,-2	Ada
			CSC	SMDM Utilities	B-HB/HI	S3-1,-2, P3-1,-2	Ada/ Asm
	UPA	13A	CSCI	Urine Processor Assembly	B-HSV	FC	Ada

APPENDIX B-2: FLIGHT SOFTWARE CSCI AND MAJOR CSC (Concluded)

Location	CSCI Acronym	1st Flt	CSCI/ CSC	CSCI Name	Devel-oper	Host MDM	Lang Used
All modules with an MDM	MDMLU†	n/a	CSCI	MDM Loader Utility	B-HB/HI	Any MDM	Ada
Lab	SSMMU	TBD	CSCI	Solid State Mass Memory Unit	B-HB/HI	Lab	Ada
		2A	CSCI	Early Portable Computer System Software	GFE	PCS	C++
		5A	CSCI	Portable Computer System Software	GFE	PCS	C++
		5A	CSCI	Portable Computer System Operating System	GFE	PCS	
MOOT CD	TCS	UF2	CSCI	Test Control Software	B-HB/HI		C++
	TAS	UF2	CSCI	Test Application Software	B-HB/HI		Ada
Node 3	N3SYS1	20A	CSCI	Node 3 Systems 1	B-HSV	N301	Ada
			CSC	SMDM Utilities	B-HB/HI	N3-1	Ada/ A sm
Node 3	N3SYS2	20A	CSCI	Node 3 Systems 2	B-HSV	N3-2	Ada
			CSC	SMDM Utilities	B-HB/HI	N3-2	Ada/ A sm
HCS	HCS	20A	CSCI	Hub Control Software	B-HOU	HCS-1	Ada
ELC ExPCA (sustaining to begin on 5/1/2011	N/A	ULF 3	CSCI	ELC Flight Software	GSFC	Payload MDM	C

APPENDIX B-2 GROUND SOFTWARE INCLUDING MBF

CSCI/CSC	Software Developer	Destination
Data Integration Tool Set	B-HB	MBF
Mission Database Application	ESA	MBF
Oracle RDBMS	Oracle	MBF
Software Processing & Storage Tool	B-HB	MBF
Software Release Distribution Tool (SRDT)	B-HB	MBF
SQL *Net	Oracle	MBF
SQL *Pro Ada	Oracle	MBF
SQL *Pro C	Oracle	MBF
Sun Ada	SUN	MBF
SunOS Operating System	SUN	MBF
VAX Ada	DEC	MBF
VAX C	DEC	MBF
VaxSet Software Management Tools	DEC	MBF
VMS Operating System	DEC	MBF
Simulations I/O Services	B-HB	FEUs
EEPROM Header Tool	B-HB	MDMs
Timeliner Compiler Kernel and Adapter	GFE	MBF
Aonix Alsys AdaWorld VAX/VMS to 80386 Cross Compiler w/Optimizer, Debugger, Linker	Aonix	MBF
Aonix Alsys AdaWorld VAX/VMS to 80386 Problem Reporting Compiler	Aonix	MBF
Aonix ActivAda Real-Time Cross to 80386 Problem Reporting Compiler (Windows NT Platform)	Aonix	MBF
Destination – e.g., Segment, LAB, ORU, SVF, etc.		

APPENDIX B-3 GSE/TSE SOFTWARE

CSCI Acronym	CSCI /CSC	CSCI Name	SW Developer
VTS	CSCI	Video Test Set	B-HB
	CSCI	Ku-Band Test Set	B-HB
	CSCI	S-Band Test Set	B-HB

APPENDIX B-4 FQT SUPPORT SOFTWARE INCLUDING SIMULATIONS

CSCI Name	SW Developer	Destination
LSYS1SIM Lab Systems 1 Simulation	B-HSV	MATE
LSYS2SIM Lab Systems 2 Simulation	B-HSV	MATE
LSYS3SIM Lab Systems 3 Simulation	B-HSV	MATE
N2SYS1SIM Node 2 Systems 1 Simulation	B-HSV	MATE
N2SYS2SIM Node 2 Systems 2 Simulation	B-HSV	MATE
N3SYS1SIM Node 3 Systems 1 Simulation	B-HSV	MATE
N3SYS2SIM Node 3 Systems 2 Simulation	B-HSV	MATE
PCASIM Pressure Control Assembly Simulation	B-HSV	AG
WPSIM Water Processor Simulation	B-HSV	AG

ALSYS1SIM Airlock Systems 1 Simulation	B-HSV	MATE
PEPSIM Payload Executive Processor Simulation	B-HSV	MATE
INTSYSSIM Internal Systems Simulation	B-HSV	MATE
CES Command and Control Environment Simulation	B-HOU	MATE
NES Node 1 Control Environment Simulation	B-HOU	MATE
ETCS Simulation	B-HB	MATE
GN&C Simulation	B-HB	MATE
External Simulation	B-HB	MATE
SARJ Simulation	B-HB	MATE
SDMS Simulation	B-HB	MATE
IACO MATE Simulation Components	B-HB	MATE
Power Management Control Application MATE Simulation	B-CP	MATE
Photovoltaic Control Application MATE Simulation	B-CP	MATE
Local Bus Controller	B-HB	PC
Sensor / Effector Simulator	B-HB	TBD
MATE-3 Development and Control Services	B-HB	MATE
MATE-3 I/O Services	B-HB	MATE
MATE-3 I/O Utilities	B-HB	MATE

APPENDIX B-5 FLIGHT TRAINER SOFTWARE SUSTAINING

CSC Name	SW Developer	Destination
RUSSIAN SEGMENT TRAINER (RST) SOFTWARE	RSC-E	SSTF

APPENDIX B-6 PAYLOAD GROUND SOFTWARE

CSCI/CSC	SW Developer	Destination
CSCI (sustaining to begin on 5/1/2011**)**	GSFC	ELC Suitcase Simulator Software/ELC Simulators

APPENDIX B-7 GROUND AND FLIGHT PAYLOAD SOFTWARE

CSCI/CSC	SW Developer
Software Toolkit for Ethernet Lab-Like Architecture (STELLA)	B-HSV
Remote Advanced Payload Test Rig Software (RAPTR)	B-HSV

APPENDIX C – NASA FACILITES TO BE MAINTAINED AND OPERATED

The Software Development and Integration Lab (SDIL), which consists of the following: (SSCN 13327 – S/A 1904)

- Prime Software Production Facility, (PSPF)
- Mission Build Facility (MBF)
- ISS Software Integration Laboratory (ISIL)/Integrated Test Rig (ITR)
- Software Verification Facility (SVF)
- Hardware and Software Integration Laboratory (HSIL)
- ISS Power Lab (IPL)
- SDIL Host Room Common Assets
- Simulation Integration Platform (SIP)
- Joint Station LAN (JSL) Lab
- ISS Guidance, Navigation and Control Laboratory (IGL)
- Integrated Communications Unit (ICU) Lab
- Portable Computer System (PCS) Independent Verification and Test (IVT) Lab
- SDIL Configurable Remote Access Capability

APPENDIX D –Reserved

APPENDIX E – ISS PROGRAM DOCUMENTS TO BE BOOK COORDINATED

Document Number	Title
683-71106	International Space Station Program Internal Systems R2 (INTSYS R2) Computer Software Configuration Item 683G93A Pre-Position Loads (PPL) Version Description Drawing
D683-35473-01	Payload Data Library (PDL) Users Guide
D683-47376-1	Payload MDM Users Manual
D684-10025 Vol 1	Integration and Verification Plan for ISS System
D684-10293 Vol 1	Software Configuration Handbook
684-10409	Node Control Software (NCS) Release 2 Multiplexer/Demultiplexer (MDM) Version Description Drawing (VDD)
684-10573	Display Data Control Tables (DDCT) for the Command And Control Software (CCS) Multiplexer/Demultiplexer (MDM) Version Description Drawing (VDD)
684-10649	International Space Station Program Command and Control Software (CCS) Release 4 (R4) Multiplexer/Demultiplexer (MDM) Version Description Drawing (VDD)
684-10716	International Space Station Program Hub Control Software (HCS) Multiplexer/Demulitplexer (MDM) Version Description Drawing (VDD)
S684-11032	Software Requirements Specification for the R2 command Control (C&C)
684-10716	International Space Station Program Hub Control Software (HCS) Multiplexer/Demulitplexer (MDM) Version Description Drawing (VDD)
S684-11032	Software Requirements Specification for the R2 command Control (C&C)
CSDL-306626-V01	User Interface Language Flight System Software Requirements Volume 1: Timeliner Kernel
CSDL-306626-V02	User Interface Language Flight System Software Requirements Volume 2: ISS Timeliner Adapter
D683-21459-1	PSIV/F Maintenance Concept for the STEP
D683-27519-1	User's Guide for the Payload Rack Checkout Unit (PRCU)
D683-27522-1	PRCU Maintenance Plan
D683-80552-1	Consolidated Sustaining Engineering Plan
D684-10017-01	Prime Contractor Software Development Plan
D684-10056-01	Prime Contractor Software Standards and Procedures Specifications
D684-10175-01	Software Test Plan For the Command and Control (C&C) Multiplexer/Demultiplexer (MDM) Computer Software Configuration Item (CSCI)
D684-10177-01	ISS MISSion Build Facility Standard Output Definition Part 1
D684-10189-01	Data Base Design Document (DBDD) for the Node 1 Control Software (NCS)
D684-10191-01	Software User's Manual for the Node 1 Control Software
D684-10195-01	Software Top Level Design Document for the Node 1 Control Software
D684-10696-01	ISS Post Production Support Warehouse Operations Plan
D684-10749-01	ISS Product Support Team TCTI Mod Kit Procedure
D684-10773-01	Product Support ISS Managed Asset Retention and Utilization Plan

D684-10850-01	Program Management and Implementation Plan for Hardware History Retrieval System
D684-11424-01	Product Support ISS PRCU H/W Calibration Process
D684-11074-01	ISS Product Support Inventory Management Plan
D684-11179-01	ISS Obsolescence Management Plan
D684-11424-01	Product Support ISS PRCU H/W Calibration Process
D684-11428-01	Science and Utilization Segment Payload Rack Checkout Unit (PRCU) Training & Certification Program
ISAC-245, Rev S	VMDB Release 9.0 Requirements Document
ISAC-319	Orbital Replacement Unit Data Directory (ORUDD) to International Space Station (ISS) Vehicle Master Database (VMDB) Interface Control Document (ICD)
ISS MPLM IDD 006	MPLM Interface Definition Document
JSC-26656	Project Technical Requirements Specification for the ISS Global Positioning System (GPS) Subsystem
JSC-26961	ACS Moding Indicator Critical Item Specification
JSC-26975	PCS Displays Software Requirements Specification
JSC-26976	ISS Displays Software Design Document for the Portable Computer System (PCS)
JSC-27274	Development Specification for the Portable Computer System (PCS)
JSC-27437	Command And Data Software Software Design Document for the Portable Computer System (PCS)
JSC-27440	Command And Data Software Software Requirements Specification (CDS SRS) for the Portable Computer System (PCS)
JSC-36387	Software Design Document for the Automated Procedure Viewer
JSC-36393	Software Requirements Specification for the Automated Procedure Viewer
NSTS-21000-IDD-ISS	Shuttle Orbiter/International Space Station Cargo Standard Interfaces
RP AI 0030	MDM Connectivity Document for Node 3
RR-00022V2	Component Data Interface Format Specification Volume 2: Remote Power Control Module
RR-00022V4	Component Data Interface Format Specification Volume 4: Power Converter Controller
RR-00022V6	Component Data Interface Format Specification Volume 6: Power Electronics Unit
S683-29523	Prime Item Development Specification for U.S. Laboratory
S683-70870	Internal Systems R2 CSCI 683G93A Software Requirements Specification
S683-70918	International Space Station Program Node 3 Systems 1 CSCI 683042A Software Requirements Specification
S683-70919	International Space Station Program Node 3 Systems 2 CSCI 683043A Software Requirements Specification
S684-10101	Prime Item Development Specification for Rack Standard/Payload
S684-10102	Prime Item Development Specification for Node 1
S684-10109	Addendum Specification for Photovoltaic Module S4
S684-10111	Prime Item Development Specification for Integrated Truss Segment S0
S684-10115	Prime Item Development Specifications for Pressurized Mating Adapter-1
S684-10122	Prime Item Development Specification for Photovoltaic Module P4

S684-10123	Prime Item Development Specification for Truss Element, Short Spacer, S5
S684-10124	Prime Item Development Specification for S6
S684-10131	Software Requirements Specification for the R1 Command And Control (C&C) Multiplexer/Demultiplexer (MDM) CSCI
S684-10137	Critical Item Development Specification for Main Bus Switching Unit
S684-10142	Prime Item Development Specification for Airlock
S684-10143	Prime Item Development Specification for Station Management and Control
S684-10144	Prime Item Development Specification For Guidance Navigation and Control Processor
S684-10145	Prime Item Development Specification for Power Management Control Unit
S684–10150	Addendum Specification for Truss Element, Short Spacer, P5
S684-10151	PIDs for Photovoltaic Module S6
S684-10154	PIDs for Integrated Truss Segment Z1
S684-10158	Prime Item Development Specification for Active Rack Isolation
S684-10439	Prime Item Development Specification for ARIS/Express Installation And Maintenance Trainer
S684-10584	Noncomplex Item Development Specification for the Payload Crew Aids Kit
S684-10585	Prime Item Development Specification for the Passive Rack Isolation System (PaRIS)
S684-10644	Software Requirements Specification (SRS) for the Hub Control Software (HCS) Computer Software Configuration Item (CSCI)
S684-11034	Software Requirements Specification for the R4 Command and Control (C&C) Multiplexer/Demultiplexer (MDM) Computer Software Configuration Item (CSCI)
SN-C-0005	Contamination Control Requirements
SP-M-229	Addendum Specification for Integrated Truss Segment S3
SP-M-233	PIDs for Integrated Truss Segment P1
SP-M-235	PIDs for Integrated Truss Segment P3
SP-M-301	Prime Item Development Specification For Pressurized Mating Adapter
SP-M-321	PIDS for Integrated Truss Segment S1
SSP 50257	Program Controlled Document Index
SSP 50936	Common Communications for Visiting Vehicles (C2V2) to International Space Station (ISS) Interface Control Document (ICD)
SSP 50937	International Space Station (ISS) Common Communications for Visiting Vehicles (C2V2) Ethernet Interface Control Document
SSP 50976	International Space Station (ISS) to Visiting Vehicle (VV) Ethernet Interface Control Document (ICD)
SSP-52000-ETRD-ERP	Expedite the Processing of Experiments to Space Station (EXPRESS) Transportation Requirements Document
SSP 52000-ICD-ERP	EXPRESS Rack Payloads Interface Control Document Blank Book

SSP 52000-ICD-WRP	WORF Rack Payloads Interface Control Document Blank Book
SSP-52000-PIH-WRP	Window Observational Research Facility (WORF) Payload Integration Handbook
SSP-52050	International Standard Payload Rack to ISS ICD Part 1
SSP 57005	ARIS To Payload ICD
SSP 57006	ARIS User's Handbook
SSP 57007	International Standard Payload Rack (ISPR) Structural Integrator's Handbook
SSP 57058	PaRIS-to-ISPR ICD
SSP 57239	BEAM to ISS Interface Control Document (ICD)
SSP-30233	Space Station Requirements for Materials and Processes
SSP-30237	Space Station Electromagnetic Emission and Susceptibility Requirements
SSP-30238	Space Station Electromagnetic Techniques
SSP-30240	Space Station Grounding Requirements
SSP-30242	Space Station Cable/Wire Design and Control Requirements for Electromagnetic Compatibility
SSP-30243	Space Station Requirements for Electromagnetic Compatibility
SSP-30245	Space Station Electrical Bonding Requirements
SSP-30256-001	SSP Extravehicular Activity (EVA) Standard Interface Control Document
SSP-30262-010	Portable Fire Extinguisher Standard ICD Part 1
SSP-30312	Electrical, Electronic, and Electronmechanical (EEE) and Mechanical Parts Management and Implementation Plan
SSP-30423	Space Station Approved Electrical, Electronic, and Electromechanical Parts List
SSP-30425	Space Station Program Natural Environment Definition for Design
SSP-30426	Space Station External Contamination Control Requirements
SSP-30482-01	Electric Power Specifications and Standards: V2 Consumer Constraints
SSP-30482-02	Electric Power Specification and Standards, Volume 2: Consumer Constraints
SSP-30512	Space Station Ionizing Radiation Design Environment
SSP-30513	Ionizing Radiation Environment Effects Test And Analysis
SSP-30559	Structural Design and Verification Requirements
SSP-30573	Space Station Program Fluid Procurement and Use Control Specification
SSP-41004-PART 1	Common Berthing Mechanism to Pressurized Elements Interface Control Document Part 1
SSP-41004-PART 2	Common Berthing Mechanism to Pressurized Elements Interface Control Document Part 2
SSP-41015-PART 1	Common Hatch And Mechanism to Pressurized Elements Interface Control Document Part 1
SSP-41015-PART 2	Common Hatch And Mechanisms to Pressurized Elements Interface Control Document Part 2
SSP-41017-PART 1	Rack to Mini Pressurized Logistics Module Interface Control Document Part 1

SSP-41017-PART 2	Rack to Mini Pressurized Logistics Module Interface Control Document Part 2
SSP-41143-PART 2	Space Station Program Node Element 2 to U.S. Laboratory Element Interface Control Document Part 2
SSP-41145	Node Element 1 to Airlock Element Interface Control Document, Part 1
SSP 41153-01	Node Control Software General Software Interfaces Interface Control Document, Part 2
SSP-41153-02	Node Control Software to Common Berthing Mechanism ICD Part 2
SSP-41153-03	Node Control Software to Communications And Tracking Orbital Replaceable Units ICD Part 2
SSP-41153-04	Node Control Software to Remote Power Control Module ICD Part 2
SSP-41153-06	Node Control Software Release 1 to GFE ICD Part 2
SSP-41153-07	Node Control Software to Remote Power Control Module, DC/DC Converter Unit, and Plasma Contactor Unit ICD Part 2
SSP-41154	Software Interface Control Document Part 1 United States On-Orbit Segment To United States Ground Segment Command and Telemetry
SSP-41155	Refrigerator/Freezer Rack to Mini Pressurized Logistics Module Interface Control Document
SSP 41158	Software Interface Control Document Part I United States On-Orbit Segment To International Ground System Segment Ku-Band Telemetry Formats
SSP-41162	Segment Specification for the United States On-Orbit Segment
SSP-41164	Italian Mini-Pressurized Logistics Module
SSP-41172	Qualification and Acceptance Environmental Test Requirements
SSP-41175-01	Software ICD Part 1 SMC-to-ISS Book 1, Hardware Architecture
SSP-41175-02	Software ICD Part 1 SMC-to-ISS Book 2, General Software Interface Requirements
SSP-41175-03	Software ICD Part 1 SMC-to-ISS Book 3, Portable Computer System Interface
SSP-41175-04	Software ICD Part 1 SMC-to-ISS Book 4, Guidance, Navigation and Control Interface
SSP-41175-05	Software ICD Part 1 SMC-to-ISS Book 5, Power Management and Control Application
SSP-41175-06	Software Interface Control Document Station Management and Control To International Space Station Book 6, Internal Multiplexer/Demultiplexer Interface
SSP-41175-07	Software ICD Part 1 SMC-to-ISS Book 7, External Multiplexer/Demultiplexer Interface
SSP-41175-08	Software ICD Part 1 SMC-to-ISS Book 8, Payload Multiplexer/Demultiplexer Interface
SSP-41175-09	Software ICD Part 1 SMC-to-ISS Book 9, Node Control Software Interface
SSP-41175-10	Software ICD Part 1 SMC-to-ISS Book 10, Control Electronics Unit Interface
SSP-41175-14	Software ICD Part 1 SMC-to-ISS Book 14, Space-to-Space Station Radio Interface
SSP-41175-15	Software ICD Part 1 SMC-to-ISS Book 15, Video Baseband Signal Processor Interface
SSP-41175-16	Software ICD Part 1 SMC-to-ISS Book 16, High-Rate Frame Multiplexer Interface
SSP-41175-17	Software ICD Part 1 SMC-to-ISS Book 17, High-Rate Multiplexer Interface
SSP-41175-18	Software ICD Part 1 SMC-to-ISS Book 18, Assembly Contingency Baseband Signal Processor Interface
SSP-41175-19	Software ICD Part 1 SMC-to-ISS Book 19, Synchronization and Control Unit Interface
SSP-41175-20	Software ICD Part 1 SMC-to-ISS Book 20, Video Switching Unit Interface

SSP-41175-21	Software ICD Part 1 SMC-to-ISS Book 21, Internal Audio Controller Interface
SSP-41175-22	Software ICD Part 1 SMC-to-ISS Book 22, Transponder Interface
SSP-41175-23	Software ICD Part 1 SMC-To-ISS Book 23, External Video Switching Unit Interface
SSP-41175-24	Software ICD Part 1 SMC-to-ISS Book 24, Radio Frequency Group Interface
SSP-41175-25	Software ICD Part 1 SMC-to-ISS Book 25, Space-to-Ground Transmitter/Receiver Controller Interface
SSP-41175-26	Software ICD Part 1 SMC-to-ISS Book 26, Integrated Motor Controller Assembly Interface
SSP-41175-28	Software ICD Part 1 SMC-to-ISS Book 28, Monitor Interface
SSP-41175-29	Software ICD Part 1 SMC-to-ISS Book 29, Secondary Interface
SSP-41175-31	Software Interface Control Document Station Management and Control to ISS Book 31, Communication Outage Recorder (COR) Interface
SSP-41175-32	Software Interface Control Document Station Management And Control to ISS Book 32, Hub Control Zone (HCZ) Multiplexer/Demultiplexer Interface
SSP-41175-35	Software Interface Control Document, Station Management and Control to International Space Station PROX Interface Book 35
SSP-41175-37	Software ICD: Station Management and Control to ISS Book 37, SpaceX Commercial Orbital Transportation Services Ultra High-Frequency Communications Unit Interface
SSP-41175-39	Software Interface Control Document Station Management and Control to International Space Station (ISS) Book 39, Commercial Orbital Transportation Services (COTS) Free Flyer Common Interface
SSP-41176-01	Software ICD Part 1 PMC-to-ISS Book 1, Hardware Architecture
SSP-41176-04	Software ICD Part 1 PMC-to-ISS Book 4, Photovoltic Control Unit Interface
SSP-41177-01	Software ICD Part 1 GN&C-to-ISS Book 1, Hardware Architecture
SSP-41177-03	Software ICD Part 1 GN&C-to-ISS Book 3, Control Momentum Gyroscope Interface
SSP-41177-04	Software ICD Part 1 GN&C-to-ISS Book 4, Rate Gyro Assembly Interface
SSP-41177-05	Software ICD Part 1 GN&C-to-ISS Book 5, Global Position System Receiver Processing
SSP-41177-07	Software ICD Part 1 GN&C-to-ISS Book 7, MDM/Node 1 MDM Pass thru Interfaces to Aft Flight Deck PCS/ECOMM and OIU
SSP-41177-08	ICCA to CEV SW ICD
SSP-41178-01	Software ICD Part 1 Internal MDM-to-ISS Book 1, Hardware Architecture
SSP-41178-03	Software ICD Part 1 Internal MDM-to-ISS Book 3, Pump Package Assembly Interface
SSP-41178-07	Software ICD Part 1 Internal MDM-to-ISS Book 7, Laboratory Module 1 Interface
SSP-41178-08	Software ICD Part 1 Internal MDM-to-ISS Book 8, Laboratory Module 2 Interface
SSP-41178-09	Software ICD Part 1 Internal MDM-to-ISS Book 9, Laboratory Module 3 Interface
SSP-41178-10	Software ICD Part 1 Internal MDM-to-ISS Book 10, Airlock Interface
SSP-41178-12	Software ICD Part 1 Internal MDM-to-ISS Book 12, Major Constituent Analyzer Interface
SSP-41178-13	Software ICD Part 1 Internal MDM-to-ISS Book 13, Pressure Control Assembly Interface
SSP-41178-15	Software ICD Part 1 Internal MDM-to-ISS Book 15, Defibrillator Interface
SSP-41178-17	Software ICD Part 1 Internal MDM-to-ISS Book 17, Charged Particle Directional Spectrometer – LV
SSP-41178-18	Software ICD Part 1 Internal MDM-to-ISS Book 18, Volatile Organic Analyzer

	Interface
SSP-41178-20	Software ICD Part 1 Internal MDM-to-ISS Part 1, Charged Particle Directional Spectrometer – EV
SSP-41178-21	Software ICD Part 1 Internal MDM-to-ISS Book 21, Tissue Proportionate Counter Interface
SSP-41178-23	Software ICD Part 1 Internal MDM-to-ISS Book 23, Node Control Software Interface
SSP-41178-24	Software Interface Control Document Internal Multiplexer/Demultiplexer to International Space Station Book 24, Node 2 -1 Interface
SSP-41178-25	Software Interface Control Document Internal Multiplexer/Demultiplexer to International Space Station Book 25, Node 2-2 Interface
SSP-41178-27	Software ICD Part 1 Internal MDM-to-ISS Book 27, Common Berthing Mechanism Interface
SSP-41178-35	Software Interface Control Document, Internal Multiplexer/Demultiplexer to ISS Book 35, HTY Interface
SSP-41178-41	Software ICD: Internal Multiplexer/Demultiplexer to ISS Book 41, SpaceX Commercial Orbital Transportation Services (COTS) Vehicle Interface
SSP-41178-42	Software ICD: Internal Multiplexer/Demultiplexer to ISS Book 42, SpaceX Commercial Orbital Transportation Services (COTS) Berthed Common Interface
SSP-41179-01	Software ICD Part 1 External MDM-to-ISS Book 1, Hardware Architecture
SSP-41179-03	Software ICD Part 1 External MDM-to-ISS Book 3, External Control Zone Tier 3 Com
SSP-41179-05	Software ICD Part 1 External MDM-to-ISS Book 5, Integrated Motor Controller Assembly Interface
SSP-41184-01	Multilateral Training Management Plan – Volume 1
SSP-41184-02	Multilateral Training Management Plan – Volume 2
SSP-41186	Software ICD Space Station Manned Base to Columbus Attached Pressurized Module
SSP-42011	Integrated Truss Segment S0 to United States Laboratory Interface Control Document Part 1
SSP-42014	Crew Health Care System (CheCS) to Laboratory Interface Control Document
SSP-42017	Space Station To Global Positioning System Interface Control Document
SSP-42018	ISS United Space On-Orbit Segment to Ground (Through Tracking & Data Relay Satellite System) Interface Control Document Part 1
SSP-42018-PART 2	ISS United Space On-Orbit Segment to Ground (Through Tracking & Data Relay Satellite System) Interface Control Document Part 2
SSP-42097-PART 2	Pressurized Mating Adapter 2 & 3 to U.S. Pressurized Elements Core (Node 2 to Pma2) Interface Control Document, Part 2
SSP-42104	United States On-Orbit Segment to Space Station Control Center Video ICD
SSP-42105	United States On-Orbit Segment to Space Station Control Center Audio ICD Part 1
SSP-42108	MDA GSE to LLS GSE Interface Control Document
SSP-42120-PART 1	Androgynous Peripheral Assembly System to Pressurized Mating Adapter Interface Control Document Part 1
SSP-42120-PART 1-AppA	Androgynous Peripheral Assembly System to Pressurized Mating Adapter Interface Control Document Part 1 – Appendix A
SSP-42120-PART 2 Core	Androgynous Peripheral Assembly System to Pressurized Mating Adapter Interface Control Document, Part 2, Core (APAS to PMA-2 & 3)
SSP-42120-PART	Androgynous Peripheral Assembly System to Pressurized Mating Adapter Interface

2-AppA	Control Document, Part 2, Appendix A (APAS To PMA-1)
SSP-42124	Integrated Truss Segment S0 to Node 2 Interface Control Document Part 1
SSP-42124-PART 2	Space Station Program Integrated Truss Segment S0 to Node 2 Interface Control Document Part 2
SSP-42125	Integrated Truss Segment P1 to Integrated Truss Segment P3 Interface Control Document Part 1
SSP-42126	Integrated Truss Segment S0 to Integrated Truss Segment P1 ICD Part 1
SSP-42127	Integrated Truss Segment S0 to Integrated Truss Segment S1 ICD Part 1
SSP-42132	Mobile Transporter to Integrated Truss Segments S0, S1, S3, P1, P3, Interface
SSP-42150	SSP Space to Space Station Radio (SSSR) to U.S. Laboratory Standard ICD
SSP-44025 PART 2	Integrated Truss Segment S3 to Integrated Truss Segment S4 Interface Control Document, Part 2
SSP-44026	Part 2 Integrated Truss Segment P3 to Photovoltaic Module P4 Interface Control Document, Part 2
SSP-44029	PG-2 Ground Support Equipment (GSE) to Launch And Landing Site (LLS) GSE Interface Definition Document (IDD)
SSP-44030	Integrated Truss Segment Z1 to Node 1 Interface Control Document Part 1
SSP-44032	Integrated Truss Segment Z1 to Laboratory Umbilicals ICD Part 1
SSP-44033	Integrated Truss Segment Z1 to Integrated Truss Segment S0 ICD Part 1
SSP-50002	ISS Video Standard
SSP-50004	Ground Support Equipment Design Requirement
SSP-50005	International Space Station Flt Crew Integration
SSP-50026	Software Verification Facility (SVF) to Space Station Control Center ICD Part 1
SSP-50061-01	U.S. Laboratory to Global Positioning System Interface Control Document Part 1
SSP-50061-02	U.S. Laboratory to Global Positioning System Interface Control Document Part 2
SSP-50093-PART 1	Extravehicular Charged Particle Directional Spectrometer (EVCPDS) ICD Part 1
SSP-50093-PART 2	Extravehicular Charged Particle Directional Spectrometer (EVCPDS) ICD Part 2
SSP-50097-02	Space Station Manned Base to Russian Segment Software Interface Control Document Book 2, Caution And Warning
SSP-50097-03	Space Station United States On-Orbit Segment to Russian Segment Software Interface Control Document Book 3, Caution and Warning
SSP-50097-04	Space Station Manned Base to Russian Segment S/W ICD BK 4, Integrated RS/US GN&C Software Mode Configurations & Attitude Control Handover Descriptions
SSP-50097-PART 1	Space Station Manned Base to Russian Segment Software Interface Control Document Part 1
SSP-50103-PART 1	Integrated Truss Segment S0 to Global Positioning System Interface Control Document Part 1
SSP-50103-PART 2	Integrated Truss Segment S0 to Global Positioning System Interface Control Document Part 2
SSP-50104	Portable Breathing Apparatus Standard Interface Control Document

SSP-50142-01	Russian Segment (RS) to the Software Development and Integration Laboratory (SDIL) Interface Control Document Part 1
SSP-50142-02	Russian Segment (RS) to the Software Development and Integration Laboratory (SDIL) Interface Control Document Part 2
SSP-50144-01	Software ICD Part 1 NCS-to-ISS Book 1, Hardware Architecture Requirements
SSP-50144-03	Software ICD Part 1 NCS-to-ISS Book 3, Node Control Software (NCS) Non-1553 Input/Output (I/O) Interface
SSP-50144-04	Software ICD Part 1 NCS-to-ISS Book 4, Common Berthing Mechanism (CBC) Interface
SSP-50144-05	Software ICD Part 1 NCS-to-ISS Book 5, Assembly/Contingency Baseband Processor Interface
SSP-50144-06	Software ICD Part 1 NCS-to-ISS Book 6, Radio Frequency Group Interface
SSP-50144-07	Software ICD Part 1 NCS-to-ISS Book 7, Transponder Interface
SSP-50144-08	Software ICD Part 1 NCS-to-ISS Book 8, Plasma Contactor Interface
SSP-50144-09 – PART 1	Software Interface Control Document, Part 1, Node Control Software to International Space Station, Book 9, Remote Power Controller Module Interface
SSP-50144-10	Software ICD Primary NCS-to-ISS Book 10, Photovoltaic Control Unit (PYCU) Interface
SSP-50144-11	Software ICD Part 1 NCS-to-ISS Book 11, DC-to-DC Converter Unit (DDCU) Interface
SSP-50144-12	Software ICD Part 1 NCS-to-ISS Book 12,Secondary Node Control Software (NCS) Interface
SSP-50144-13	Software ICD Part 1 NCS-to-ISS Book 13, Portable Computer System Interface
SSP-50147-01	Mobile Service System (MSS) to the Software Development and Integration Laboratory (SDIL) Interface Control Document Part 1
SSP-50147-02	Mobile Service System (MSS) to the Software Development and Integration Laboratory (SDIL) Interface Control Document Part 2
SSP-50193-01	Software ICD Part 1, Payload MDM-to-ISS Book 1, Hardware Architecture Requirements
SSP-50193-03	Software ICD Part 1, Payload MDM-to-ISS Book 3, Charged Particle Directional Spectometer-Extravehicular Interface
SSP-50193-04	Software ICD Part 1, Payload MDM-to-ISS Book 4, Defibrillator Interface
SSP-50193-05	Software ICD Part 1, Payload MDM-to-ISS Book 5, Tissue Equivalent Proportional Counter Interface
SSP-50193-06	Software ICD Part 1, Payload MDM-to-ISS Book 06, Volatile Organic Analyzer Interface
SSP-50193-07	Software ICD Part 1, Payload MDM-to-ISS Book 7, Blood Pressure and Electrocardiograph Interface
SSP-50193-08	Software ICD Part 1, Payload MDM-to-ISS Book 8, Incubator Interface
SSP-50193-09	Software ICD Part 1, Payload MDM-to-ISS Book 9, Medical Equipment Computer Interface
SSP-50193-10	Software ICD Part 1, Payload MDM-to-ISS Book 10, Spectrophotometer Interface
SSP-50193-11	Software ICD Part 1, Payload MDM-to-ISS Book 11, Charged Particle Directional

	Spectometer Intravehicular Interface
SSP-50193-13	Software ICD Part 1, Payload MDM-to-ISS Book 13, Automated Payload Switch Interface
SSP-50193-14	Software ICD Part 1, Payload MDM-to-ISS Book 14, Payload Ethernet Hub/Gateway Interface
SSP-50193-17	Software Interface Control Document Payload Multiplexer/Demultiplexer to Internaitonal Space Station Book 17, Intra-Vehicular – Tissue Equivalent Proportional Counter Interface
SSP-50193-18	Software Interface Control Document Payload Multiplexer/Demultiplexer to International Space Station Book 18, Radiation Assessment Detector Interface
SSP-50200-04	Station Program Implementation Plan, Volume IV: Payload Engineering Integration
SSP-50200-05	Station Program Implementation Plan (SPIP) Vol. V Logistics and Maintenance (Part 1&2)
SSP-50200-05-ANXP	NASA/ASI Bilateral Operations Processes for PMM
SSP-50221	ACS Moding Indicator to Pressurized Mating Adapter Standard Interface Control Document
SSP-50228-09	Space Station Program Configuration and Assembly Standard Interface Control Document Volume 9: Advanced Vision Function to Integrated Truss Segment P1
SSP-50228-10	Space Station Program Configuration and Assembly Standard Interface Control Document Volume 10: Advanced Vision Function to Integrated Truss Segment S3
SSP-50228-11	Space Station Program Configuration and Assembly Standard Interface Control Document Volume 11: Advanced Vision Function to Integrated Truss Segment P3
SSP-50228-13	Space Station Program Configuration and Assembly Standard Interface Control Document Volume 13: Advanced Vision Function to United States Laboratory
SSP-50235	Interface Definition Document (IDD) for ISS Visiting Vehicles
SSP-50276	Depot/Manufacturing Facility Certification Plan
SSP-50276-ANX1	NPLD Facility and ORU Certifications-Increment 1 Annex
SSP-50276-ANX2	NSLD Facility and ORU Certifications – Increment 2 Annex
SSP-50276-ANX3	Boeing Reusable Space Systems – Palmdale Facility and ORU Certifications – Increment 3 Annex
SSP-50280	Node 2 Bilateral Hardware and Software Exchange Agreements Lists and Schedules For Node 2
SSP-50285	Shuttle-Based Wireless Instrumentation System (SWIS) to ISS Elements Interface Control Document
SSP-50290	Prime Item Development Specification for Node 2
SSP-50324	U.S. Oversize Hardware Transportation Roles and Responsibilities Plan – Super Guppy Transportation System
SSP-50335	ATV Demonstration and Nominal Operations Flight Plan
SSP-50337	Software Requirements Specification for Mobile Servicing System (MSS) Graphical User Interface (GUI)
SSP-50337-01-ANX08A	Software Requirements Specification for Mobile Servicing System (MSS) Graphical User Interface (GUI) Volume 1: Space Station Remote Manipulator System (SSRMS), Annex 8a
SSP-50337-02	Software Requirements Specification for Mobile Servicing System (MSS) Graphical User Interface (GUI) Volume 2: Mobile Base System (MBS)

SSP-50342	Mil-Std 1553 Remote Terminal Test Exceptions Report
SSP-50351	Software Interface Control Document Part 2 Mobile Servicing System PCS/GUI Configuration Files
SSP-50405-01	Software Interface Control Document, Hub Control Zone Multiplexer/Demultiplexer to International Space Station Book 1, Hardware Architecture
SSP-50405-03	Software Interface Control Document Hub Control Zone (HCZ) Multiplexer/Demultiplexer (MDM) to ISS Book 3 Hub Control Zone (HCZ) to N3-1 Interface
SSP-50405-04	Software Interface Control Document Hub Control Zone (HCZ) Multiplexer/Demultiplexer (MDM) to ISS Book 4 Hub Control Zone (HCZ) to N3-2 Interface
SSP-50405-05	Software Interface Control Document Hub Control Zone (HCZ) Multiplexer/Demultiplexer (MDM) to ISS Book 5 Oxygen Generator Assembly (OGA) Interface
SSP-50405-06	Software Interface Control Document Hub Control Zone (HCZ) Multiplexer/Demultiplexer (MDM) to ISS Book 6 Urine Processor Assembly (UPA) Interface
SSP 50978	System Specification for NASA Docking System (NDS)
JSC 65795	NASA Docking System Interface Definition Document
JSC 64600	Executive Summary NASA Docking System (NDS) Concept of Operations

SSP-50405-07	Software Interface Control Document Hub Control Zone (HCZ) Multiplexer/Demultiplexer (MDM) to ISS Book 7 Water Processor Assembly (WPA) Interface
SSP-50405-08	Software Interface Control Document Hub Control Zone (HCZ) Multiplexer/Demultiplexer (MDM) to ISS Book 8 Pump/Fan Motor Controller (PFMC) Interface
SSP-50451	Electrical Flight Grapple Fixture to Strela Cargo Crane Adapter Interface Control Document
SSP-50461	Interim Resistive Exercise Device (IRED) to Node 1 Interface Control Agreement (ICA) Hardmounted and Isolated IRED Assemblies
SSP-50462	International Space Station (ISS) Telemetry Format Definition Document
SSP-50478	Payload Data Library Requirements Document
SSP-50482	ISSP Software Management Plan
SSP-50493	Prime Item Development Specification for the Direct Current Switching Unit Interface Flight Support Equipment
SSP-50520	International Space Station Logistics & Maintenance Operational Support Concepts and Requirements
SSP-50531	FRAM AVT Card
SSP-50539	Software Interface Definition Document Application Process Identifiers and Logical Data Path Identifier Definition
SSP-50540	Software Interface Definition Document for Broadcast Ancillary Data
SSP-50610	External Maintenance Operations
SSP-50672	Software Interface Control Document, United States On-Orbit Segment to Japanese Experiment Module
SSP-50720	Space Station Operations Databook (SSODB)
SSP-50790	NASA/JAXA Common Spares Pool (CSP) Joint Implementation Plan for Japanese Experiment Module (JEM)
SSP 50822	H-II Transfer Vehicle Avionics Simulator to the Software Development and Integration Laboratory Interface Control Document
SSP-50835	ISS Pressurized Volume Hardware Common Interface Requirements Document (CIRD)
SSP-50858	PCS to Orion Ethernet
SSP-50859	ISS to Orion ICCA Ethernet
SSP 50860	**Prime Item Development Specification (PIDS) for International Space Station (ISS) High Rate Communication System (HRCS)**
SSP-50887	High Rate Communications Systems to U. S. Lab Interface Control Document
SSP-50891	Joint Station LAN (JSL) Management Plan
SSP-50906	Unique Requirements Specification for Interational Space Station (ISS) Advanced Recycle Filter Tank Assembly (ARFTA) and ARFTA Drain Kit (ADK)
SSP-50916	Orbital Sciences Corporation Commercial Orbital Transportation Services Avionics Interface Test Units to the Software Development and Integration Laboratory Interface Control Document
SSP-52000-EIA-	EXPRESS Integration Agreement Blank Book

ERP	
SSP-52000-IDD-ERP	EXPRESS Rack Payloads Generic Payload Verification Plan
SSP-52000-PDA	Ayload Data Sets Blank Book
SSP-52000-PIA-SP	Payload Integration Agreement (PIA) Blank Book for Small Pressurized Payloads
SSP 52000-PVP-ERP	EXPRESS Rack Payloads Generic Payload Verification Plan
SSP 52005	Payload Flight Equipment Requirements and Guidelines for Safety Critical Structures
SSP-52052	Portable Computer System (PCS) Interface Description Document (IDD)

SSP-57000	Pressurized Payloads Interface Requirements Document
SSP-57001	Pressurized Payloads Hardware Interface Control Document Template
SSP-57002	Payloads Software Interface Control Document Template
SSP-57003	Attached Payload Interface Requirements Document
SSP-57004	Attached Payloads Hardware Interface Control Document Template
SSP-57008	Pressurized Payload Non-Rack ICD Template
SSP-57011	Payload Verification Program Plan
SSP 57012	Flight Releaseable Attachment Mechanism (FRAM) based Common Payload Interface Requirements Document (IRD)
SSP 57012	ISS FRAM Based Payload Common Launch Interface Requirements Document (IRD)
SSP-57027	ISS Payload Interface Fault Tolerance Document
SSP-57059	Standard Payload Integration Agreement (SPIA) for Pressurized Payloads
SSP-57061	Standard Payload Integration Agreement (SPIA) for Attached Payloads
SSP-57063	Standard Payload Integration Agreement (SPIA) for Small Pressurized Payloads
SSP-57072	Standard Payload Integration Agreement for ISS Payloads
SSP-53109	EXPRESS Rack ICD for Potable Water Dispenser (PWD)
SSP-53110	EXPRESS Rack ICD for ISS Food Warmer
SSP-57206	EXPRESS Rack 6 Hardware ICD
SSP-58029	Payloads Software Management Plan
SSP-TBD	External Payload to FRAM IRD
SSQ 21005	Resistor, Fixed, Film, Chip, Space Quality
SSQ 21006	Resistor, Network, Fixed Film 10 PIN SIP, Space Quality
SSQ 21007	Resistor, Network, Fixed Film 16 PIN SIP, Space Quality
SSQ 21008	Resistor, Network, Fixed Film 4 PIN SIP Space Quality
SSQ 21009	Resistor, Network, Fixed Film 6 PIN SIP Space Quality
SSQ 21010	Resistor, Network, Fixed, Film 8 PIN SIP, Space Quality Specification For
SSQ 21111	Capacitors, Fixed, Supermetalized, Plastic Film Dielectric (DC, AC or DC & AC), Hermetically Sealed, Space Quality
SSQ 21112	Capacitors, Chip, Fixed, Tantalum High Reliability
SSQ 21113	Capacitors, Ceramic, High Voltage Radial-Leaded, High Reliability General Specification For
SSQ 21215	Filters, Radio Frequency/Electromagnetic Interface Suppression, Hermetically Sealed, Space Quality
SSQ 21216	Filters, Radio Frequency/Electromagnetic Interface Suppression, Resin Sealed Space Quality
SSQ 21217	Filters, Radio Frequency/Electromagnetic Interface Suppression, Hermetically Sealed On One End, Space Quality
SSQ 21218	Filters, Radio Frequency/Electromagnetic Interface Suppression, Hermetically Sealed, Space Quality

SSQ 21635	Connectors and Accessories Electrical Circular Miniature IVA/EVA Compatible Space Quality General Specification For
SSQ 21636	Connectors and Accessories Electrical Rectangular Rack And Panel Space Quality General Specification For
SSQ 21637	Connectors and Accessories Electrical Umbilical Interface Environmental Space Quality General Specification For
SSQ 21644	Clamp Electrical Cable Harness Space Quality, General Specification For
SSQ 21652	Wire, Electric, Silicone Insulated, Nickel Coated Copper, Space Quality General Specification For
SSQ 21653	Cable, Coaxial, Twinaxial and Triaxial Flexible and Semirigid General Specification For
SSQ 21654	Cable Single Fiber Multimode Space Quality, General Specification For
SSQ 21655	Cable, Electrical MIL-STD-1553 Data Bus Space Quality, General Specification For
SSQ 21656	Wire And Cable, Electric, Fluoropolymer-Insulated Nickel Coated Copper Or Copper Alloy, General Specification For
SSQ 21676	Coupler Data Bus MIL-STD-1553B Space Quality General Specification For
SSQ 21678	Switch MIL-STD-1553B Data Bus, Space Quality General Specification For
SSQ 21936	Semiconductor Device, Diode, Silicon, Fast Recovery, Power Rectifier (Similar To 1N5816 Type)
SSQ 21937	SSPO Semiconductor Device Diode Silicon Schottky Barrier Fast Recovery Specification
SSQ 22039	Semiconductor Device, Transistor, Silicon, PNP Power (Similar To 2N5153)
SSQ 22039	Microcircuit, Digital, Advanced Schottky TTL Monolithic Silicon (Selected 54F Device Types)
SSQ 22263	Microcircuit, Digital, Advanced Schottky TTL Monolithic Silicon (Selected 54F Device Types)
SSQ 22264	SSPO Microcircuit, Digital High Speed CMOS Monolithic Silicon General Specification
SSQ 22563	SSPO Microcircuit, Linear, CMOS, Analog Switch Monolithic Silicon Specification
SSQ 22569	Microcircuit, Linear, CMOS/Analog Single 8 Channel Multiplexer/Demultiplexer With Overvoltage Protection, Monolithic Silicon, Positive Logic (508A)
SSQ 22580	Microcircuit, Linear, Quad High Speed Differential Line Driver, Monolithic Silicon (26LS31)
SSQ 22581	Microcircuit, Linear, Quad Differential Line Receiver, Monolithic Silicon (26LS32)
SSQ 22582	SSPO Microcircuit Linear Regulating Pulse – Width Modulator Monolithic Silicon (1526 and 1527A) General Specification For
SSQ 22662	Microcircuit Digital CMOS, Microprocessor, Monolithic Silicon (80C86)
SSQ 22663	Microcircuit Digital CMOS Programmable Interval Timer, Monolithic Silicon (82C54)
SSQ 22665	Microcircuit Digital CMOS, Programmable Interrupt Controller, Monolithic Silicon (82C59A-5)
SSQ 22667	SSPO Microcircuit Digital 16 Bit Microprocessor, CHMOS Monolithic, Silicon General Specification For
SSQ 22668	Microcircuit Digital 32 Bit Microprocessor CHMOS Microcircuit, Circuit Digital 32

	Bit
SSQ 22669	SSPO Microcircuit Digital 80 Bit Numeric Process SSPO Microcircuit, Digital, 80 Bit Numeric Processor, CHMOS Monolithic, Silicon General Specification For
SSQ 22670	SSPO Microcircuit Multi-Bus II Interface Controller CHMOS Monolithic, Silicon General Specification For

SSQ 22673	Microcircuit, Digital, CMOS, MIL-STD-1553, BUS Controller, Monolithic, Silicon
SSQ 22676	Transformer, MIL-STD-1553, Terminal Interface, Space Quality
SSQ 22678	SSPO Microcircuit, Hybrid, MIL-STD-1553 Terminal Interface, and Transceiver Space Quality General Specification For
SSQ 22679	Microcircuit, Interface, Bipolar, MIL-STD-1553, Dual BUS Transceiver
SSQ 22680	Connectors Rectangular (ORU) Space Quality General Specification For
SSQ 22681	Connectors, Modular, Rectangular Space (RPCM), Quality, General Specification For
SSQ 22684	Semiconductors, Device, Coupler, Opto-Electronic Solid State Types 4N47, 4N48, and 4N49
SSQ 22685	Microcircuit Linear High Speed Pulse Width Modulator Controller 1825
SSQ 22687	Microcircuit Bipolar Hall Effect Digital Latch Omh-3075
SSQ 22689	MOS Field Effect Transistor Semiconductor Device N-Channel Silicon IRHM 7450SE
SSQ 22691	Microcircuit, Hybrid, Smart Power 3-Phase Motor Drivers
SSQ 22698	Connectors Electrical Circular EVA/IVA Compatible Space Quality General Specification For
SSQ 22720	Wire, Electrical, Super Flex, Tefzel Insulated, Nickel Coated, Space Quality, General Specification For
SSQ 25000	Destruct Physical Analysis Testing Specification For The Space Station Program
SSQ 25001	Upgrade Screening EEE Parts Requirements
SSQ 26000	Space Station Program, Standard Repair For Sharp Edges on SSQ 21635 NZGL Type Connector Assemblies and Components
SSP 41175-38	Software Interface Control Document, Station Management and Control to ISS Book 38, ICU Interface
SSP 41177-09	Software Interface Control Document Guidance Navigation and Control Multiplexer/Demultiplexer to International Space Station Book 9, International Docking Adapter (IDA) – Docked Visiting Vehicle Interfaces
SSP 41178-36	Software Interface Control Document, Internal MDM to ISS Book 35, HTY Interface
SSP 41178-37	Software Interface Control Document, Internal MDM to ISS Book 37, OGA Interface
SSP 41178-38	Software Interface Control Document, Internal MDM to ISS Book 38, WRS2 Interface
SSP 41178-39	Software Interface Control Document, Internal MDM to ISS Book 39, WRS1 Interface
SSP 50405-09	Software Interface Control Document, HCZ MDM to ISS Book 09, Sabbatier Interface
SSP 30261:001	Space Station Program Office Command & Data Handling(C&DH) Standard Interface Control Document
SSP 30261:002	Space Station Program Office Space Station Multiplexer/Demultiplexer (SSMDM) Standard Interface Control Document
SSP 30261:004	Space Station Program Enhanced Space Station Multiplexer/Demultiplexer (ESSMDM) Standard Interface Control Document
SSP 30261:005	EPIC MDM ICD

SSP 50892	Ethernet Requirements for Interoperability with the Joint Station LAN (JSL)
SSP 50193-15	Software Interface Control Document Payload MDM to ISS Book 15, Improved Automated Payload Switch Interface
SSP 50193-16	Software Interface Control Document Payload MDM to ISS Book 16, Improved Paload Ethernet Hub/Gateway Interface
SSP 50193-XX	Software Interface Control Document Payload MDM to ISS Book XX, Tissure Equivalent Proportional Counter IVA interface
SSP 50097-05	ISS Manned Base to Russian Segment Software Inteface Control Dcoument Book 5, Mobile Servicing System (MSS) to Mini Research module 1 (MRM 1) Interface
CMC-00002-ESP3-013.A1	Prime Item Development Specification for External Stowage Platform 3
SSP 50699-01	USOS Certification Baseline Volume 1: ISS Orbital Replacement Unit (ORU) Certification Baseline
SSP 50699-02	USOS Certification Baseline Volume 1: ISS Orbital Replacement Unit (ORU) Limit Expansions
SSP 50699-04	ISS Certification Baseline Volume IV: ISS Lifetime Extension
SSP 50760	External Stowage Platform 3 to International Space Station Interface Definition Document
SSP 50866	NASA/ESA Common Spares Pool (CSP) Joint Implementation Plan for Columbus
SSP 57210	Payloads to COLUMBUS (COL) Exposed Payload Facility (EPF), Command and Data Handling (C&DH), and Common Transport Interface Control Document (ICD)

APPENDIX F – ANALYTICAL MODELS & TOOLS TO BE MAINTAINED

- 3D CAD models of all ISS elements
- Integrated ISS Passive Thermal Control System Models
- Integrated ISS Active Thermal Control System Models
- Integrated ISS EPS Models: Electrical Power Simulation Model (EPSIM)
  - Power Usage analysis Model w/user guide
  - SABER Circuit Simulation Models w/user guide
  - EPSOP w/user guide
  - EPS models w/user guide
  - SEPS (Analysis) – Secondary Electrical Power System
  - Software, documentation, procedures, etc., required to maintain System Test beds (SPEL and Firmware Lab)
  - MER EPS Tools
  - Verification Tools (OPMT, RTM, VPCM, PDS, Verification Databases)
  - SABER Power Transfer Unit (PTU) and System Circuit Model
- Integrated ISS ECLS Models
  - N_2O_2 Logistics Model
  - Water Logistics Model
  - SINDA Fluent Models
  - Computational Fluid Dynamics Model
  - Pressure Equalization Model
  - CO_2 Model
- Integrated ISS Structural Models
  - Component/ORU Stress models in bulk data format
  - Component Stick Beam Models
  - Component Dynamic Models with output transformation
  - Articulating and partially deployed component dynamic models
  - Integrated ISS Stick Beam Models
  - Integrated ISS Dynamic Models with output transformations
  - Mechanism and Non-linear Joint Models and tools
  - Forcing Function models and generation tools
  - Loads database and processing tools
  - SDMS data processing tools
  - Quasi-steady modeling and analysis tools (SSMRBS)
  - SAMA/MAMS/IWIS data processing tools
  - Acoustic (AutoSEA) modeling and analysis tools
  - Signal processing tools (MATLAB)
  - Finite element analysis tools (NASTRAN)
- Integrated C&T Models
  - Solar Array Beta Gimbal and Ku-band Antenna Control Analysis
  - Fiber Optic Monte Carlo Model
- Integrated C&DH Models
  - Network Response Simulator (NRS)
  - Optical Time Domain Reflectometer (OTDR)
  - HRDL links analysis tool
  - Remote Terminal Validation Tool

- Payload Ethernet Hub Gateway (PEHG) models and tools

- Integrated GN&C Tools and Models
  - Monster Matrix
  - 4D client (IPCL Database)
  - MOODS (Multiple Object Orbital Dynamics Simulation)
    - Monte Carlo, CVS, CMS, etc
  - XSIM
  - LVLH Momentum Manager Design Tool (MMCON), Inertial Momentum Manager Design Tool (IMCON)
  - MET and MSIS models – atmospheric density models
- Natural and Induced Environments Models
  - NASAN-II
  - SPHINX
  - LMSC/Boeing ISS External Contamination Data Base
  - Boeing/BREL ISS EEE parts IR test and analysis data base
  - Boeing Optical Surface Degradation Effects {by natural and induced environments} Data Base
- EEE Parts
  - Alchemy database

APPENDIX G – RESERVED

APPENDIX H – LIST OF ACRONYMS

AAA ..... Allocations, Assessments and Analyses
ACA……Associate Contractor Agreement
ADP..... Acceptance Data Package
AOH..... Assembly Operations Handbook
APAS .....Androgynous Peripheral Attachment System
APC.....Auxiliary Power Converter
APCU..... Assembly Power Converter Unit
ARES……..Crew Launch Vehicle (formerly called CLV)
ASAP .....Aerospace Safety Advisory Panel
ATCS .....Active Thermal Control Subsystem
ATP.....Acceptance Test Procedure
ATV……..Automated Vehicle Transfer
BFS ..... Backup Flight Software
BIVP .....Bilateral Integration and Verification Plan
C&DH..... Command and Data Handling Subsystem
C&T ..... Communication and Tracking Subsystem
C&W.....Caution and Warning
CAD ..... Computer Aided Design
CAM ..... Centrifuge Accommodation Module
CAR ..... Certification Approval Request
CAU .....Cockpit Avionics Upgrade
CCA .....Circuit Card Assembly
CCAA .....Common Cabin Air Assembly
CCB.....Configuration Control Board
CDR .....Critical Design Review
CEI .....Contract End Item
CEV……...Crew Exploration Vehicle (see Orion)
CI.....Configuration Item
CIL ..... Critical Items List
CIR.....Cargo Integration Review
CITRIX .....Paragraph 3.8.10.1 Not an acronym – software vendor name
CLV……Crew Launch Vehicle (see ARES)
CM ..... Configuration Management
CMG ..... Control Moment Gyroscope
CN.....Change Notice
CoFR.....Certificate of Flight Readiness
COSMOS ..... Paragraph 1.3.3.1.1
COTS…….Commercial Orbital Transportation System
CPDS.....Computer Program Development Specification
CPR..... Cost Performance Reports
CR .....Certification Requirement
CR .....Change Requests
CSAS.....Configuration Status and Accounting System
CSCI..... Computer Software Configuration Item
CSPF .....Consolidated Software Production Facility

CVAS ..... Configuration Verification Accounting System
D&C ..... Displays and Controls
DCN ..... Document Change Notice
DCR ..... Design Certification Review/Data Change Request
DDT&E ..... Design, Development, Test and Evaluation
DFI ..... Development Flight Instrumentation
DFL ..... Decommutation Format Load
DIL ..... Deliverable Items List
DM ..... Documentation Management
DO ..... De-Orbit Through Landing
DoD ..... Department of Defense
DPA ..... Digital Pre-Assembly
DQA ..... Data Quality Assurance
DR ..... Discrepancy Report
DRD ..... Data Requirements Description
DRR ..... Data Review Room
DSC ..... Dedicated Signal Conditioner
DSE ..... Development Support Environment
DTO ..... Developmental Test Objective
Eagle ..... Enhance Automated Graphical Logistics Environment
ECLS ..... Environmental Control and Life Support Subsystem
ECN ..... Electrical Change Notice
EDMS ..... Engineering Data Management System
EEE ..... Electrical, Electronic, and Electromechanical
EMC ..... Electromagnetic Compatibility
EME ..... Electromagnetic Effects
EMI ..... Electromagnetic Interference
EO ..... Engineering Order
EPCE ..... Electrical Power Consuming Equipment
EPD&C ..... Electrical Power Distribution and Control
EPIMS ..... EEE Parts Information Management System
EPO ..... Element Project Office
EPS ..... Electrical Power Subsystem
EPSL ..... Electrical Power System Laboratory
ESD ..... Electro Static Discharge
ET ..... External Tank
EVR ..... Extravehicular Robotic Subsystem
FACI ..... First Article Configuration Inspection
FCP ..... Flight Software Change Proposal
FDM ..... Frequency Division Multiplexer
FEL ..... First Element Launch
FDF ..... Flight Data File
FDIR ..... Fault Detection, Isolation, and Recovery
FOR ..... Flight Operations Reviews
FMEA ..... Failure Modes Effects Analysis
FMEA/CIL ..... Failure Modes Effects Analysis and Critical Items List
FPL ..... Fetch Pointer Load

FPSWG ..... Flight Production Schedules Working Group
FRR ..... Flight Readiness Review
FSE ..... Flight Support Equipment
FSOH ..... Flight Software Operations Handbook
FSR ..... Flight Software Requirements
FSSE ..... Flight Systems and Software Engineering
FSSR ..... Functional Subsystem Software Engineering
FSW ..... Flight Software
GAO ..... General Accounting Office
GIDEP ..... Government-Industry Data Exchange Program
GFE ..... Government Furnished Equipment
GFD ..... Government Furnished Data
GNC ..... Guidance, Navigation and Control Subsystem
GOLD ..... Government On-Line Data
GPC ..... General Purpose Computer
GSE ..... Ground Support Equipment
H_2 ..... Liquid Hydrogen
HDBK ..... Handbook
HR ..... Hazard Report
IAV ..... Integrated Avionics Verification
ICD ..... Interface Control Document
IDAGS ..... Integrated Display and Graphic Standards
IDR ..... Interim Design Review/interim Discrepancy Report
IDRD ..... Increment Definition Requirements Document
IDRP ..... Increment Definition and Requirements Plan
IFL ..... Integrated Flight Loads
IG ..... Inspector General
IGA ..... Intergovernmental Agreements
IMS ..... Information Management System
IP ..... International Partners
IPCL ..... Instrumentation Program and Components List
IPL ..... Initial Program Load
IPL ..... ISS Power Laboratory
IP/P ..... International Partner/Participant
IMMT ..... Increment Mission Management Team
INC ..... Installation Notice Card
IRD ..... Information Requirements Document
ISIL ..... ISS Software Integration Laboratory
ISS ..... International Space Station
ISS Program ..... International Space Station Program
IT ..... Information Technology
IV ..... Integrated Vehicle
JEM ..... Japanese Experiment Module
JMP ..... Joint Management Plans
JPD ..... Joint Program Directive
JPMP ..... Joint Project Management Plan
JPRCB ..... Joint Program Requirements Control Board

JSC ..... Johnson Space Center
KHB ..... Kennedy Handbook
KSC ..... Kennedy Space Center
L ..... Launch
LCC ..... Launch Commit Criteria
LO ..... Lift-off through Orbit Insertion
LRU ..... Line Replaceable Unit
L/S ..... Post-Landing/Safing
LSAR ..... Logistics Support Analysis Records
LSRR ..... Launch Site Readiness Review
LTA ..... Launch Through Activation
MADS ..... Modular Auxiliary Data Systems
MAPTIS ..... Materials and Process Technical Information System
MAST ..... Measurement and Stimuli
MATCO ..... Material Analysis, Tracking and Control
MBF ..... Mission Build Facility
MCC ..... Mission Control Center
MCR ..... Master Change Record
MDCA ..... Main Distribution Control Assembly
MDM ..... Multiplexer-De-Multiplexer
MEDS ..... Multifunction Electronic Display Subsystem
MEL ..... Minimum Equipment List
MER ..... Mission Evaluation Room
MICB ..... Mission Integration Control Board
MIL ..... Military
MIP ..... Mission Integration Plan
MIS ..... Measurement Implementation Sheet
MIS ..... Management Information System
MIUL ..... Materials Identification and Usage List
MML ..... Master Measurement List
MMU ..... Mass Memory Unit
Mod ..... Modification
MOD ..... Mission Operations Directorate
MOU ..... Memoranda of Understanding
MR ..... Material Review
M/S ..... Measurements and Stimuli
MSID ..... Measurement/Stimulus Identification
MUA ..... Material Usage Agreement
MVP ..... Master Verification Plan
NASA ..... National Aeronautics and Space Administration
NCR ..... Non-Conformance Report
NDC ..... Notification of Document Change
NOPAR ..... Non-Orbiter Project Parts List (OPPL) Part Approval Request
NLT ..... No Later Than
NSTS ..... National Space Transportation System
O_2 ..... Liquid Oxygen
OEM ..... Original Equipment Manufacturer

OI ..... Operational Instrumentation
OMI..... Orbiter Maintenance Instruction
OMRS ..... Operations and Maintenance Requirements and Specifications
OMRSD Operations and Maintenance Requirements and Specifications Document
OO..... Orbital Operations
OPC..... Orbiter Power Converter
OPCU..... Orbiter Power Converter Unit
OPF ..... Orbiter Processing Facility
OPPL..... Orbiter Project Parts List
OPPR..... Orbiter Project Parts Requirements
Orion……Crew Exploration Vehicle (formerly called CEV)
ORU ..... On-Orbit Replaceable Unit
OSE ..... Orbital Support Equipment
OV..... Orbiter Vehicle
OVEI..... Orbiter Vehicle End Item
PASS..... Primary Avionics Software System
PCASS ..... Program Compliance Assurance and Status System
PCM..... Pulse Code Modulator
PCM-MUX ..... Pulse Code Modulator Multiplexer
PCS ..... Portable Computer System
PCTAP..... Personal Computer Transport Analysis Program
PDIT..... Program Data Integration Team
PDR..... Preliminary Design Review
PDRD..... Program Definition and Requirements Document
PIRN ..... Preliminary/Proposed Interface Revision Notice
P/L..... Payload
PL..... Pre-Launch
PMA..... Pressurized Mating Adapter
PMM……Permanent Multi-purpose Module
PMR ..... Performance Management Review
PMR ..... Project Management Reviews
PMS..... Performance Measurement System
PPL..... Pre-Positioned Load
PPS..... Post Production Support
PR..... Problem Report
PRACA ..... Problem Resolution and Corrective Action
PRCB ..... Program Requirements Control Board
PRCBD ..... Program Requirements Control Board Directives
PRD..... Program Requirements Document
PRMS..... Program Risk Management System
PRR..... Production Readiness Review
PTCS..... Passive Thermal Control Subsystem
PTT ..... Part Task Trainer
PTU..... Power Transfer Unit
PVCS..... Process Version and Control System
QA..... Quality Assurance
QSA..... Qualification Site Approval

R&M ..... Reliability and Maintainability
RBD ..... Reliability Block Diagrams
RCN ..... Requirements Change Notice
RHFA ..... Reusable Hardware Flight Authorization
RIT ..... Requirements Issue Tracking
RME ..... Risk Mitigation Experiments
RMS ..... Remote Manipulator System
RPCM ..... Remote Power Controller Module
RST ..... Russian Segment Trainer
S&M ..... Structures and Mechanical Subsystem
S&MA ..... Safety and Mission Assurance
SAIL ..... Shuttle Avionics Integration Laboratory
SAN ..... Software Authorization Notice
SAR ..... System Acceptance Review/Safety Analysis Report
SASCB ..... Shuttle Avionics Software Control Board
SCA ..... Shuttle Carrier Aircraft
SCR ..... Software Change Request
SCN ..... Specification Change Notice
SD ..... Shuttle Document
SDIL ..... Software Development and Integration Lab
SDRP ..... Shuttle Data Recon Products
SDTO ..... Station Development Test Objective
SE ..... Sustaining Engineering
SFAC ..... Space Flight Advisory Committee
SFOC ..... Space Flight Operations Contract
SM ..... Systems Management
SODB ..... Shuttle Operations Data Book
SODF ..... Station Operations Data File
SOP ..... Standard Operating Procedure
SOW ..... Statement of Work
SPDM ..... Special Dexterous Manipulator
SPF ..... Software Production Facility
SPN ..... Station Program Notes
SPOC ..... Space Program Operations Contract
SPRT ..... System Problem Resolution Team
SRB ..... Solid Rocket Booster
SRD ..... System Requirements Document
SRMS ..... Space Shuttle Remote Manipulator System
SRR ..... System Requirements Review/Software Readiness Review
SRS ..... Software Requirements Specification
SRU ..... Shop Replaceable Unit
SSCM ..... Space Station Change Memo
SSCN ..... Space Station Change Number
SSME ..... Space Shuttle Main Engine
SSODB ..... Space Station Operational Data Book
SSP ..... Space Shuttle/Station Program
SSP ..... Space Station Program

SSPF……..Space Station Processing Facility
SSPTS ..... Station-Shuttle Power Transfer System
SSRMS..... Space Station Remote Manipulator System
SSRP ..... System Safety Review Panel
SSTF ..... Space Station Training Facility
SSUAS ..... Space Station Utilization Advisory Subcommittee
SSV ..... Space Shuttle Vehicle
STD ..... Standard
STE ..... Special Test Equipment
SVF ..... Software Verification Facility
SW..... Software
TCM..... Technical Coordination Meeting
TCT ..... Time Compliance Technical Instruction
TFL ..... Telemetry Format Load
TIM ..... Technical Interchange Meeting
TIP..... Test Implementation Plan
TLM ..... Telemetry
TRR..... Test Readiness Review
UPF ..... Universal Patch Format
US ..... United States
USA..... United States Alliance
UTC..... United Technologies Corporation
USOS ..... United States On-Orbit Segment
VCN ..... …Verification Closure Notice
VCN ..... Verification Compliance Notice
Vdc..... Volts Direct Current
VE ..... Vehicle Engineering
VLN ..... Verification Logic Network
VMDB..... Vehicle Master Database
VPS ..... Verification Planning Sheet
VTL..... Verification Tracking Log
WBS ..... Work Breakdown Structure

APPENDIX I – RESERVED

APPENDIX J –KEY TERMS AND DEFINITIONS

Assembly Complete Vehicle: The on-orbit Space Station configuration as specified in SSP 41000.

Book Coordinator: A function that provides for developing new documents or updates to existing documents. Tasks include the following: integrating inputs from technical experts, submitters and reviewers; maintaining the technical consistency of the document; updating the document using the Configuration Management (CM) Change Request (CR) process; interfacing with CM and Data Quality Assurance (DQA); coordinating International Partner/Participant (IP/P) inputs and IP/P issue resolution; developing Notification of Document Changes (NDCs) for documents that affect RSC-E; coordinating translations as required; coordinating and conducting Technical Concurrence Meetings (TCMs); production, distribution and resolution of minutes and actions from TCMs; and developing and presenting presentations to the appropriate control boards as required for CR and document approvals.

Common Hardware and Software: NASA developed and certified hardware and software that is used by both USOS elements and IP/P elements. The common hardware and software can be that hardware provided to IP/P's as Government Furnished Equipment (GFE) or procured directly by the IP/P from the US Original Equipment Manufacturer (OEM). Common software is generally software that resides with the hardware, e.g., Multiplexer De-Multiplexer (MDM) boot code, or common hardware application software, like the MDM software required to control and operate a Environmental Control and Life Support Subsystem (ECLSS) Common Cabin Air Assembly (CCAA).

Component: A functional unit which is an entity for purposes of analysis, manufacturing, testing, maintenance, and record-keeping (e.g., batteries, electronic boxes).

Configuration Item/Computer Software Configuration Item (CI/CSCI): Hardware or software (or an aggregation of both) designated by the contracting agency for configuration management.

Conformed: All outstanding document changes (e.g., Specification Change Notices (SCNs), Document Change Notices (DCNs), Preliminary/Proposed Interface Revision Notices (PIRNs), etc.) have been consolidated into the document. Also referred to as consolidated.

Contingency Kits/Items: Items that are not part of the original design of a CI/Contract End Item (CEI)/Element/Segment but developed as operational needs of the ISS mature or are positioned on ISS as risk mitigation tools (e.g., the Ammonia Servicer, jumper kits).

Contract End Item (CEI): Hardware or software (or an aggregation of both) identified in the contract as a deliverable entity. A CEI may be a separate CI or CSCI, or an aggregate of CIs/CSCIs grouped as a set.

Control Board: A management forum which establishes and control changes to the baseline and associated documentation and provides a forum for resolving related technical and schedule

issues. The specific board scope, responsibilities, authority, and membership are defined in their charter.

Control Panel: A subordinate forum to a parent control board with delegated responsibility and control as defined in their charter.

Data Owners: The individuals that are identified as the authorized source for each data category in the Vehicle Master Database (VMDB). Data owners are documented in the Team Authorization list located in the VMDB.

Data Quality Assurance (DQA): An administrative function to ensure documentation and documentation updates are prepared in accordance with documentation standards contained in SSP 50010.

Design, Development, Test, and Evaluation (DDT&E): Development, verification and delivery of hardware and software for the USOS elements.

Development: The acquisition of hardware, software and support products. Includes the design, manufacture, qualification & acceptance testing, production and required verification or life cycle testing, through formal delivery (e.g., DD250) to NASA. This includes modifications or replacement of hardware and/or software as required for enhanced designs, inferior designs, obsolescence, or new capabilities.

Element: An integrated, assembled set of hardware and/or software capable of supporting an operational role such as the U.S. Lab module. It is the primary subdivision of the ISS Vehicle for purpose of accommodation in a launch vehicle.

Flight Support Equipment (FSE): An item required to integrate ORU/Contingency Items into/onto the carrier used in the shuttle payload bay or any pressurized volume which is transported to orbit by a launch vehicle (e.g., adapter plates, shrouds).

Government Furnished Data (GFD): The data associated with International Partners (IP) (in accordance to the Bilateral Data Exchange Agreements Lists (BDEALS)) and GFE manufacturers/providers (in accordance with SSP 50177).

Government Furnished Equipment (GFE) Flight Elements: The ISS GFE flight elements are the Node 2, Node 3, PMM, and Cupola.

Ground Support Equipment (GSE): Equipment required to support launch processing and post landing operations (e.g., dollies, lifting devices, slings).

Increment: The time frame is defined by each crew expedition. The duration of an increment is the time period from the launch of a designated flight crew to the undocking of the return vehicle for that crew.

Increment Definition Requirements Document (IDRD): Documentation of ISS Program requirements for the flights and increments within a planning period. These include the launch dates, traffic plans, top-level manifest, resource allocations, and specific flight/increment requirements and priorities.

Information Technology (IT): Any equipment or interconnected system or subsystem of equipment that is used in the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission or reception of data or information that is used by ISSP. IT includes computers, ancillary equipment, software, firmware, and similar procedures, services (including support services), and related resources.

Integration and Operations (I&O): Integration and sustaining engineering of the USOS elements and other system elements necessary to assemble and operate a safe and productive International Space Station. Design work to be accomplished under I&O is limited to systems, hardware, and software sustained under SOW Appendices.

International Partners/Participants.: Those non-U.S. space agencies that formally participate in the ISS. The International Partners are the Canadian Space Agency (CSA), European Space Agency (ESA), National Space Development Agency of Japan (NASDA), and Russian Aviation and Space Agency (Rosaviakosmos). The Italian Space Agency (ASI) is an International Participant.

ISS System: The composite of hardware, software, facilities, personnel, and services needed to perform the ISS mission. This includes on-orbit, ground, and IP/P assets. ISS System requirements are specified in SSP 41000.

ISSP Management Center: A program facility in the Mission Control Center (MCC) to support real-time ISS operations that is staffed and operated by program personnel.

Launch Package: Full complement of ISS hardware and software delivered to, or returned from, the ISS.

Management Information System (MIS): A computerized information-processing system designed to keep ISSP and other personnel apprised of the most current ISS technical, financial, workforce, schedule and operational information, including issues and risks. MIS links ISS core business issues and goals with the technical aspect of the Program.

Mission Evaluation Room (MER): The MER provides on-console engineering support during real time operations.

Nominal: The expected value or condition, as measured in terms of functional or performance characteristics, of a component, subsystem, or system operating normally in its intended environment.

Operational Item: Equipment, miscellaneous in nature, but required to ensure the integrity, performance and use of the ORU or Contingency Kit/Item while on-orbit, as applicable through the phases of the International Space Station applicable to cycling an ORU/Contingency Item to

orbit, deploying it on-orbit, recovering the ORU/Contingency Item it is replacing back to the return carrier, and returning that ORU/Contingency Item to ground (a.k.a. mission phases) (e.g., bump protectors and connector protective covers).

Orbital Replacement Unit (ORU): Equipment that may be removed from the on-orbit ISS and replaced with a like unit for maintenance activities.

Orbital Support Equipment (OSE): An item required to support Flight hardware in the On-orbit ISS. OSE items are required to accommodate integrated assemblies used to deliver ORU/Contingency Items to/from on-orbit worksites and on-orbit storage locations (e.g., micro-meteoroid debris protection).

Other Produce Development: Design, development, verification, and delivery of hardware and software components to support and enhance operation of the ISS elements.

Part: A single piece not normally subject to disassembly without destruction or impairment of use (e.g., resistors, transistors, relays, gears, etc.).

Segment: A grouping of elements that are functionally related and often physically interface (e.g., U.S. On-Orbit Segment or U.S. Ground Segment).

Spares: Acquisition and deployment of space hardware components for ISS maintenance and repair.

Stage: The elements comprising the orbital vehicle at a given point in the assembly sequence. Each stage begins with orbital insertion of a flight containing Vehicle elements.

Subsystem: A functional grouping of components that combine to perform a major function (e.g., electrical power, attitude control, propulsion, etc.).

Support Equipment: An item required to transport, access, handle, protect, service, or verify a qualification/flight item. Equipment included in the category of Support Equipment is GSE, FSE, OSE, and Operations Items.

Sustaining: Ongoing support of on-orbit systems, hardware and software after formal delivery (e.g., DD250) to NASA. Includes hardware and software expertise, integration and analyses required to assess the detailed performance of the vehicle and ISS Equipment and to maintain a functional/operational vehicle. It also includes the required ground infrastructure required to support the on-orbit vehicle, e.g., MER, depots, software development facilities, original equipment manufacturers, SMA, CM, etc. Should also include modifications to hardware and/or software as required for anomaly resolution and parts obsolescence issues that maintain the accepted design certification/functionality and/or optimize the operational aspect of the hardware/software.

Sustaining Engineering: The design engineering expertise provided after the development of hardware/software items is completed and these items have been provisionally accepted.

United States On-Orbit Segment (USOS): An Earth orbiting facility which houses experiment payloads, distributes resource utilities, and supports permanent human habitation for conducting research and science experiments in a microgravity environment. The USOS supplies the ISS with services and capabilities as specified in SSP 41162.

Validation: The process of formally approving the developed process, services, or products at the conclusion of operational test and evaluation. This approval indicates developed processes, services, or products satisfy their intended operational mission.

Vehicle: The Vehicle includes the whole, integrated, on-orbit station (including hardware and software) as it is currently configured On-Orbit and the future station configurations as it evolves to the Assembly Complete (AC) configuration. The vehicle configuration is defined by the particular point in time under assessment or discussion.

Verification: The process for demonstrating compliance with the ISS System and U.S. On-Orbit Segment Specifications. For the ISS System Specification-level verification, this includes interfaces with the International Partners/Participants and U.S. Ground Segments.

APPENDIX K – DEPTH OF PENETRATION FOR IPs/Ps, COMMERCIAL VISITING VEHICLES (SpaceX AND ORBITAL), GFE, AND PAYLOADS

Depth of Penetration (DOP) for International Partners/Participants (IPs/Ps), Commercial Visiting Vehicles (SpaceX and Orbital), Government Furnished Equipment (GFE) and Payloads (PLs):

II. Purpose and Scope

This direction defines the roles and responsibilities of NASA and the contractor regarding treatment of International Partner and Participants (IP/P) elements and subsystems (including FGB), Commercial Visiting Vehicles (SpaceX and Orbital), Government Furnished Equipment (GFE) and Payloads (PL) relative to ISS stage certification. It identifies appropriate ground rules for the subsystem and technical discipline teams to define the scope of work required to technically integrate the IP/P/GFE/PL/Commercial Visiting Vehicles SpaceX and Orbital systems and support the Certificate of Flight Readiness (CoFR) process.

III. General

B. <u>General Groundrules:</u>

1. The depth of penetration into IP/P/GFE/PL/Commercial Visiting Vehicles SpaceX and Orbital HW/SW design, development, verification processes and fabrication will be to the extent required to ensure physical, functional, safety, and operational compatibility at the system level and element-to-element interface.

2. The IP/P/GFE/PL/Commercial Visiting Vehicles SpaceX and Orbital provider is responsible for verification and certification that their elements meet end-item and segment specification requirements. NASA provides the IP/P elements to the contractor as Government Furnished Equipment (GFE), suitable for its intended use.

3. The contractor is responsible for end-to-end subsystem management for the ISS vehicle. The contractor is expected to understand the interfaces to the IP/P/GFE/PL/Commercial Visiting Vehicles SpaceX and Orbital systems, however the contractor will only be expected to understand IP/P/GFE/PL/Commercial Visiting Vehicles SpceX and Orbital designs sufficiently to assess the impacts of IP/P/GFE/PL/Commercial Visiting Vehicles SpaceX and Orbital hardware and software performance on overall system performance.

4. For real-time anomalies with IP/P/GFE/PL/Commercial Visiting Vehicles SpaceX and Orbital hardware and software, the appropriate provider (IP/P/GFE/PL/Commercial Visiting Vehicls SpaceX and Orbital) will be responsible for resolution of the anomaly. The contractor will understand IP/P/GFE/PL/Commercial Visiting Vehicles SpaceX and Orbital hardware/software designs sufficiently to assess the impacts of anomalies to overall system performance and to ensure that no hazard controls have been violated.

5. The contractor will not be responsible for IP/P/GFE/PL/Commercial Visiting Vehicles SpaceX and Orbital hardware/software (HW/SW) Certification of Flight

Readiness (CoFR) with regard to the IP/P/GFE/PL/Commercial Visiting Vehicles SpaceX and Orbital satisfying end-item design and segment specification requirements.

6. The contractor will be expected to perform analytical integration of the total ISS System, including integration of IP/P and Commercial Visiting Vehicles SpaceX and Orbital models, and will produce and maintain integrated schematics. When the contractor performs IP/P verification in accordance with the Bilateral Integration and Verification Plan (BIVP), the contractor CoFR will extend to that component of the verification process.

7. Data furnished through NASA from the IP/P/GFE/PL/Commercial Visiting Vehicles SpaceX and orbital providers will not be independently verified except in items suspected of not meeting requirements and after specific direction from NASA. NASA/the contractor will not duplicate element verification activities performed by the providers. Where necessary, data/models from the providers will be incorporated into U.S. integrated models as required to support stage verification.

C. <u>Scope:</u>

In order to support the CoFR process for the stage, the following areas shall be addressed by each team when performing their stage integration task, including documented system knowledge and Program processes.

1. Knowledge Base

a) Each subsystem and technical discipline teams should have data on their respective ISS stage subsystem or area (including IP/P/Payload/GFE/Commercial Visiting Vehicles SpaceX and Orbital portions). This data can exist in the form of provider-produced data. This data can also exist in the form of US-generated products, which incorporate traceable IP/P-provided data. This data will be used for incorporation into appropriate products and maintained by the appropriate NASA or contractor expert.

b) This data should be sufficient to understand the functional operation and performance of the subsystem, and will include integrated models, top level schematics, design descriptions, Safety Hazard Reports (including failure detection, isolation, and recovery assessments,) failure tolerance assessments, and all contract deliverables pertaining to the respective subsystem or area of expertise.

c) The level of penetration into the IP/P/GFE/PL/Commercial Visiting Vehicles SpaceX and Orbital element, segment or hardware should be sufficient to identify the point in the architecture where the subsystem architecture is isolated from the the IP/P/GFE/PL/Commercial Visiting Vehicles SpaceX and Orbital element, segment or hardware for stage functionality and performance.

C. Processes

a) NASA provides IP/P/GFE/PL/Commercial Visiting Vehicles SpaceX and Orbital data to the contractor in accordance with this contract. NASA obtains the IP/P data via the Government Furnished Data (GFD), the Bilateral Data Exchange Agreement, Lists and Schedules (BDEALS) processes. These are used for identifying, tracking, receiving, and approving (if required) data from the IP/Ps.

b) Technical Interchange Meetings (TIMs), teleconferences and videoconferences are used with IP/P/GFE/PL/Commercial Visiting Vehicles SpaceX and Orbital providers in order to resolve technical issues and exchange technical information. IP/P data collected through protocols, or faxes signed by IP/P management are considered valid.

c) Joint operating plans for assembly, nominal operations and off-nominal operations will be developed to support FOR, Operations Data File and Chits affecting the real-time mission support.

d) Process Sampling is used to confirm the IP/P end-item provider has a valid verification program. Critical requirements by subsystem or discipline will be processed sampled by exception at NASA request.

e) Joint testing and analysis will be documented in the Bilateral Interface Verification Plan (BIVP), and subsystem verification plans, as appropriate. Joint verification activities used to close requirements will be documented in Verification Logic Network / Detailed Verification Objectives (VLN/DVOs) for assembly flights or Verification Objectives (VOs) for post assembly complete flights.

f) The Safety Review Panel is used to assess safety and reliability data provided by the IP/P/GFE/PL/Commercial Visiting Vehicles SpaceX and Orbital providers, including safety hazard controls, failure detection, isolation, and recovery assessments, and failure tolerance assessments.

g) The VLN/DVO process is used to provide a traceable, auditable trail of requirements verification and closeout for each Stage through assembly complete. Post assembly complete, the ISS CoFR Validation process shall be used for each visiting vehicle flight and stage.

h) The Verification Analysis Cycle (VAC) is used to perform verification analysis for integrated systems through assembly complete. Post assembly complete, the ISS CoFR Validation process shall be used. (S/A 1614)

APPENDIX L – NON-BOEING SUSTAINED PAYLOAD FACILITIES FOR FUNCTION ANALYSIS

Appendix L - Non-Boeing Sustained Payload Facilities for Functional Analysis (SOW 6.88 and 3.3.8.2.2)

Nomenclature	Part Number	Associated Function
Absorber Cartridge	67212MFAM71000	CIR-FIR
Air Hose Adapter	67212MFAN10030	CIR-FIR
Air Velocity Probe	67211MFAD40001	CIR-FIR
ATCU Fan	67211MFAD11010	CIR-FIR
ATCU Fan Filter Electronics	67211MFAD11063	CIR-FIR
ATCU Fan Lint Screen	67211MFAD11009	CIR-FIR
ATCU Smoke Detector	67211MFAD40024	CIR-FIR
ATCU to Bench Seal - Center	67212MFAH20025	CIR-FIR
ATCU to Bench Seal - RH/LH	67212MFAH20020	CIR-FIR
Chamber Fan	67212MFAH30021	CIR-FIR
Chamber Window - Coated	67212MFAH33013	CIR-FIR
Chamber Window - Uncoated	67212MFAH33000	CIR-FIR
Common AIM	67211MFAB40000	CIR-FIR
Dew Point Sensor Electronics and Probe	67212MFAM60000	CIR-FIR
Digital Control Module	67211MFAB20000	CIR-FIR
Digital Control Module (LTCF configuration)	67211MFAB20500	CIR-FIR
ECS Electronics Unit	67211MFAD10050	CIR-FIR
Electrical Power Control Unit	67211MFAG40010	CIR-FIR
EPCU Rack Power Switch	67211MFAB60020	CIR-FIR
Fiber Optic Cleaning Kit	67211MFKG10026	CIR-FIR
Filter Compensator Module #2	67212MFAN42200	CIR-FIR
Fixed Mirror Module	67212MFAN31000	CIR-FIR
Focus Prism Module	67212MFAN80000	CIR-FIR
FOMA Calibration Unit	67212MFAM62000	CIR-FIR
FOMA Contol Unit	67212MFAM40000	CIR-FIR
FOMA Recirculation Pumps	67211MFAM23000	CIR-FIR
Gas Chromatograph Instrument Package	67212MFAM30000	CIR-FIR
HiBMs 30mm Relay Optics Module	67235MFAB11201	CIR-FIR
HiBMs 50mm Relay Optics Module	67212MFAN62000	CIR-FIR
HiBMs 90mm Objective Optics Module	67212MFAN51000	CIR-FIR

Appendix L - Non-Boeing Sustained Payload Facilities for Functional Analysis (SOW 6.88 and 3.3.8.2.2)

Nomenclature	Part Number	Associated Function
HiBMs Common Relay Optics Module	67212MFAN61000	CIR-FIR
HiBMs Compensator Module	67212MFAN42200	CIR-FIR
HiBMs Imaging Package - IAM	67212MFAN11000	CIR-FIR
I/O Processor Hard Disk Drives	67211EFAB10831	CIR-FIR
IAM Air Hose #3	67212MFAN10040	CIR-FIR
IAM F/O Cable #1	67212EFAH20812-1	CIR-FIR
Illumination Control Module	67212MFAN91000	CIR-FIR
Illumination Objective Optics Module	67212MFAN56000	CIR-FIR
Illumination Source Module	67212MFAN90000	CIR-FIR
Illumination Source Module F/O Cable	67212MFAN13010	CIR-FIR
Image Processing and Storage Unit	67211MFAB30100	CIR-FIR
Image Processing and Storage Unit - Analog	67211MFAB31100	CIR-FIR
Input/Output Processor	67211MFAB10300	CIR-FIR
Instrument Resource Ring GC Filter	67212MFAM00100	CIR-FIR
Instrument Resource Ring Vent Filter	67212MFAM00101	CIR-FIR
Krytox Kit	67211MFKG10250	CIR-FIR
Lint Free Wipe Assembly	67211MFAG10243	CIR-FIR
Liquid Crystal Tunable Filter Module	67212MFAN40000	CIR-FIR
LLL-UV 50mm Relay Optics Module	67212MFAN65000	CIR-FIR
LLL-UV Filter Module	67212MFAN52000	CIR-FIR
Low Light Level Air Hose	67212MFAN14010	CIR-FIR
Low Light Level-UltraViolet Image Acquisition Module	67212MFAN70000	CIR-FIR
MDCA Avionics Handle	67235MEAD12001	CIR-FIR
MDCA Avionics Package	67235MEAD12000	CIR-FIR
MDCA Boot Selector	67235EFAG70008	CIR-FIR
MDCA Chamber Insert Assembly	67235MFAC17100	CIR-FIR
MDCA Color Camera	67235MFAC14000	CIR-FIR
MDCA Fiber Arm	67235MFAC17146	CIR-FIR
MDCA Fuel Resevior Sub Assembly	67235MFAC13500	CIR-FIR
MDCA Igniter Tip	67235MFAL21007	CIR-FIR
MDCA Needle 1	67235MFAC13310	CIR-FIR
MDCA Needle 2	67235MFAC13300	CIR-FIR

Appendix L - Non-Boeing Sustained Payload Facilities for Functional Analysis (SOW 6.88 and 3.3.8.2.2)

Nomenclature	Part Number	Associated Function
MDCA Radiometer Package	67235MFAC13950	CIR-FIR
MDCA Retractable Indexing Fiber Kit Assembly	67235MFAL21050	CIR-FIR
MDCA Return Hose	67235MFAC17191	CIR-FIR
MDCA Supply Hose	67235MFAC17192	CIR-FIR
Optics Bench UML Cover Plate	67212MFAH20600	CIR-FIR
Optics Housing Module	67212MFAN20000	CIR-FIR
Rack Door Switch	67211EFAB50024	CIR-FIR
SAMS Head (TSH-ES)	60005MA5000	CIR-FIR
Seals Kit	67211MFKG10225	CIR-FIR
UML Latch Handle	67211MFAB21000	CIR-FIR
Valve Timer	67212MFAM10200	CIR-FIR
Water Flow Controller Assembly	67211MFAD20040	CIR-FIR
WFCA Controller Box Assembly	67211MFAD20056	CIR-FIR
Air Velocity Probe and FDS Bracket	67211MFAD40010	CIR-FIR
Air Velocity Probe Electronics	67211MFAD40017	CIR-FIR
ATCU Fan	67211MFAD11010	CIR-FIR
ATCU Fan Filter Electronics	67211MFAD11063	CIR-FIR
ATCU Fan Lint Screen	67211MFAD10043	CIR-FIR
ATCU Smoke Detector	67211MFAD40025	CIR-FIR
ECS Electronics Unit	67211MFAD10050	CIR-FIR
Electrical Power Control Unit	67211MFAG40010	CIR-FIR
EPCU Rack Power Switch	67211MFAB60020	CIR-FIR
Fluid Science Avionics Package	67213MFAF40000	CIR-FIR
I/O Processor Hard Disk Drives	67211EFAB10831	CIR-FIR
Image Processing and Storage Unit - Analog	67211MFAB31100	CIR-FIR
Input/Output Processor	67211MFAB10300	CIR-FIR
Light Microscopy Module	67215MEAB2000	CIR-FIR
LMM BIO Base	S1051MFA0025	CIR-FIR
LMM Clean Up Kit	67215MEAB23600	CIR-FIR
LMM Control Box Assembly	67215MEAB23700	CIR-FIR
LMM Gloves	67215MFKB20123	CIR-FIR
LMM Lens 100x	67215MFLA11040	CIR-FIR

Appendix L - Non-Boeing Sustained Payload Facilities for Functional Analysis (SOW 6.88 and 3.3.8.2.2)

Nomenclature	Part Number	Associated Function
LMM Lens 10x	67215MFLA11035	CIR-FIR
LMM Lens 2.5x	67215MFLA11051	CIR-FIR
LMM Lens 20x	67215MFLA11036	CIR-FIR
LMM Lens 50x	67215MFLA11038	CIR-FIR
LMM Lens 63x	67215MFLA11035	CIR-FIR
LMM Monochrome Camera	67215MEAB21031	CIR-FIR
LMM Surveillance Camera	67215MEAB23250	CIR-FIR
LMM X-Y Stage	67215MEAB21758	CIR-FIR
PACE LED Base	S1052MFA1000	CIR-FIR
PACE Oil Despensor	S1051MFA0009	CIR-FIR
Rack Door Switch Assembly	67211EFAB50024	CIR-FIR
SAMS Head (TSH-ES)	60005MA5000	CIR-FIR
Seals Kit	67211MFKG10225	CIR-FIR
Water Flow Controller Assembly	67211MFAD20010	CIR-FIR
WFCA Controller Box Assembly	67211MFAD20056	CIR-FIR
White Light Chasis	67213MFAL70710	CIR-FIR
White Light F/O Cable	67213MFAL70702	CIR-FIR
White Light Lamp	67213MFAL70750	CIR-FIR
Glacier - Main Flight Unit	CBSE-F10060-1	Cold Stowage
Glacier - Fan Motor (ORU)	CBSE-E70110-1	Cold Stowage
Glacier - Blower Assy (ORU)	CBSE-E70109-1	Cold Stowage
Glacier - Hybrid Capacitors	CBSE-F50336-1	Cold Stowage
Glacier - Electrical Boards	Non-COTS	Cold Stowage
Glacier - Water Supply Lines	CBSE-F10065-1	Cold Stowage
Glacier - Water Supply Lines	CBSE-F10065-5	Cold Stowage
Glacier - Water Return Lines	CBSE-F10066-1	Cold Stowage
Glacier - Water Return Lines	CBSE-F10066-5	Cold Stowage
Glacier - Volume Compensators	PCG-F10052-1	Cold Stowage
Glacier - Cryocoolers	CBSE-F21540-3	Cold Stowage
Glacier - Desiccant Filter	CBSE-F10067-1	Cold Stowage
Glacier - IVA Handle	CBSE-F10075-1	Cold Stowage
Glacier - Type V Trays	CBSE-F10083-1	Cold Stowage

Appendix L - Non-Boeing Sustained Payload Facilities for Functional Analysis (SOW 6.88 and 3.3.8.2.2)		
Nomenclature	**Part Number**	**Associated Function**
Glacier - Type X Trays	CBSE-F10102-1	Cold Stowage
MERLIN Flight Assembly	PCG-F10045-1	Cold Stowage
MERLIN Flight Assembly	PCG-F10045-3	Cold Stowage
MERLIN Water Supply Line	PCG-F10053-1	Cold Stowage
MERLIN Water Return Line	PCG-10054-1	Cold Stowage
MERLIN Double Water Supply Line	PCG-F10055-1	Cold Stowage
MERLIN Double Water Supply Line	PCG-F10056-1	Cold Stowage
Volume Compensator	PCG-F10052-1	Cold Stowage
MERLIN Aux Sensor Harness	CBSE-F50401-1	Cold Stowage
IVA Handle	PCG-F20583-1	Cold Stowage
MERLIN Pouch	CBSE-F10077-1	Cold Stowage
Desiccant Pack Assembly	24400-20074-701	Cold Stowage
D-Ring Pallet Assembly	WLSI242134-302	Cold Stowage
ARCTIC Tray Assembly	WLSI242108-301	Cold Stowage
Brayton Machine	03102	Cold Stowage
Electronic Unit	03301	Cold Stowage
Rack Interface Unit	03480	Cold Stowage
Rack Interface Unit Switchbox	03407	Cold Stowage
Temperature Data Recorder Battery Pack	03370	Cold Stowage
Master Controller	96M21060-1	MSRR
SSPCM	96M21166-1	MSRR
Thermal and Environmental Control system	96M00066-3	MSRR
Vacuum Sensor Assembly	96M00804-1	MSRR
Avionics Shelf Maintenance Kit (Shelf Removal)	VASAVIOT1	MSRR
TECS Cap Kit (Shelf Removal)	TECSKIT2	MSRR
TECS Cap Kit (Shelf Removal)	TECSKIT1	MSRR
Shelf Accumulator	96M19616-1	MSRR
MSRR-1 W021 (Laptop Cable)	96M21021-1	MSRR
Vacuum Valve	B43553-1	MSRR
Pressure Tranducer	7200-8281	MSRR
Video Box	96M21140-1	MSRR
MSL MASS SPECTROMETER ELECTRONICS BOX	2494-302 021 00	MSRR/MSL

Appendix L - Non-Boeing Sustained Payload Facilities for Functional Analysis (SOW 6.88 and 3.3.8.2.2)

Nomenclature	Part Number	Associated Function
MSL MASS SPECTROMETER SENSOR	QMA 200 BKM25299	MSRR/MSL
MSL MOTOR VALVE	2494-302 060 00	MSRR/MSL
MSL PRESSURE SENSOR 2 BAR	2494-302 042 50	MSRR/MSL
MSL PRESSURE SENSOR	2494-302 070 00	MSRR/MSL
MSL PRESSURE SENSOR 7 BAR	PCDR314-2664	MSRR/MSL
MSL SOLENOID VALVE LARGE	2494-302 042 40	MSRR/MSL
MSL SOLENOID VALVE SMALL	2494-302 042 10	MSRR/MSL
MSL CORE FACILITY SEAL O-RING 1	VITON V80 340 X 4	MSRR/MSL
MSL CORE FACILITY SEAL O-RING 2	VITON V80 360 X 4	MSRR/MSL
MSL FILTER UNIT	2494-302-040 00	MSRR/MSL
MSL GAS FILTER	2494-302-020 40	MSRR/MSL
MSL PUMP LUBRICATION KIT	PM 073 073-T	MSRR/MSL
MSL SAMPLE CARTRIDGE DATA CABLE	CPD 194	MSRR/MSL
MSL SERVICING FLEX LINE	2494-350 220A00C	MSRR/MSL
MSL TURBOMOLECULAR PUMP	PM 901 350	MSRR/MSL
MSL TURBOMOLECULAR PUMP ELECT BOX	2494-302 120A00C	MSRR/MSL
MSL VACUUM SENSOR	2494-302 220 12	MSRR/MSL
MSL PRESSURE SWITCH	2494-302 070 40	MSRR/MSL
MSL VACUUM SENSOR COMBI	2494-302 070 30	MSRR/MSL
MSL GAS SUPPLY	2494-303 000A00C	MSRR/MSL
MSL HEATER CURRENT SOURCE	MSL-305-410F	MSRR/MSL
MSL WATER REFILLING DEVICE	2494-350 210A00C	MSRR/MSL
MSL LGF	1714-1100-0000	MSRR/MSL
MSL SQF	1783-1000-0000	MSRR/MSL
MSL Power Supply Unit	2494-305 000A00C	MSRR/MSL
MSL Facility Control Unit	2494-304 000A00C	MSRR/MSL
MSL Core Facility	2494-301 000A00C	MSRR/MSL
MSL Vacuum Gas System/Water Pump Package	2494-302 000A00C	MSRR/MSL
MSL Water Pump	6011M-040-01	MSRR/MSL
MSL Buffer Volume	2494-302 011 00	MSRR/MSL
MSL Drive Unit	CT51475C001	MSRR/MSL
MSL Water Pump Elect Box	6011M-080-01	MSRR/MSL

Appendix L - Non-Boeing Sustained Payload Facilities for Functional Analysis (SOW 6.XX and 3.3.8.2.2)

Nomenclature	Part Number	Associated Function
Microgravity Acceleration Measurement System	400000	MAMS
SAMS Interium Control Unit	60005MA17100	SAMS
SAMS Remote Triaxial Sensor	60005MA31400	SAMS
Triaxial Sensor Head - Ehternet Standalone	60005MA50000	SAMS
Seat Track Device	60005MA50043	SAMS
Sensor Enclosure	60005MA12100	SAMS
Fan Assembly (Spare Fan for SAMS ICU or RTS drawer)	60005MA17400	SAMS
Temp Sensor (Spare for SAMS ICU or RTS drawer)	60005MA17309	SAMS
Power Control Box (Spare for SAMS ICU drawer)	60005MA17300	SAMS
Electronics Enclosure	60005MA12200	SAMS
Standard Payload Computer	2000001	MSG
WV Sensor Bracket Assembly	436.103.AA	MSG
MSG Work Volume Illumination Unit Assembly	436.104.AA	MSG
Gas Sensor Conditioner	436.107.AC	MSG
Filter Delta P Sensor Box left	436.107.AD	MSG
WV Delta P Sensor Box Assy	436.107.AF	MSG
AHU Fan	436.108.AA	MSG
Internal Ctrl Panel	436.110.AA	MSG
Test Conditioner Box	436.112.AA	MSG
E-Box Assembly	436.140.AB	MSG
MSG Temperature Sensor Conditioner MTL IN	436.160.AG	MSG
Front Filter	500.104.AA	MSG
AAA Fan Assembly	6047.03.AB	MSG
AAA Fan Filter	6047.03.AC	MSG
AAA Fan Filter	6047.03.AC	MSG
AAA Control Unit (E-Box)	6047.03.AD	MSG
Area Smoke Detector Assembly	64647 2119818	MSG
Video Fuse Cartridge	7009.20.AH	MSG
Footswitch	7009.20.AO	MSG
STD Camera 4	7009.80.AA	MSG

Appendix L - Non-Boeing Sustained Payload Facilities for Functional Analysis (SOW 6.88 and 3.3.8.2.2)

Nomenclature	Part Number	Associated Function
STD Spare Lens	7009.80.AB	MSG
WA Spare Lens	7009.80.AC	MSG
Digital Recorder 2	7009.80.AD	MSG
Hi8 Recorder 3	7009.80.AE	MSG
Video Monitor 2	7009.80.AF	MSG
Touchpad	7009.80.AG	MSG
Velcro Mounting Pad	7009.80.AI	MSG
MSG Velcro Mounting Pad	7009.80.AI	MSG
Extension Cable	7009.80.AJ	MSG
Video multipurpose arm	7009.80.AM	MSG
C Track Adapter	7009.80.AP	MSG
Fuse 3A	F03A250V-3A	MSG
Fuse 5A	F06A250V5A	MSG
AL Pressure and Temperature Sensor Box	MSG357	MSG
AL Front Door Seal	MSG506	MSG
AL Top Lid Seal	MSG507	MSG
ESEM1	SPO-PD-030200	MSG
ESEM 2	SPO-PD-030300	MSG
ESEM 3	SPO-PD-030400	MSG
ESEM 4a	SPO-PD-030500	MSG
SIDE PORT	436.100.AB	MSG
Front Window Assembly	436.100.AH	MSG
Fire Hole	436.100.AJ	MSG
Flapper Unit Assembly	436.101.AA	MSG
MSG PCV Motor Drive Assy	436.109.AE	MSG
MSG CMP Power Status Panel	436.130.AD	MSG
MSG CMP Test Interface Panel	436.130.AE	MSG
MSG CMP Switch Panel	436.130.AF	MSG
MSG CMP Information and Control Center Panel	436.130.AG	MSG
MSG CMP Health and Status Panel	436.130.AH	MSG
Power Distribution and Control Box	436.160.AB	MSG

Appendix L - Non-Boeing Sustained Payload Facilities for Functional Analysis (SOW 6.88 and 3.3.8.2.2)

Nomenclature	Part Number	Associated Function
Lust Inverter	436.180.AA	MSG
Loading Port Seal 16"	500.100.58	MSG
4" Gloveport Plug	500.100.AF	MSG
MSG 4" Closed Glove Ring	500.100.AQ	MSG
6" Glovering Assy. (size 7)	500.100.AS.07	MSG
6" Glovering Assy. (size 9)	500.100.AS.09	MSG
MSG Glove Ring Assy (Size 10)	500.100.AS.10	MSG
MSG AL Glove Ring Assy (size 7)	500.100.AT.07	MSG
MSG AL Glove Ring Assy (size 9)	500.100.AT.09	MSG
MSG AL Glove Ring Assy (size 10)	500.100.AT.10	MSG
Rear Filter	500.104.AB	MSG
2" Feedthru Assembly Type 3	500.106.AD	MSG
6" Closed Gloveport Assembly	500.108.AA	MSG
J403 Feedthru	96M53036-1	MSG
J404 Feedthru	96M53037-1	MSG
Fuse 4A	FM09A250V4A	MSG
Airlock E-Box	MSG349	MSG
Airlock Tray	MSG351	MSG
MSG Airlock Illumination Unit	MSG359	MSG
AL Top Lid Interlocking Assembly	MSG365	MSG
Airlock Toplid Handle Assy	MSG366	MSG
AL Tray Bungee	MSG-ATB	MSG
MSG Recompression Valve Assembly	436.020.AB	MSG
UIP Fluid QD MTL Out	683-16348-247	MSG
UIP Fluid QD MTL In	683-16348-248	MSG
UIP GN2 QD	683-16348-332	MSG
UIP VRS QD	683-16348-51	MSG
UIP VES QD	683-16348-57	MSG
Flapper Bank Cover	436.101.AC	MSG
Filter Cap Assembly	500.100.AC	MSG
Filter Cap with Adapter	500.100.AD	MSG

Appendix L - Non-Boeing Sustained Payload Facilities for Functional Analysis (SOW 6.88 and 3.3.8.2.2)		
Nomenclature	**Part Number**	**Associated Function**
L-6 Fastener	500.100.84	MSG
L-12 Fastener	500.100.85	MSG
L-18 Fastener	500.100.86	MSG
L-24 Fastener	500.100.87	MSG
L-30 Fastener	500.100.88	MSG
Particle Catcher	500.100.AE	MSG
6" Gloveport Plug	500.100.AR	MSG
100mm Bungee Cords	MSG1022	MSG
150mm Bungee Cords	MSG1023	MSG
200mm Bungee Cords	MSG1024	MSG
Filter Cartridge	MSG1145	MSG
Straylight Cover	MSG376	MSG
Straylight Cover Side	MSG377	MSG
Spotlight	MSG760	MSG
Gooseneck	MSG830	MSG
AL Airlock Inlet Removal Tool	436.100.100	MSG
GN2 Test Connector	436.800.01	MSG
Vacuum QD Test Connector	436.800.02	MSG
Vent QD Test Connector	436.800.03	MSG
Particle Catcher Adapter	500.100.BA	MSG
Video Drawer	7009.20.AA	MSG
W101	96M00553-01	MSG
W102	96M00554-01	MSG
W201	96M00557-01	MSG
W202	96M00558-01	MSG
W203 Ethernet	96M00559-01	MSG
W205	96M00561-01	MSG
W209	96M00563-01	MSG
Airlock Return Bezel Assembly	96M44005-1	MSG
Plug Assembly	96M44006-1	MSG
MSG Comp Based Training	96M53001-1	MSG

Appendix L - Non-Boeing Sustained Payload Facilities for Functional Analysis (SOW 6.88 and 3.3.8.2.2)

Nomenclature	Part Number	Associated Function
MLC	96M53004-1	MSG
Fuse Box	96M53005	MSG
Assorted Ziplock Bags	96M53008	MSG
Tissues	96M53009-1	MSG
Velcro Cable Ties	96M53011-1	MSG
MLC 28V Brick	96M53014-1	MSG
RS422/232 Converter	96M53016-1	MSG
Ethernet Cable	96M53017-1	MSG
Ethernet Card	96M53017-1	MSG
1553 Card Cable Assy.	96M53018-1	MSG
1553 Card	96M53018-1	MSG
W206	96M53020-01	MSG
Short Velcro Strip	96M53032-3	MSG
Long Velcro Strip	96M53032-7	MSG
System Software CD	96M53034-1	MSG
MSG Compact Disk Assembly	96M53034-3	MSG
MLC Bogen Arm	96M53040	MSG
Multipurpose Mount	96M53041-1	MSG
W204 Sams Data	96M53043-01	MSG
W210	96M53046-01	MSG
W105	96M53047-01	MSG
Threaded Fastener Bag	96M53050	MSG
W212 MLC Ethernet Cable	96M53406-1	MSG
MSG Cartridge Adapter	96M53407-1	MSG
MSG USB E-Net Adapter	96M55014-001	MSG
Fuse 12A	F03A250V12A	MSG
Fuse 5A	F03A250V5A	MSG
Spotlight Cable	MSG832	MSG
Rack Power Switch Label	SDG32107033-001	MSG
Fire Port Label LAB1S2_J2	SDG32108589-004	MSG
Contents Label LAB1S2_H1	SEG32106109-029	MSG

Appendix L - Non-Boeing Sustained Payload Facilities for Functional Analysis (SOW 6.88 and 3.3.8.2.2)		
Nomenclature	**Part Number**	**Associated Function**
MSG Tool - 3/8" DRIVE TRIPLE SQUARE M5	SF49X-M5	MSG
ESEM General Assembly	SPO-PD-032000	MSG
ESEM Housing	SPO-PD-032100	MSG

APPENDIX M – FUNCTIONAL CARGO BLOCK (FGB) HARDWARE TO BE ANALYZED FOR SPARING

APPENDIX M- FUNCTIONAL CARGO BLOCK (FGB) HARDWARE TO BE ASSESSED (SOW 6.89)	
Part Name	**Part Number**
Container КР-МПА	АФЕК.464512.001
Container КП-МПА	АФЕК.468179.002
Container КС1-МПА-01	АФЕК.468179.003-01
Container КД1-МПА	АФЕК.468364.071
Terminal strip ЛКВ-П	АФЕК.687228.012
Terminal strip ЛКВ-О	АФЕК.687228.013
Terminal strip ЛКП	АФЕК.687228.005
Terminal strip ЛКК	АФЕК.687228.015
Terminal strip ЛКК	АФЕК.687228.015-01
Set of cables	АФЕК.442611.088
Digital user I/O adapter (23A287M) (program logic control device (УПЛУ))	Т63.036.053
Relay user signal I/O adapter (23A288) (УПЛУ)	Т63.036.041
Custom logic processor (23A291) (УПЛУ)	Т63.031.107
Status monitoring device (ПКС) УПЛУ (41А-01)	Т62.393.108
23A281-4 standard switching device	Т62.393.085
23A281-5 standard power switching device	Т62.393.087
11M157M circuit breaker unit	Т62.395.001
АП-1М automatic switch	6АГ.296.072 ТУ
УКТ-90 amplifier switch	СЛИЮ.461241.005
РБС-10/3 onboard outlet	17КС.10Ю.2454-0
ЩО-ЛО lighting panel	17КС.10Ю.2406-0
Light ССД-305	НКГД.441467.066ТУ
Radio telemetry device ТА-948.04	ИЮ2.158.024-04
Transmitter ША 262С	ИЮ2.010.039-14
Transmitter ША 262И	ИЮ2.010.039-08
Local switch ТА203М	ЦХ2.148.004
Local switch ТА204М	ИЮ2.148.063

APPENDIX M- FUNCTIONAL CARGO BLOCK (FGB) HARDWARE TO BE ASSESSED (SOW 6.89)	
Part Name	**Part Number**
Temperature measuring system СИТ 9Л	ИЮ2.148.054 СП
Static memory device СЗУ-ЦУ8	ЦВИЯ.467666.013
Cross connection unit ТА601	ИЮ2.148.060 СП
Cross connection unit ТА604	ИЮ3.027.014 СП
Distribution unit ТА044	ИЮ2.393.506
Time transducer ЮА059 М1	ИЮ3.097.680
Sawtooth voltage sensor ДПН9	ИЮ3.263.001 СП
Set of cables to check the system	TBD
Data output subsystem ТА124	ИВЯФ.468173.069
ПТАБ-2 storage battery current converter	ЕИГА 435241.001-02 ТУ
БУПТ-2 current converter control unit	ЕИГА 468333.001-02 ТУ
РТ-50-2 current controller	ЕИГА 435264.001-02 ТУ
СНТ-120/28 V voltage and current stabilizer	ЕИГА 435253.014 ТУ
СНТ-28/120 V voltage and current stabilizer	ЕИГА 435253.015 ТУ
800А storage battery	ИКШЖ.563534.007 ТУ
МИРТ-3 charge-discharge current integrator	СЛИЮ.411613.001 ТУЭ
Current source	ИТ-50М
Digital voltmeter	GDM type
Oscilloscope	TDS type
Power source	Б5-49 type
Replaceable low-noise dust collector filter	МБП-1Ф
Set of sanitary wipes for treating surfaces kits	Хт4.160.003 ТУ
Low-noise dust collector fan	МО-2М-01
Low-noise dust collector (per specs 342-3160.000 ТУ)	МБП-1
Smoke detector СВТ 1592.00.000	ИДЭ 3
Fire extinguisher	ОСП-4,11Ф77-7892-0
Gas mask	ИПК -1М, Вт 8.068.09.000
Fungistat set	Хт4.160.657 ТУ
Samplers kit	Хт4.160.001 -03
Fan	МО-1М
Fan	МО-2М
Fluid flow regulator replaceable panel (СП РРЖ)	77КМ-7651-900-01
Internal hydraulic loop replaceable pump panel (СПН ВГК)	77КМ-7618-100
External hydraulic loop replaceable pump panel (СПН НГК)	77КМ-7651-300
Air duct	77КМ-7660-340
Air duct	17КС-7664-70-01
Air duct	17КС-7664-70-02
Air duct	77КМ-7660-50

APPENDIX M- FUNCTIONAL CARGO BLOCK (FGB) HARDWARE TO BE ASSESSED (SOW 6.89)	
Part Name	**Part Number**
Air duct	77КМ-7660-130
Matching unit [УС-31]	ПИМЖ.466225.026
Converter (ПС) 28.5/120-90	МКТН.435151.002
Terminal switch unit [КСР]	17КС.33Ю 2334-0
Local analog switch ТА249М	ИВЯФ.468349.014-03
Local digital switch ТА250	ИВЯФ.468349.015
Local temperature switch ТА251	ИВЯФ.468349.055
Local analog switch ТА252	ИВЯФ.468349.017
Local digital switch ТА253	ИВЯФ.468349.018
Local group secondary power source ТА818М	ИВЯФ.436734.039
Programmable memory device ТА765Б	ИВЯФ.431212.005
Switch ТА056	ИЮ2.393.568
Command generator (БФК)	37КС.1610-0
Nitrogen pumping system avionics unit (БАСПА)	17КС.32Ю 2506-0
Compressor power unit (БПК)	17К.8281-0А
Filter unit (БФ)	17КС.32Ю 2505А-0
Power distribution panel (-) (РЩМ)	17КС.10Ю 2412-0
Power distribution panel (+) (РЩП-С)	17КС.10Ю 2414-0
Power distribution panel (+) (РЩП-С1)	17КС.10Ю 2415-0
Power supply switching unit (БКПТ)	17КС.10Ю 2722-0
High gain antenna [ОНА] power switching unit (БСК)	17КС.10Ю 2740-0
Power switching unit БСК-1	17КС.10Ю 2703-0
Power switching unit БСК-1В	17КС.10Ю 2704-0
Power switching unit БСК-2	17КС.10Ю 2705-0
Power switching unit БСК-2В	17КС.10Ю 2706-0
Power switching unit БСК-5	17КС.10Ю 2707-0
Power switching unit БСК-5В	17КС.10Ю 2708-0
Power switching unit БСК-7.5В	17КС.10Ю 2710-0
Power switching unit БСК-25	17КС.10Ю 2715-0
Power switching unit БСК-50	17КС.10Ю 2719-0
Power switching unit БСК-50В	17КС.10Ю 2720-0
Integrated propulsion system (ОДУ) power switching unit (БСК)	17КС.10Ю 2733-0
Standard relay unit (БРУ)	11Ф732.7854-0
Fuse box panel БПП-2	17КС.10Ю 2441-0-01
Fuse box panel БПП-20	17КС.10Ю 2441-0-19
Docking system command processing unit (БОК СС)	17КС.10Ю 2231А-0
Command processing unit (БОК) for the DC	17КС.10Ю 2244-0

APPENDIX M- FUNCTIONAL CARGO BLOCK (FGB) HARDWARE TO BE ASSESSED (SOW 6.89)	
Part Name	**Part Number**
Command processing unit (БОК) for the МД [unexplained abbreviation]	37КД.2127-0
Short circuit monitoring unit (БККЗ)	17КС.10Ю 2108-0
Sanitary/hygiene water regeneration system (СРВ СГ) command processing unit (БОК)	17КС.10Ю 2219-0
Command processing unit БОК-3	17КС.10Ю 2243-0
Intermodule connection matching unit (БСМС)	17КС.10Ю 2248-0
Matrix commutator for restored channels [КМВК]	17КС.10Ю 2101-0
Matrix commutator with backup commands (КМДК)	17К.7412-0
Triple channel matrix commutator [КМТК]	17К.7413-0
Triple command commutator [КТК]	37КД.2812-0
Backup command commutator (КДК)	37КД.2813-0
Matrix commutator (КТКИ)	17КС.10Ю 2117-0
Command output unit БВК-2	17КС.10Ю 2427-0-04
Command output unit БВК-2	17КС.10Ю 2427-0-05
РБС-10/3 outlet	17КС.10Ю 2454-0
Caution & warning panel (ПСС)	СТИК.468.382.004
Current stabilizer [СТ-25]	ТУ16-87 ИЖЕА.435151.002ТУ
Matching device ВСБ-589	ИХ2.032.260 ТУ
User panel ВСБ-95	ИХ3.624.533 ТУ
ЯУ2.000.032-01	ЯУ2.000.032-01
ЯУ2.008.050	ЯУ2.008.050
ЯУ2.998.064	ЯУ2.998.064
Air flow sensor ИП-1-1	17КС.210Ю1806-30
Air flow sensor ИП-1-2	17КС.210Ю1806-40
Air flow sensor ИП-1-3	17КС.210Ю1806-10