SECTION C

Description/Specifications/Statement of Work

C.1 SCOPE OF WORK

The work the contractor shall perform under this contract is described in the statement of work below:

INTEGRATED MISSION OPERATIONS CONTRACT

STATEMENT OF WORK

INTEGRATED MISSION OPERATIONS CONTRACT (IMOC) INTRODUCTION

Integrated Mission Operations Contract (IMOC) provides support and products for the Mission Operations Directorate (MOD), Avionics and Software Office in the International Space Station (ISS) Program Office, and Flight Crew Operations Directorate (FCOD) ground-based human spaceflight operations capability development and execution. This includes the support to mission preparation (Plan), crew and flight controller training (Train), and real-time mission execution (Fly) activities related to Exploration operations and the International Space Station (ISS) operations. Operations capability development support is required from the contractor as NASA defines operations requirements associated with the emerging programs for the Exploration initiatives (primarily the Multi-Purpose Crew Vehicle Program, but to a lesser extent the Space Launch Systems Program, the Lunar Precursor Robotic Program, the Human Research Program, the Exploration Technology Program, the Commercial Crew and Cargo Programs and advanced technology and research).

This contract provides ISS Plan-Train-Fly (PTF) mission operations and for Human Spaceflight Operations capability development associated with Exploration initiative derived programs.

The Government will lead, and is responsible for, mission execution and requisite mission preparation tasks, new capability development, non-mission specific Programmatic support tasks, and disposition of anomalies.

The contractor will provide the work as defined in the Statement of Work. The Government will define requirements and develop specifications for future use. The contractor will not be required to prepare, or assist in preparing, work statements, specifications, or requirements to be used in competitively acquiring services, or to provide material leading directly, predictably, and without delay to such work statements, specifications, or requirements unless the intended procurement is a sole source to the contractor, the contractor has participated in the development and design work, or unless more than one contractor has been involved in preparing the work statement.

1.0 MANAGEMENT

Management tasks are to be performed by the contractor in order to develop and deliver the required support to MOD, ISSP Avionics and Software Office, and FCOD for ground-based human spaceflight operations.

1.1 MANAGEMENT PROCESSES, PLANNING, AND REVIEWS

The contractor shall manage the IMOC personnel and processes to accomplish the requirements identified below.

The contractor shall prepare all contract documentation in accordance with the DRDs.

The deliverables associated with the planning DRDs, once approved, shall become part of the contract, and the Government will utilize these deliverables to evaluate the contractor's performance.

The contractor shall comply with all applicable regulations, NASA Directives, JSC Directives, and JSC internal documents (Attachment J-3).

The contractor shall obtain NASA approval prior to initiating or terminating any activity that requires a change to a NASA or other NASA contractor process. In the event that this change

may impact this or other contract value, the approval shall be obtained from the Contracting Officer.

The contractor shall provide and maintain an IMOC Management Plan (DRD-IMOC-01). The contractor's management structure shall fully integrate all related management plans, including those of its subcontractors and major vendors. The contractor shall include a continuous improvement (CI) plan in the IMOC Management Plan and how this CI plan is a part of management policies, procedures, and techniques. The contractor shall address the functions and data requirements described in this SOW in the management plan.

The contractor shall develop a process by which employees will complete certification training in accordance with the IMOC Personnel Certification Management Plan (DRD-IMOC-02). The contractor shall provide retention capability for certified flight controllers, instructors, and analysts in accordance with the IMOC Critical Skill Retention Plan (DRD-IMOC-03).

The contractor shall utilize government-furnished discrepancy and anomaly reporting systems and databases for NASA systems including the following:

a. NT/Quality Assurance Discrepancy Reporting and Tracking System (QARC).
b. EG/Distributed Defect Tracking System.
c. ISS Problem Reporting and Corrective Action (PRACA).
d. ISS Change Paper and Version Control System (PVCS).
e. DA/Discrepancy Report Tracking System (DRTS).
f. DA/Joint Execute Package Development & Integration (JEDI).
g. DA/NBL/SVMF Discrepancy Reporting Systems.
h. Facility Development Operations Contract discrepancy reporting systems.

The contractor shall report discrepancies and anomalies to the IMOC-controlled processes in accordance with the IMOC Quality Management Plan (DRD-IMOC-26) and the IMOC Performance Report (DRD-IMOC-04).

The contractor shall propose cost reductions in order to achieve the NASA cost reduction goals while maintaining technical capability. The contractor shall propose revisions to the NASA processes for efficiency and accuracy and participate in reviews of proposed changes. (IMOC Performance Report – DRD-IMOC-04)

The contractor shall participate in and support NASA management meetings and reviews. These meetings include Flight Operations Integration Group (FOIG), Process Integrity Metrics Review (PIMR), MOD Safety Committee, MOD Staff Meeting, and MOD Leadership Council.

The contractor shall conduct Contract Management Reviews (CMR) to provide NASA with current status of the contractor's financial, workforce, and technical activities. CMRs shall be conducted in accordance with an agreed to schedule. The details of what will be reported are defined in the IMOC Performance Report (DRD-IMOC-04).

The contractor shall develop an IMOC Organizational Conflict of Interest (OCI) Mitigation Plan (DRD-IMOC-05) that will support NASA's OCI mitigation process per the MOD Government OCI Assessment of IMOC.

Deliverables

The contractor shall deliver and maintain the following document(s):

- DRD-IMOC-01: IMOC Management Plan

- DRD-IMOC-02: IMOC Personnel Certification Management Plan
- DRD-IMOC-03: IMOC Critical Skill Retention Plan
- DRD-IMOC-04: IMOC Performance Report
- DRD-IMOC-05: IMOC Organizational Conflict of Interest (OCI) Mitigation Plan

1.1.1 FIRST LINE MANAGEMENT

For both Prime and Subcontract, the contractor shall provide the business management control of the resources allocated to technical task and delivery order work content within discrete program funding levels.

1.2 RISK MANAGEMENT

The contractor shall implement risk management policies, processes, and standards as defined by NASA and shall manage risks according to the IMOC Risk Management Plan (DRD-IMOC-06). Risk management requirements include:

a. The contractor shall identify, evaluate, manage, and control the safety, technical, cost, and schedule-related risks associated with all aspects of the performance of this contract.

b. The contractor shall provide substantiating data for each identified risk in the form of historical information and analysis.

c. The contractor shall communicate identified risks to NASA management.

d. For contractor proposed process changes, the contractor shall provide a risk assessment and corresponding issues to NASA management.

e. The contractor shall provide risk mitigation as part of their assessment.

Deliverables

The contractor shall deliver and maintain the following document(s):

- DRD-IMOC-06: IMOC Risk Management Plan

1.3 PROJECT INFORMATION RESOURCES AND PERFORMANCE MANAGEMENT

The contractor shall provide and maintain an integrated Performance Measurement System (PMS) that provides resource and financial management for the accumulation, documentation, and analysis of cost and workforce data. The system will be the basis for communication with NASA concerning financial planning and control, accounting of accrued expenditures and other liabilities, evaluation of cost performance, and forecasting of cost and workforce requirements. The contractor shall provide the baseline of financial parameters.

The contractor shall provide an IMOC Contract Work Breakdown Structure (CWBS) (DRD-IMOC-07). The MOD WBS for this contract will be the IMOC SOW structure with delimiters for the MOD organizations and programs supported.

The contractor shall provide and present cost and technical reporting and budgetary estimates per the IMOC Financial Management Report (NF533) – DRD-IMOC-08, and IMOC Performance Report – DRD-IMOC-04. Reports and estimates will correspond to the government fiscal year. NF533 will provide cost reporting by fund source and WBS including:

a. Elements of cost and workforce including labor equivalent personnel (EP).

b. Overhead costs.

c. Other direct and indirect costs.

The contractor shall provide an on-line database accessible to NASA which provides accurate and timely resource information such as resource plans, workforce staffing, and actual costs.

The contractor shall provide financial planning data to support the government budget process including:

a. Planning, Programming, Budgeting, and Execution [PPBE] budget calls

b. Operating plan budget calls

c. Construction of Facilities (CofF) budget calls

d. Support special requests for budget impacts.

The format and content of the contractor's inputs and supporting rationale shall be in accordance with the budget or special request guidelines and reporting format specified by NASA. The contractor shall provide cost and schedule integration when requested by NASA.

The contractor shall support programmatic technical, cost, and schedule reviews, providing NASA with insight into the contractor's, subcontractors', and vendors' overall technical, schedule, and cost performance. The presentations shall depict performance measurement, accomplishments, issues, corrective actions, and enhanced variance reporting which will provide more insight into the cause of the variance.

The contractor shall track and report on-site and off-site workforce per the IMOC Workforce Report (DRD-IMOC-09).

The contractor shall develop and maintain performance metrics which effectively indicate the level of success in execution of the contract requirements. This task includes definition and development of the metrics; correlation of the metrics to the requirements; and measurement of management responsiveness to the performance indicated by the metrics. Performance reporting (IMOC Performance Report – DRD-IMOC-04) is also required on subcontracts that the contractor has determined, based on risk, schedule criticality, or dollar value, have the potential to impact the successful fulfillment of this contract. The contractor shall provide NASA direct electronic access to the contractor PMS including direct log-on capability into the system from JSC intranet.

For development and production efforts which may be authorized in this contract, the contractor shall provide performance reporting (DRD-IMOC-04) in accordance with NPD 9501.1, NASA contractor Financial Management Reporting System, which correlates work accomplished and actual costs against baseline cost plans and schedules.

The contractor shall provide a summary of the performance report in the CMR. This summary report includes technical issues and accomplishments, analysis of cost and schedule performance, and corrective actions in problem areas.

The contractor shall provide wage/salary and fringe benefit data in accordance with IMOC Wage/Salary and Fringe Benefit Data (DRD-IMOC-10).

The contractor shall provide analytical models, unique tools, supporting documentation, equipment, and resource/cost information upon Contracting Officer's request in accordance with IMOC Reprocurement Data Package (DRD-IMOC-11).

Deliverables

The contractor shall deliver and maintain the following document(s):

- DRD-IMOC-07: IMOC Contract Work Breakdown Structure (CWBS)
- DRD-IMOC-08: IMOC Financial Management Report (NF533)
- DRD-IMOC-09: IMOC Workforce Report
- DRD-IMOC-10: IMOC Wage/Salary and Fringe Benefit Data
- DRD-IMOC-11: IMOC Reprocurement Data Package

1.4 CONTRACT MANAGEMENT

The contractor shall provide overall management of the contract requirements.

The contractor shall manage and control the work and resources within discrete program funding levels.

1.4.1 PRIME CONTRACT MANAGEMENT

The contractor shall perform all tasks associated with administering this contract.

1.4.2 SUBCONTRACT MANAGEMENT

The contractor shall accomplish the management and technical control of subcontractor(s) required to fulfill the contract. The contractor shall define the managing of the subcontract effort as described in the IMOC Management Plan (DRD-IMOC-01).

The contractor shall provide management visibility into all aspects of subcontractor activities, and this visibility shall be integrated with other required management systems and reporting requirements of the prime contractor.

1.5 INFORMATION, DOCUMENT, AND RECORDS MANAGEMENT

The contractor shall provide information, document, and records management in support of contract requirements.

1.5.1 INFORMATION AND DOCUMENT MANAGEMENT

The contractor shall develop, maintain, operate, and secure information systems which provide for the management, preparation, publication, control, and dissemination of information and documents required by this contract. The contractor's information management activities shall include operating and maintaining a document and data repository or repositories for originals in any media including classified and proprietary documents. The contractor shall document its process for the management of all data and documents generated under this contract in accordance with the IMOC Document Data Management Plan (DRD-IMOC-11), which shall be compliant with JPD 2314.2, Managing Internal JSC Documents and other associated document control Directives identified in J-3.

The contractor shall maintain files of the contractor documentation required to perform all the tasks in this SOW. The contractor shall establish a formal documentation release system and a system for rapid retrieval of all records.

The contractor shall include data security (integrity, availability, confidentiality) requirements to assure that the data, processes, and tools are protected from security breaches.

The contractor shall ensure that their IT systems are interoperable with NASA IT systems.

Deliverables

The contractor shall deliver and maintain the following document(s):

- DRD-IMOC-12: IMOC Document and Data Management Plan

1.5.2 RECORDS MANAGEMENT

The contractor shall maintain accurate originals. The contractor shall comply with the records control processes as required in the NPD 1440.6, *NASA Records Management*; NPR 1441.1, *NASA Records Retention Schedules*; and JPR 1440.3, *JSC Files and Records Management Procedures.*

The contractor shall maintain files of the contractor documentation required to demonstrate performance of all the tasks in this SOW and shall establish a system for rapid retrieval and release of all records.

The contractor shall identify, collect, maintain, and archive all records generated during the performance of all tasks in this SOW in accordance with the IMOC Records Management Plan (DRD-IMOC-12). This shall include plans for disposition of these records at the end of the contract.

Deliverables

The contractor shall deliver and maintain the following document(s):

- DRD-IMOC-13: IMOC Records Management Plan

1.6 CONFIGURATION MANAGEMENT

The contractor shall perform Configuration Management in accordance with the IMOC Configuration Management Plan (DRD-IMOC-13). The contractor's Configuration Management Plan shall provide the following:

a. Configuration identification.

b. Configuration control.

c. Configuration status accounting.

d. Configuration management verification and audits.

Deliverables

The contractor shall deliver and maintain the following document(s):

- DRD-IMOC-14: IMOC Configuration Management Plan

1.7 PROPERTY MANAGEMENT

The contractor shall be accountable for NASA property in accordance with the IMOC Government Property Management Plan (DRD-IMOC-15).

Deliverables

The contractor shall deliver and maintain the following document(s):

- DRD-IMOC-15: IMOC Government Property Management Plan

1.8 SECURITY AND TECHNOLOGY PROTECTION MANAGEMENT

The contractor shall establish an effective and comprehensive program that encompasses control of classified information and material and sensitive but unclassified information, material, and services (including export controlled, proprietary data, and material) in accordance with the IMOC Security Management Plan (DRD-IMOC-16).

The contractor shall maintain a technology protection program in accordance with the IMOC Technology Protection Control Plan (DRD-IMOC-17). The contractor's technology protection program shall encompass control of classified information and material and sensitive but unclassified information, materials, and services (including data and material that are subject to export control and proprietary requirements).

The contractor shall provide internal export control functions for hardware, services, software, and data requiring export in the execution of specific contract responsibilities in accordance with the Department of Commerce (DOC) Export Administration Regulations (EAR), the Department of State (DOS) International Traffic in Arms (ITAR), and the NASA Export Control Program (ECP). The contractor shall ensure that in the absence of NASA exemptions or exceptions, that licenses and Technical Assistance Agreements (TAAs) are in place to support exports. The contractor shall provide the methodology and processes for the application of risk assessment to all security and technology protection activities and the integration of security and technology protection management across the contract and its subcontractors.

Deliverables

The contractor shall deliver and maintain the following document(s):

- DRD-IMOC-16: IMOC Security Management Plan
- DRD-IMOC-17: IMOC Technology Protection Control Plan

1.9 SAFETY, QUALITY ASSURANCE, MISSION ASSURANCE, AND ENVIRONMENTAL MANAGEMENT

Safety, Reliability and Quality Assurance includes the integration of all Safety and Mission Assurance activities (safety, reliability, maintainability, and quality) into mission operations to ensure the mitigation of risk.

1.9.1 OCCUPATIONAL SAFETY

The contractor shall implement an occupational safety and health (OS&H) program that monitors activities to ensure compliance with NASA and Occupational Safety and Health Administration (OSHA) requirements.

The contractor shall protect personnel, property, and equipment.

The contractor shall develop, implement and maintain a Safety and Health Plan to establish Safety, Health, and Environmental Compliance requirements for providing support to NASA organizations in accordance with the IMOC Safety and Health Plan – (DRD-IMOC-21. The plan shall include:

a. Processes for reporting and investigating mishaps within facilities controlled by the contractor.

b. Provisions for NASA approval of risk associated with occupational hazards not eliminated or controlled.

c. Reporting, investigation, and corrective actions in accordance with guidelines found in NPR 8621.1, NASA Procedural Requirements for Mishap Reporting and Close Call Reporting, Investigating, and Recordkeeping.

d. Plans for contingency and emergency situations.

e. Exercises and simulations that promote employees awareness and action to contingency and emergency situations and participation in government exercises and simulations upon request.

The contractor shall report and investigate those mishaps resulting in personnel injuries or damage to NASA property. The contractor shall provide summary data on all mishaps that occur on NASA property and contractor operated sites in accordance with the IMOC Safety Summary Report – (DRD-IMOC-22). The report shall include:

a. Assessments of accident impacts to cost.

b. Schedule and mission performance

c. Remedial and corrective actions performed.

The contractor shall report monthly metrics for the contractor's safety and health program in accordance with the IMOC Monthly Safety and Health Metrics – (DRD-IMOC-23).

The contractor shall provide a safety and health program that complies with the JSC on-site Voluntary Protection Program (VPP) Star Site certification.

The contractor shall provide a safety and health program self evaluation in accordance with the IMOC Safety and Health Program Self Evaluation (DRD-IMOC-24).

Safety and health discrepancies shall be reported in accordance with the IMOC Performance Report (DRD-IMOC-04).

Deliverables

The contractor shall deliver and maintain the following document(s):

- DRD-IMOC-21: IMOC Safety and Health Plan
- DRD-IMOC-22: IMOC Safety Summary Report
- DRD-IMOC-23: IMOC Monthly Safety and Health Metrics
- DRD-IMOC-24: IMOC Safety and Health Program Self Evaluation

1.9.2 MISSION AND QUALITY ASSURANCE

The mission and quality assurance requirements are embedded in the Human Spaceflight Mission Operations Support sections (2.0, 3.0, 4.0, and 5.0) and section 6.0 FCOD Support.

1.9.3 ENVIRONMENTAL MANAGEMENT

The contractor shall protect the environment by ensuring that all work performed and equipment used on-site at JSC, Ellington Field, Sonny Carter Training Facility, and El Paso Forward Operating Location to fulfill the requirements of this contract are in compliance with all Federal, state, and local regulations and public laws, and the following NASA JSC directives: JPD 8500.1,

JSC Environmental Excellence Policy**;** JPR 8550.1, JSC Environmental Compliance Procedural Requirements**;** JPR 8553.1, JSC Environmental Management System Manual**;** CWI JE9W-06, EMS Aspect/Impact Assessment and EMP Process**;** NPR 8570.1, Energy Efficiency and Water Conservation**;** JSC's Energy and Water Conservation 5-Year Plan; and CWI J69W-03, Energy Conservation (Reference Section H). The contractor shall provide data on affirmative procurement, waste reduction activity, energy efficient product procurement, and ozone depleting substances in accordance with DRD-IMOC-25, Environmental and Energy Consuming Product Compliance Reports.

Deliverables

The contractor shall deliver and maintain the following document(s):

- DRD-IMOC-25: IMOC Environmental and Energy Consuming Product Compliance Reports

1.10 QUALITY MANAGEMENT SYSTEM AND ADMINISTRATION

The contractor shall develop, implement, and maintain a Quality Management System which is certified by a third party and is compliant with the ANSI/ISO/ASQ Q9001-2000 Quality Management Systems - Requirements (IMOC Quality Management Plan - DRD-IMOC-26).

The contractor shall provide input to quality management forums (e.g., the Quality System Panel (QSP), the Quality System Management Review (QSMR)).

The contractor shall support government audit and surveillance of contractor plans, procedures, and processes when deemed necessary by the government. These audits and surveillances will provide understanding and insight of processes and procedures that NASA has identified as critical; have the potential for impact to future mission schedules, or as needed. Government audits and surveillances will include all disciplines and tasks which are involved with or support mission operations, safety and quality assurance, logistics, procurement, and financial operations.

Deliverables

The contractor shall deliver and maintain the following document(s):

- DRD-IMOC-26: IMOC Quality Management Plan

1.11 COMMERCIAL MARKETS

The contractor shall deliver and maintain a Commercial Market Report (CMR) that describes the market for MOD's plan/train/fly services, in accordance with DRD-IMOC-18.

Deliverables

The contractor shall deliver and maintain the following documents(s):

- DRD-IMOC-18: IMOC Commercial Market Report (CMR)

HUMAN SPACEFLIGHT MISSION OPERATIONS SUPPORT

2.0 OPERATIONS INTEGRATION

Operations Integration is considered to be that support that goes across all aspects of MOD's PTF functional areas of support.

2.1 ADMINISTRATIVE SUPPORT

2.1.1 MEETING AND LOGISTICS SUPPORT

The contractor shall provide administrative logistical support, documentation preparation, agenda preparation, and minute's publication for various meetings. These include meetings such as the Flight Operations Reviews (FORs), MOD Flight Readiness Reviews (FRRs), Flight Techniques Panel (FTP) meetings, Joint Operational Panel (JOP) meetings, MOD Projects Integration Board (MPIB) meetings, International Display and Graphics Standards (IDAGS) or equivalent, Flight Rules Control Board (FRCB), Flight Operations Integration Group (FOIG), and Project-specific Control Board meetings.

2.1.2 EXPORT CONTROL PROCESS SUPPORT

The contractor shall provide export control compliance services (ref MOD Export Control Process DA-WI-05 and JSC Export Compliance Work Instruction J29W.01) including:

a. Identification of export classification (ITAR versus EAR).

b. Identification of applicable exemptions or exceptions.

c. Preparation for NASA signature of the paperwork required for export control (such as JSC Forms 1724 and 1735, Controlled Area Access cards).

2.1.3 EDITORIAL AND ELECTRONIC MEDIA SUPPORT

The contractor shall provide the logistical function of documentation formatting, editing, updating, reviewing, and publishing, and distribution of mission operations documentation in hardcopy and in electronic media. The contractor shall provide administrative support for electronic media used in MOD. This includes graphics development and technical assistance for the development and administration of web and SharePoint sites.

The contractor shall develop new and modify existing processes in accordance with the IMOC Guide for Editorial and Logistical Support to Operations Documentation (DRD-IMOC-31), which includes configuration management processes that involve the following:

a. Receiving written or electronic material from MOD content owners and formatting the content as required by the owner's requirements or NASA standards.

b. Verifying and incorporating crew procedures standards.

c. Maintaining schedule for technical review and document publication.

d. Implementing document guidelines.

The contractor shall implement a review process that will ensure content true to the MOD owner's input and publication by the owners need date or as negotiated.

Deliverables

The contractor shall deliver and maintain the following document(s):

- DRD-IMOC-31: IMOC Guide for Editorial and Logistical Support to Operations Documentation

2.1.4 LIBRARY AND DOCUMENTATION MAINTENANCE

The contractor shall maintain the MOD Libraries and console documentation in order to effectively and efficiently support the day-to-day office operations of MOD and real-time mission operations in accordance with the IMOC MOD Library Handbook and Glossary (DRD-IMOC-32), which includes:

a. Real-Time Mission Support Services:
    1. Real-time mission printing and distribution capabilities.
    2. Administrative Mission Support.
        i. Conference Room Management (currently 5 conference rooms to manage).
        ii. Documentation Updates (e.g., ODF, Flight Rules, Handbooks).
        iii. Shift Recorder updates.
        iv. Maintain control room supplies (printers, office supplies).
        v. Assign headset lockers.
        vi. Maintain list of console telephone numbers.

b. Technical Data Services:
    1. Library Collections:
        i. Collection/File Maintenance.
        ii. Perform Checkout/in of training materials, reference data, etc.
        iii. Organize collections.
        iv. Perform Archival of library collections.
    2. Customer Service:
        i. Research Assistance for Engineering Data.
        ii. Provide training on use of JSC electronic repositories.
        iii. Plot/print engineering drawings.
    3. Verification tasks:
        i. Performs CoFR Verification Tasks.
        ii. Drawings, Technical Data (Electronic or Hardcopy).

Deliverables

The contractor shall deliver and maintain the following document(s):

- DRD-IMOC-32: IMOC MOD Library Handbook and Glossary

2.2 SAFETY INTEGRATION AND ANALYSIS

The contractor shall provide assessments and recommendations for NASA on spacecraft and payload safety requirements and compliance. This includes safety issue resolution, real-time safety analysis, and safety knowledge for various pre-flight planning meetings (e.g., Joint Operations Panels, Flight Techniques, and Safety Review Panels). The contractor shall provide safety assessments and recommendations on design and requirements; procedures and flight rules; integrated hazard analyses (including facilitating and technical input to operational controls agreements (such as Operational Controls Agreements Database (OCAD)); integrated safety verification reports (e.g., Independent Safety Verification Review (ISVR)); safety data packages; test assessments; reports; and development test reviews. The contractor shall participate in working groups, reviews, control boards, and panels in order to provide technical operational inputs into safety analysis and integration.

The contractor shall present the MOD position in safety forums such as the Safety Engineering Review Panel (SERP) or equivalent, S&MA Safety Boards and Payload Safety Panel.

The contractor shall provide technical inputs for the maintenance of MOD Safety Reliability & Quality Assurance (SR&QA) Plan (JSC 36528). The contractor shall provide support in the assessment for compliance of MOD SR&QA Plan.

The contractor shall prepare Hazard Analyses per JPR 1700.1 JSC Safety and Health Handbook for IMOC activities to comply with facility system safety requirements to identify critical items for mitigation or elimination (e.g., Space Vehicle Mockup Facility user testing).

2.3 DOCUMENTATION MANAGEMENTSUPPORT

2.3.1 OPERATIONS DOCUMENTATION MANAGEMENT

The contractor shall develop, maintain, and ensure technical accuracy of mission operations documentation to support missions and training. The contractor shall ensure the document's content technically fulfills mission requirements. The contractor shall attend procedure validation sessions and hardware and software testing in order to obtain technical content. The contractor shall ensure that the document is published and distributed to a specified schedule based on program or mission milestones in order to effectively support the training and mission schedules. This includes crew procedures books, flight controller procedures book, mission constraints documentation, mission preparation procedures, user guides, and technical operations support documentation (e.g., systems manuals, drawings, schematics).

The contractor shall assist MOD in maintaining non office automation related IT equipment in support of crew procedures book fabrication.

2.3.2 FLIGHT RULES SUPPORT

The contractor shall support Flight Rules generation and publication in accordance with the IMOC Flight Rules Production Plan (DRD-IMOC-33). Support includes:

a. Editing technical inputs into the flight rule document standards and formats.

b. Attending meetings to discuss schedules and flight rules production processes.

c. Maintaining and distributing Flights Rules documents.

Deliverables

The contractor shall deliver and maintain the following document(s):

- DRD-IMOC-33: IMOC Flight Rules Production Plan

2.4 TECHNICAL INTEGRATION AND PRODUCTION PROCESS SUPPORT

The contractor shall support development, management and maintenance of the processes and schedules required to efficiently deliver flight products. The contractor shall establish test requirements and manage the required testing of flight software product deliveries associated with the flight production process. This includes:

a. Schedule integration and schedule performance measurement assessments.
b. Support NASA-led internal studies to reduce turnaround times.
c. Configuration management of the NASA formal change process for the production templates.
d. Metrics development of the flight production process.
e. Production data retention and reacquisition.
f. Risk mitigation assessments (cost and schedule).
g. Assessing change request impacts on mission performance
h. Supporting validation and verification of flight product deliveries.

The contractor shall provide administrative support to the MOD compliance process of ensuring continuity of requirements implementation, across all production disciplines, for flight readiness.

The contractor shall provide schedule and resource impacts to support the government-managed manifest planning efforts.

2.5 SPECIAL DEVELOPMENT PROJECTS

The contractor shall support special Plan-Train-Fly projects. Projects shall be conducted according to the NASA Program and Project Management Processes and Requirements document (NPR 7120.5), the MOD Program-specific System Engineering Management Plans, and the MOD Software Management Plan (JSC 63756). The format and process for reporting on these projects will be specified by NASA.

3.0 MISSION OPERATIONS PREPARATION (PLAN)

Mission Operations Planning covers three distinct aspects of a new program, project, element, hardware or software:

1) The development and formulation work required to support Phase A-D of a new Program
2) Work that is performed during all phases of a Program
3) The tactical Phase E operations support provided for an existing Program

Phase A-D as outlined in the NASA System Engineering Handbook (NASA/SP-2007-6105) includes the work from initial concept development through the Operations Readiness Review Phase E is the recurring work done for each Space Flight mission.

Mission Operations Planning is the preparation for flight and mission execution. Operation planning begins with establishing mission objectives and priorities and continues through preflight preparations. Operations planning uses mission requirements to develop integrated, executable

plans for both the crew and ground team members and the supporting operational procedures needed to accomplish mission objectives. It includes all aspects of mission timeline development (encompasses crew activities, trajectory design, consumables planning, ground commanding events, power resource planning, communication coverage, EVA activity planning, and robotic planning), cargo and payload integration, flight rules development, crew and ground procedure development, command and telemetry definitions, flight techniques development, and utilizing post-flight reports, debriefs and anomaly resolution plus safety and hazard reports during the planning phase. Mission plans are constrained by and conform to the launch commit criteria, operational flight rules, vehicle hardware and software configuration, operational ground rules and constraints, mission priorities and objectives, and engineering specifications that define acceptable flight envelopes, flight safety, and human rating requirements, and other NASA and programmatic policies and regulations. Integration aspects of operational planning requires the participation in meetings in order to acquire, coordinate, and document operational and technical information that impacts flight safety and mission success.

3.1 DEVELOP AND FORMULATION PLANNING (PHASE A-D)

3.1.1 DEVELOP MISSION OPERATIONS CAPABILITY AND PROCESSES

The contractor shall provide support to NASA-led development, assessment, and integration of MOD's mission design and operations processes including:

a. Participating in the development of an efficient and integrated flight production process in support of MOD mission preparation.

b. Participating in NASA-led trade studies and benchmarking to continuously seek improved flight production processes and operational concepts.

c. Supporting the development of the architecture and workflow taking advantage of lessons learned from previous manned space flight programs. This support shall include risk assessments of proposed architecture.

d. Performing research into the Shuttle and ISS Programs' history to determine applicability of existing processes and products as candidates for reuse and document these findings with rationale as input to the NASA-led effort to capture lessons learned.

e. Participating in flight production workflow process testing and validation.

f. Supporting the development of operational baselines, operations concepts, mission timelines, and associated documentation.

g. Assisting in the NASA-led development and evaluation of various mission scenarios, cockpit display options, trajectory profiles, consumables profiles, and flight techniques.

h. Participating in the development of processes for the production, maintenance, and distribution of operations documentation.

i. Conducting analog missions in order to develop operational concepts.

j. Identifying improvements to flight techniques, products, and policies.

3.1.2 VEHICLE REQUIREMENT AND DESIGN SUPPORT

The contractor shall assist MOD in providing operations technical feedback and assessments to design requirements for vehicle (including visiting vehicles to ISS), cargo, flight equipment, and ground systems which includes:

a. Supporting development and design reviews; and technical meetings in order to convey the operations perspective to the design process and gather knowledge.

b. Documenting MOD's recommendations to support vehicle, cargo, flight equipment, and ground systems design and requirement reviews.

c. Reviewing and providing operational feedback to test plans and objectives.

d. Supporting vehicle tests including hardware, vehicle stand alone, vehicle integrated, and end-to-end with the Mission Control Center (MCC), International Partner and other control centers as applicable.

e. Providing support to NASA-led analysis, concepts of operational scenarios, trade study support, test and verification plan inputs, and lessons learned inputs.

f. Providing support for program and project efforts of design engineering, software engineering, specialty engineering, human rating, system architecture, integrated test planning, system requirements, configuration control, and risk management activities.

g. Supporting operations integration tasks, program and project life cycle tasks, and systems flight control operations capability tasks.

3.1.3 MISSION DEFINITION AND EVALUATION

The contractor shall participate in the integration of mission requirements, operational implementation concepts, products, and plans. These inputs will support NASA determination of the vehicle and operations architectures, and requirements. Support will include:

a. Supporting derivation of operations baselines and mission architectures requirements.

b. Ensuring consistency with the vehicle requirements and operations baseline.

c. Developing reports, assessments, and technical evaluations in order to effectively assess, verify, and validate program-level requirements and requirement changes that have potential impact to procedures, safety, or operations.

d. Performing trade studies, analysis, and risk assessments.

3.2 PROGRAM LEVEL PLANNING SUPPORT (PHASE A-E)

Contractor support to NASA Program-led planning involves studying the operational feasibility of Program level mission requirements and priorities, in the context of mission objectives. It entails support to programs in the strategic and tactical planning timeframes.

3.2.1 PROGRAM LEVEL BOARD SUPPORT

The contractor shall provide program level board support by:

a. Providing technical inputs to the MOD representatives to the programmatic boards, associated sub-boards, and panels.

b. Presenting the MOD position.

c. Developing and delivering presentations.

d. Identifying impacts due to proposed requirements changes.

e. Exchanging technical vehicle and operations information.

f. Interfacing with Program element organizations to resolve flight preparation process implementation issues.

g. Participating in NASA-led trade studies, assessment activities, and action item resolution as necessary, to support mission preparation.

3.2.2 MOD COORDINATION OF PROGRAM LEVEL CR

The contractor shall participate in the coordination, technical review, and distribution of Program Level Change Requests (CRs) and presentation material.

3.2.3 FLIGHT SOFTWARE REQUIREMENTS EVALUATION

The contractor shall participate in the MOD operational assessment of flight software requirements/discrepancies and integration of flight software technical issues, operational impacts, and ground system impacts resulting from new requirements and discrepancies.

3.3 INPUTS TO MISSION SYSTEMS DEVELOPMENT (PHASE A-E)

3.3.1 USER APPLICATIONS REQUIREMENTS, PRODUCT DEVELOPMENT, AND ACCEPTANCE TESTING

The contractor shall provide support to MOD's development of requirements and user testing and validation for user applications and tools that are used in PTF operations. The contractor shall under MOD direction prototype tools and user applications for proof of concept to drive out user requirements and shall generate a subset of office automation software/web-type tools. The process for the development of requirements is defined in the MOD Software Management Plan (JSC 63756).

NASA determines and manages all user application tool requirements and with contractor assistance verifies compatibility between user applications and mission and training operating platforms.

The contractor shall, using NASA-identified products, support MOD's generation of displays, model definition, and crew psych support products. Products include:

a. Instructor and flight controller displays used in training and mission facilities
b. Vehicle system/sub-system functional and resource models
c. MOD process flow diagrams
d. Electronic procedures
e. Automation scripts
f. Music, picture, and COTS software for crew use onboard

The contractor shall assist NASA with test and certification of these products for mission use.

3.3.2 MISSION SYSTEMS REQUIREMENTS

The contractor shall provide support to MOD's development of mission systems requirements for mission control, planning, and data management systems such as MCC (including planning

system, core trajectory services system, security, and user applications system), and training facilities (including Space Station Training Facility (SSTF), part- and full-task simulators (including international partner simulators), Space Vehicle Mockup Facility (SVMF), and Neutral Buoyancy Laboratory (NBL). This includes:

a. NASA-led strategic planning based on MOD Needs, Goals, and Objectives.

b. Operations concepts and scenarios.

c. Process flows based on requirements changes.

d. Participation in design reviews including assessment of requirements.

e. Authoring acceptance testing procedures and plans.

f. The conduct of tests for these facilities.

The contractor shall participate in activities for sustaining mission systems including documenting discrepancies, prioritizing sustaining work, and testing resolution of discrepancies.

3.4 MISSION DEVELOPMENT (PHASE E)

3.4.1 MISSION PLANNING SUPPORT

The contractor shall support MOD in providing mission specific and generic planning inputs to the mission planning process to ensure all mission objectives, requirements, and constraints are properly integrated and implemented in the mission plan. NASA determines and manages the planning process and the mission plan. The contractor shall support NASA's resolution of operational issues and development of products required for mission execution. Mission planning products and activities include the following:

a. Develop integrated and executable activity, attitude, trajectory, consumable, resource, robotic, and communication plans and schedules.

b. Support development of planning products and services including process definition, product content and format, and requirements for planning databases and tools.

c. Develop and validate crew procedures that are consistent with mission objectives, vehicle configuration, and ground systems capabilities.

d. Develop ground support products (e.g., console procedures, systems briefs, and schematics).

e. Develop flight rules, launch commit criteria, and other operational constraints.

f. Provide inputs for ground and vehicle displays, vehicle software, command and telemetry definitions, and associated reconfiguration processes.

g. Provide operational inputs (including briefing preparation, execution, and action item response), and technical representation to boards, panels, and working groups (e.g., Operations Readiness Reviews, Joint Operations Panels, Flight Techniques Panels, Operations Working Groups, Technical Interchange Meetings).

h. Review hazard reports, provide inputs to the development of operational controls, and support their inclusion in operational products.

i. Document and utilize lessons learned in the development of the mission plan.

j. Integrate crew, cargo and payload requirements, objectives, and constraints into the executable mission plan, including inventory and stowage management.

k. Provide engineering and operations inputs to the mission planning process, ensuring all vehicle system issues are properly addressed and integrated into the executable mission plan.

l. Participating in benchmarking to continuously seek improved processes and operations

m. Assisting in the development, review, and performance of NASA-led trade studies for operational concepts that impact on-going Program operations.

n. Providing operational technical feedback and assessments to the design requirements for existing operational vehicle, cargo, flight equipment, and ground systems.

3.4.1.1 INPUTS TO COMMAND AND TELEMETRY DATA RECONFIGURATION PROCESS

The contractor shall select the command and telemetry data as inputs to the reconfiguration process to meet mission objectives and to monitor and control vehicle operations. The contractor shall participate in the determination of the criticality values for commands by using standards and spacecraft information, including hazard reports, SSP-50645 ISS Command and Telemetry Team (ICATT) Standards, or equivalent, any program specific standards, and operational judgment.

The contractor shall provide support to the ISSP Avionics and Software Office for tasks including:

a. Document on-board and ground data requirements from various domestic, international, or NASA element providers in support of program objectives.
b. Coordinate command, telemetry and data requirements with MOD and IP-to-MCC-Houston ground segment data teams.
c. Coordinate data and tool requirements for integration into ISS Mission Avionics Reconfiguration System (IMARS), ICATT, Standard Out and MCC-Houston processes.
d. Coordinate command and telemetry processing guidelines into the ICATT production cycle.

3.4.1.2 INTERNATIONAL AND OTHER PARTNER COORDINATION AND SUPPORT

The contractor shall provide an integration role to the International Partners (IPs) and any other partners identified by NASA. These integration tasks include:

a. Planning and executing the mission's tasks relative to the IPs and other partners.

b. Producing integrated flight products.

c. Integrating, developing, and implementing multi-segment procedures.

d. Providing inputs into mission preparatory activities at the IP's and other partner's facilities, such as prelaunch testing, operations integration, training, and other activities preparatory to the launch of the IPs hardware or software.

e. Integrating IP and other partner flight controller operations with MOD flight control elements.

The contractor shall provide flight control team functions at the MCCs of the IPs to accomplish vehicle and flight systems operations to ensure safety and mission success. This includes the task of providing Operations Data File (ODF) coordination to integrate the joint data file requirements for implementation for ISS missions.

The contractor shall provide support to the ISSP Avionics and Software Office for tasks including:

a. Provide technical and programmatic coordination between ISS and the assigned element organization on matters dealing with avionics and software integration.
b. Document data and software requirements from various element providers and participate in NASA-supported element/segment-level reviews.
c. Identify and integrate the resolution of software/data issues.
d. Coordinate and integrate endorsements for the Pre- Stage Operations Readiness Review (SORR) documentation.
e. Initiate scheduling requests (SIFs) in support of joint activities such as testing, hardware and software deliveries.
f. Assist International and other partners in their software deliveries for joint testing and flight following activities.
g. Initiate manifest workflow Change Requests (CRs) for IP and other partner media.

3.4.1.3 CREW ON-ORBIT SUPPORT PRODUCTS

The contractor shall develop, implement, and operate the Crew On-Orbit Support Systems (COSS) software data products to support on-orbit requirements on ISS. Requirements are provided by NASA MOD and assigned ISS flight crew members. The contractor shall also, when required, troubleshoot the software and hardware in support of these functions.

Tasks associated with the COSS data products include:

a. Crew Personal Webpage or equivalent media in support of on-orbit psych support;

b. Building the Crew Support LAN (CSL) or equivalent media;

c. Integrating Computer Based Training (CBTs) and simulators used on ISS;

d. Maintaining the ISS Library Reference Tool or equivalent media; and

e. Provide support for the Space Station Computers (SSC).

3.4.1.4 VIDEO SUPPORT PRODUCTS

The contractor shall provide video recording and editing services in support of MOD Crew and Flight Controller training and Fight Crew operations. The contractor shall troubleshoot the equipment and software related to the support of this function when required.

a. Recording of training sessions/events.
b. Editing of recordings and converting to DVD or equivalent media.
c. Producing computer based training video content.

3.4.2 MISSION ANALYSIS

The contractor shall produce analyses, technical assessments, and anomaly resolution to support mission planning. These tasks include:

a. Developing and evaluating trajectory profiles.

b. Providing analysis of ascent targeting, aborts, phasing burns, orbit insertion, re-entry burns, targeting, re-entry and/or disposal trajectory, and landing site determination and dispersions.

c. Providing ascent and entry range safety analysis.

d. Performing vehicle, cargo and payload assessments.

e. Collaborating with MOD on defining and developing Development Test Objective (DTO) requirements.

f. Performing mission design related spacecraft resource and electrical power analysis.

g. Analyzing robotics maneuvers.

h. Supporting vehicle software changes with new trajectory targeting and mission design procedures.

i. Utilizing information from post mission reports, analyses, debriefs, and anomaly log completion and resolution as the basis for updates to vehicle hardware, vehicle software, mission products, and operational capabilities.

3.4.3 MISSION DESIGN

The contractor shall support the development of mission design products including trajectory, consumable, and robotic profiles and plans that meet mission requirements. The contractor shall support all associated mission specific analyses and integration activities. This includes:

a. Ascent and Entry design, including abort boundary determination, entry profiles

b. Identification of required products to support rendezvous in low earth orbit for all flight phases.

c. Providing analysis and concept of operations for generic and mission specific mission design scenarios.

3.4.4 MISSION READINESS

The contractor shall support MOD's Certification of Flight Readiness (CoFR) process by:

a. Reviewing the contractor-managed mission preparations to ensure mission readiness in accordance with MOD ISS CoFR Implementation Plan (JSC-28140). This includes:

    1. Preparing CoFR documentation ensuring that flight preparation responsibilities and requirements are met and all problems dispositioned.

    2. Preparing readiness statements that cover all processes and products required to satisfy the contractor's responsibilities for mission preparation in accordance with the IMOC CoFR Documentation (DRD-IMOC-34).

    3. Developing and implementing an auditable approach to ensure that flight preparation responsibilities and requirements are met and all problems dispositioned.

b. Providing input to and review of CoFR documentation for government-managed mission preparations in accordance with the MOD ISS CoFR Implementation Plan (JSC-28140).

Deliverables

The contractor shall deliver and maintain the following document(s):

- DRD-IMOC-34: IMOC CoFR Documentation

4.0 MISSION OPERATIONS TRAINING (TRAIN)

Mission Operations training encompasses the tasks, methods, products, and media utilized to fully prepare the personnel involved in the operational design and execution of manned spaceflight missions. This includes instructional capabilities to prepare the spaceflight crew to perform all required tasks between launch and landing; the flight control team members to perform all required tasks to plan and execute spaceflight operations; analysts to develop mission support data products; and instructors to develop and conduct training. Certified instructors are utilized to conduct all training of flight crews and MOD personnel in positions requiring certification. Mission Operations training covers the nominal operation of spacecraft and ground systems; the identification of and response to operational anomalies and malfunctions; execution of the planned timeline (including cargo, payloads, DTOs, stowage packing and unpacking, and transfer operations); and “soft skills” required to be an effective member of a team (e.g., decision-making, leadership, communication, teamwork, situation, and mission cognizance, etc.). Training tasks include managing, planning, and scheduling; developing training methods and processes; collaborating with MOD in defining training requirements and training systems requirements; developing curriculum; delivering training, and maintaining records.

4.1 TRAINING MANAGEMENT AND ADMINISTRATION SUPPORT

The contractor shall provide support to NASA for the planning, integration, scheduling, and tracking of domestic and non-domestic crew training, and MOD flight controller, instructor, and analyst training. The contractor shall also develop, implement and maintain products in support of Crew and Flight Controller training and scheduling. Support includes:

a. Developing, documenting, and maintaining integrated processes and databases used to manage training (e.g., crew training budget process, student evaluation process and database, and instructor feedback process).

b. Providing input to support MOD’s development, documentation, and maintenance of the MOD training standards and processes utilized in the production of all flight specific and generic training products.

c. Supporting the development of MOD personnel certification requirements, crew training plans, and other documentation used to manage training.

d. Providing short and long range planning inputs and constraints to optimize utilization of training systems (e.g., part-task and full-task simulators).

e. Supporting training integration activities required to develop crew training plans and products to accomplish defined mission objectives. These plans and products shall be integrated and coordinated with NASA's international partners to ensure all partners' training requirements are accomplished.

f. Providing training team leads to manage training teams and conduct training (e.g., Station Training Lead, Training Directors).

g. Coordinating with the Flight Crew Office to incorporate their input into all crew training requirements, plans, flows, curricula, and facilities.

h. Identifying and documenting crew issues revealed during training development and execution and working with the relevant operations forums or working groups for resolution.

i. Performing non-training simulator operations in support of real-time mission tests, mission following, procedure validation, and other mission support testing.

j. Inputting training records into MOD's training record system(s) (e.g., Training and Management System (TAMS), Scheduling Training Administration and Records (STAR), Certification Planning and Reporting (CPR) or future training management systems).

k. Collecting data documenting the quality of delivered training in accordance with the IMOC Training Quality Reports (DRD-IMOC-35).

l. Supporting post-flight crew debriefs and other post-training debriefs to gather feedback on training effectiveness.

m. Continuously improving training requirements, curricula, products, and execution.

n. Supporting the MOD CoFR process for training elements per SOW 3.3.4 Mission Readiness.

o. Maintain and manage support tools for Crew and Flight Control team training and scheduling or similar or equivalent function.

The contractor shall provide training to other personnel (e.g., engineering, International Partners, and programs) as directed by MOD.

Deliverables

The contractor shall deliver and maintain the following document(s):

- DRD-IMOC-35: IMOC Training Quality Reports

4.2 TRAINING SCHEDULES

The contractor shall schedule daily training activities for mission-assigned crew members (including IP crew members) while at JSC according to the constraints, priorities, and direction of NASA.

The contractor shall continuously schedule all activities in the MOD training systems for the timeframes allocated for such activities. Training systems include part-task simulators, full-task simulators, mockups, classrooms, and conference rooms. Activities include crew training, non-crew training, instructor practice/certification, user tests/evaluations, and training development. This includes scheduling instructor resources. The contractor shall assist NASA in establishing the training system operational allocation by coordinating with the facility schedulers in other contracts such as Facility Development Operations Contract (FDOC) and NBL/SVMF Operations Contract (NSOC). Short- and long-term priorities are provided by training leads (e.g., Simulation Training Leads (STLs), Training Directors) and NASA management.

4.3 ASTRONAUT CANDIDATE TRAINING

The contractor shall develop the Astronaut Candidate (ASCAN) Training Plan and schedule. The contractor shall coordinate with FCOD and instructor resources to schedule, track, and record training. The contractor shall provide an astronaut candidate training status report.

4.4 FLIGHT CONTROLLER, INSTRUCTOR, AND ANALYST TRAINING/CERTIFICATION

The contractor flight controllers, instructors, and analysts shall be certified per the MOD Space Flight Personnel Certification Plan (DA-WI-16). This requirement includes all activities to obtain certification such as personal studies, stand-alone lessons, integrated simulations, joint simulations with International Partners as appropriate, and evaluations. The contractor shall participate in the flight and mission-specific simulations. This requirement includes planning and execution of joint integrated training simulations utilizing U.S., and IP simulators, MCCs, Flight

Control Teams, and Flight Crews. Contractor personnel shall conform to security clearance, drug testing, Minimum Essential Infrastucture (MEI), and health physicals as required by DA-WI-16.

4.4.1 FLIGHT CONTROLLER, INSTRUCTOR, AND ANALYST TRAINING REQUIREMENTS

The contractor shall provide support to NASA for the development of generic and mission/increment specific training requirements (skills and objectives based on tasks) and discipline specific certification plans (certification guides) in accordance with MOD Space Flight Personnel Certification Plan (DA-WI-16). Contractor support shall include:

a. Conducting training needs assessments.

b. Providing technical input to requirements definition.

c. Documenting and distributing training requirements and certification plans.

d. Documenting mission operation tasks that require training.

4.4.2 FLIGHT CONTROLLER, INSTRUCTOR, AND ANALYST CURRICULUM, LESSON, AND SIMULATION DEVELOPMENT

The contractor shall support the planning and production of generic and mission or increment specific simulation input products by developing simulation timelines, developing simulation scripts, creating data-stores, providing inputs for instructor displays, and creating other simulation unique products.

The contractor shall support the production of lessons and training materials (includes schematics, drawings, and training manuals) based on generic and mission or increment specific-requirements and in accordance with the MOD training development standards and processes. Training curriculum and lessons shall meet Flight Controller, Instructor, and Analyst certification requirements per discipline specific certification plans. Training media includes classroom, part task trainer, full-task trainer, and mockups, as well as on-line lessons and computer based training (CBT) modules to facilitate distance learning. As part of training development, the contractor shall seek learning and cost optimization by supporting NASA-led trade studies and analyses of available facilities, media, and tools used for training.

4.4.3 FLIGHT CONTROLLER, INSTRUCTOR, AND ANALYST TRAINING EXECUTION

In accordance with training requirements, the contractor shall conduct Flight Controller, Instructor, and Analyst training which includes:

a. Teaching lessons.

b. Operating full task simulator console positions as part of the training team to support performance of simulation training.

c. Monitoring, evaluating, and providing feedback of student performance.

d. Monitoring, and providing feedback of training system performance.

4.5 FLIGHT CREW TRAINING

The contractor shall support all facets of crew training preparation, development, and execution for U.S. and foreign crewmembers, and space flight participants. This includes training toward

certification for the Capsule Communicator (Capcom) position, which is staffed by an astronaut, and other personnel selected by FCOD (ref. SOW 6.10 Crew/Vehicle Integration and Testing).

4.5.1 FLIGHT CREW TRAINING REQUIREMENTS

The contractor shall support development and documentation of generic and mission or increment specific crew training requirements (skills and objectives based on tasks) and plans (lesson flows). Contractor support shall include:

a. Conducting training needs assessments.

b. Providing technical input to training requirements definition.

c. Documenting and distributing training requirements and plans.

d. Coordinating with MOD and external organizations (e.g., program office, crew office, IPs, other partners, and other operations personnel) to document the crew tasks requiring training.

e. Coordinating IP and other partner requirements inputs.

f. Developing familiarity with IP and other partner training facilities, curriculum, and courseware.

g. Assessing IP and other partner training requirements and plans.

h. Providing technical input to the development of guidelines, operations concepts, and requirements for multi-segment and joint multi-segment simulation training.

4.5.2 FLIGHT CREW CURRICULUM, LESSON, AND SIMULATION DEVELOPMENT

The contractor shall support the planning and production of generic- and mission- or increment-specific simulation input products by developing simulation timelines, developing simulation scripts, creating data-stores, providing inputs for instructor displays, and creating other simulation unique products.

The contractor shall support the production of lessons and training materials (includes schematics, drawings, crew notes, and training manuals) based on generic- and mission- or increment-specific requirements and in accordance with the MOD Training development standards and processes. Training media includes classroom, part-task trainer, full-task trainer, mockups, and onboard training (OBT), as well as on-line lessons and computer based training modules (CBT) to facilitate distance learning. As part of training development, the contractor shall seek learning & cost optimization by supporting NASA-led trade studies and analyses of available facilities, media and tools used for training.

4.5.3 FLIGHT CREW TRAINING EXECUTION

In accordance with the generic and mission/increment specific training plans (e.g., crew training catalog), the contractor shall conduct flight crew training which includes:

a. Teaching lessons.

b. Providing instructor support for OBT events.

c. Providing instructors to support performance of simulation and team training of flight crews.

d. Monitoring, evaluating, and providing feedback of student performance.

e. Monitoring and providing feedback of training system performance.

The contractor shall assist astronauts at IP and other remote facilities to support crew training activities.

4.6 ADVANCED TRAINING CONCEPTS

The contractor shall support the development of advanced training concepts and products for human space flight systems including cooperative work with the IPs, Department of Defense (DOD), industry, and other NASA centers. The contractor shall participate in NASA-led trade studies and benchmarking of other organizations to continuously seek improved training methods.

5.0 MISSION EXECUTION (FLY)

MOD conducts and is responsible for all real-time NASA human space flight operations and may include support to other space operations, such as ISS visiting vehicles. Space flight operations are executed by a Flight Control Team (FCT) that is led by a NASA Flight Director and consists of flight controllers and support personnel that are functionally organized into various disciplines to optimize effectiveness and efficiency. These disciplines are comprised of both government and contractor personnel, which are required to work together seamlessly to ensure safety and mission success. The flight controller discipline positions, skill mix, and size of the government/contractor participation will be established through concurrence with the Annual Operating Plan and Delivery and Task Orders. The disciplines primarily support operations from the MCC, but may also be required to support from other sites (e.g., IP's, KSC, etc.).

All flight controller positions require training and certification per MOD Space Flight Personnel Certification Plan (DA-WI-16) and discipline specific certification guides. Flight controller functions include monitoring, failure analysis and response, command and control, integration, coordination, communication, planning, and documenting (e.g., anomaly reports, console logs, postflight reports, etc). FCT support is also comprised of off-console support functions including tiger teams, Mission Management Team (MMT), and Mission Evaluation Room (MER).

Mission execution constitutes all phases of flight, including pre-launch, ascent, orbit, descent, landing, post-landing, and subsequent debriefs. Real-time console support for flight operations may be continuous, or on-call.

5.1 REALTIME FLIGHT CONTROL

The contractor shall perform FCT discipline functions for mission execution. The contractor shall be compliant with the FCT's requirements and direction.

5.2 SPACECRAFT ANALYSIS (SPAN)

The contractor shall perform the realtime operations functions of the Spacecraft Analysis (SPAN) console positions. The contractor shall accomplish flight objectives, ensure flight safety and mission success, and develop technical console operations documentation. Development and integration of mission operations concepts, plans, and integrated Anomaly and Chit processing philosophies for the MCCs in Houston, Moscow, and other IP and other partner centers will be conducted to fit current or planned vehicle operations.

5.3 REALTIME ANALYSIS

The contractor shall perform realtime analysis during mission execution to reflect planned or unplanned operations. This includes robotics, consumables, and trajectory.

6.0 FCOD SUPPORT

The FCOD is responsible to the NASA Space Flight or Mission Programs for certain in-line tasks. These tasks include:

a. Providing flight crews to execute the missions planned in the space flight/mission manifests.

b. Providing flight crew input to the development and assessment of new or changing requirements in the Space Flight Programs, including participating in development, execution, and evaluation of human-piloted tests in simulators.

c. Providing flight crew input to the resolution of operations related issues in the Programs.

d. Providing as course of job duties input to and maintenance of the flight crew databases and library.

e. Documentation and configuration control.

The Government will lead and is responsible for new capability development and certain non-mission-specific Programmatic support.

6.1 ASTRONAUT SCHEDULING

The contractor shall provide JSC's unassigned flight crew scheduling function, which requires in-depth knowledge of the integrated crew scheduling details and constraints.

6.2 ASTRONAUT APPEARANCES SUPPORT

The contractor shall provide the astronaut appearances function, including:

a. Managing the day-to-day operations of the Astronaut Appearances Office

b. Making travel arrangements, schedules, agendas, itineraries, correspondence, and obtaining internal approvals (Legal Office, Financial Management Division, etc.).

c. Publicizing and coordinating events, interviews, photo opportunities and editorial boards as directed by the NASA Public Affairs Office

d. Assisting in obtaining presentation material, slides and videos, models, talking points, relevant budget or other data, etc., for the appearance

e. Tracking all appearances performed and collecting and maintaining data, as required, for reporting on astronaut appearance metrics and the effectiveness of the astronaut appearance function

6.3 PROGRAM/PROJECT REQUIREMENTS DEVELOPMENT/CHANGE TECHNICAL ASSESSMENTS

The contractor shall provide reports, assessments, and technical evaluations of Program development requirements and requirement changes that have potential impact to crew procedures, safety, or operations.

The contractor shall manage the change request (CR), or equivalent, review process for the flight crew, including routing of CRs for flight crew evaluations and maintaining an existing database of all such reviewed CRs for boards (or their successors).

The contractor shall be aware of flight crew official positions on systems level hardware, software, and operational procedure changes affecting the crew.

The contractor shall evaluate all flight software discrepancy reports, or equivalent, and user/operational notes, or equivalent, for crew operational and safety impacts. During the conceptual design of each new software release/update, the contractor shall evaluate the crew operational and safety impacts of concept proposals for software changes. The contractor shall determine the flight software code and other resource impacts of flight crew proposed changes to allow the flight crew to develop its priorities for changes prior to the baselining of each new software release/update.

The contractor shall provide technical evaluations of the crew operational and safety impacts of specific, identified changes to the space flight vehicle or module/element hardware, software, and operations.

For primary payloads, the contractor shall support the development of the payload requirements for on-board crew displays.

The contractor shall initiate and present changes for a wide range of hardware, software, and operations that affect the crew.

The contractor shall develop and present briefings to assigned flight crew.

6.4 RESERVED

6.5 FLIGHT CREW EQUIPMENT (FCE) INTEGRATION

The contractor shall manage the requirements of the flight crew for FCE and establish and maintain coordination between the flight crew and hardware suppliers for FCE.

The contractor shall initiate flight crew requested changes and present FCE CRs, or equivalent, representing the assigned flight crew FCE requirements to the boards, and shall provide status to the crew members on CRs affecting their equipment.

The contractor shall participate in the development of requirements for provisioning, stowage, and manifesting of hardware and crew items and equipment. The contractor shall be responsible for tracking Astronaut Office accountable crew preference equipment.

6.6 OPERATIONS AND OPERATIONS DEVELOPMENT FOR SPACE FLIGHT/MISSION

The contractor shall provide support to FCOD for the accomplishment of the operations development and operations of space flight/mission in-line tasks.

6.7 FLIGHT CREW TRAINING

6.7.1 SPACE FLIGHT CREW TRAINING DEVELOPMENT

The contractor shall coordinate flight crew input into all crew training plans, flows, curricula, and facilities; identify and document crew issues and crew positions; disseminate flight crew positions

to the relevant Integrated Product Team, or equivalent; and propose areas requiring developmental test objectives (DTO) or risk mitigation experiments (RME), or equivalents. The contractor shall provide reports and assessments of operational impacts of training issues.

6.7.2 SPACE FLIGHT READINESS TRAINING (SFRT) ENGINEERING SUPPORT

The contractor shall provide engineering services required for the SFRT vehicle, currently high-performance aircraft, and associated projects and activities. Engineering services, functions performed, and technical expertise required shall include but are not limited to:

a. Design, analysis and maintenance engineering for aeronautics, avionics, electrical, mechanical, instrumentation, structural systems and components of and related to the SFRT aircraft and equipment.

b. Verify and validate changes and modifications to improve operational efficiency, reliability, and safety of the SFRT aircraft.

c. Flight testing and support.

d. Data collection, analysis, and reporting.

e. Preparation of engineering drawings.

6.8 SPACE MODULE/ELEMENT ASSEMBLY, SYSTEM AND UTILIZATION OPERATIONS ASSESSMENT AND TESTING

The contractor shall provide the flight crew with assessments, technical evaluations, and reports related to space elements or modules (such as habitation modules, laboratory modules, etc) for:

a. Assembly operations and concepts, plans, tasks, and procedures.

b. Integrated operations scenarios.

c. Flight rules.

d. System, module, and payload designs including functional descriptions, drawings, and schematics.

e. Change notices that affect crew-related requirements or implementation.

f. FCE support systems including habitability support.

g. Crew displays and controls.

The contractor shall develop and review test plans for the module/element systems, payloads, tools, and procedures that require ground-based testing. The contractor shall coordinate crew participation in such tests and document the results.

The contractor shall prepare DTO or RME, or equivalent, flight documentation and post-flight test results for module/element systems, payloads, tools, and procedures that require a flight demonstration.

6.9 SPACE FLIGHT/MISSION PROGRAMS INTEGRATION

The contractor shall provide the flight crew with on-orbit capability assessments for any element/module assembly and operations tasks involving a visiting vehicle. These assessments

shall include evaluations. The contractor shall develop and review test plans for any mission operations involving integration of Space Flight/Mission Programs that have been identified as requiring ground-based tests (including EVA, robotics, rendezvous/proximity operations). The contractor shall coordinate crew participation in such tests and document the results.

The contractor shall prepare DTO/RME, or equivalent, flight documentation, and flight test results reports for flown DTO/RMEs.

The contractor shall provide program level board support by:

a. Providing technical inputs to the FCOD representatives to the programmatic boards, associated sub-boards, and panels.

b. Presenting the FCOD position.

c. Developing and delivering presentations.

d. Identifying impacts due to proposed requirements changes.

e. Exchanging technical vehicle and operations information.

f. Interfacing with Programs and Program elements to resolve flight preparation process implementation issues.

g. Participating in trade studies, assessment activities, and action item resolution as necessary, to support mission preparation.

6.10 CREW/VEHICLE INTEGRATION AND TESTING

The contractor shall provide the operations interface between JSC flight operations in-line tasks and processing or launch operations at KSC and any partner or NASA-designated sites. The contractor shall implement the Vehicle Integration Plan for Space Operations (JSC 17519A).

The contractor shall provide on-site support at facilities of any partners in support of prelaunch testing, integration, and other activities preparatory to the launch of space flight elements/modules/visiting vehicles.

6.11 CAPSULE COMMUNICATOR (CAPCOM) SUPPORT

The contractor shall provide Capcom support and is eligible for any Capcom related assignments including console support during mission operations and simulations; acting as a crew advocate in the MCC; performing and managing voice communications with the crew on orbit; coordinating use of the air- or space-to-ground communication loop(s) by other users (e.g., MCC-Moscow Glavni Operator or members of other control centers); and filtering flight control team call requests to the crew by saving them for planned discussion periods.

(END OF SECTION)