Space Flight Systems Development and Operations Contract III (SpaceDOC III)

Base Contract and Indefinite Delivery Indefinite Quantity (IDIQ)

Statement of Work

DRAFT

Dated: January 6, 2023

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1. INTRODUCTION

The National Aeronautics and Space Administration (NASA) Glenn Research Center (GRC) implements several space-related programs within the Space Flight Systems Directorate (SFSD). GRC has space flight development responsibility that range from the Space Launch System (SLS) program, Orion service module, Gateway, numerous microgravity research investigations on International Space Station (ISS) and launch vehicles, ISS power system, electric propulsion systems, human research projects, space flight technology developments and demonstrations of advanced power, propulsion, communications and other systems, and the potential for space science instrumentation packages. In addition, NASA works with other government agencies and organizations to develop technologies and space flight hardware and software.

This Statement of Work (SOW) defines the contractor's efforts required to perform definition, design, development, analysis, fabrication, assembly, test, verification, delivery, and/or operation of space flight systems. The statement of work defines a Base portion of the contract, broken down into multiple project-specific Base Orders, and an Indefinite Delivery Indefinite Quantity (IDIQ) portion defined further by separate Delivery Orders.

The statement of work is structured by the NASA project life-cycle phases as outlined in NPR 7120.5 for NASA Space Flight Programs (Figure 2):

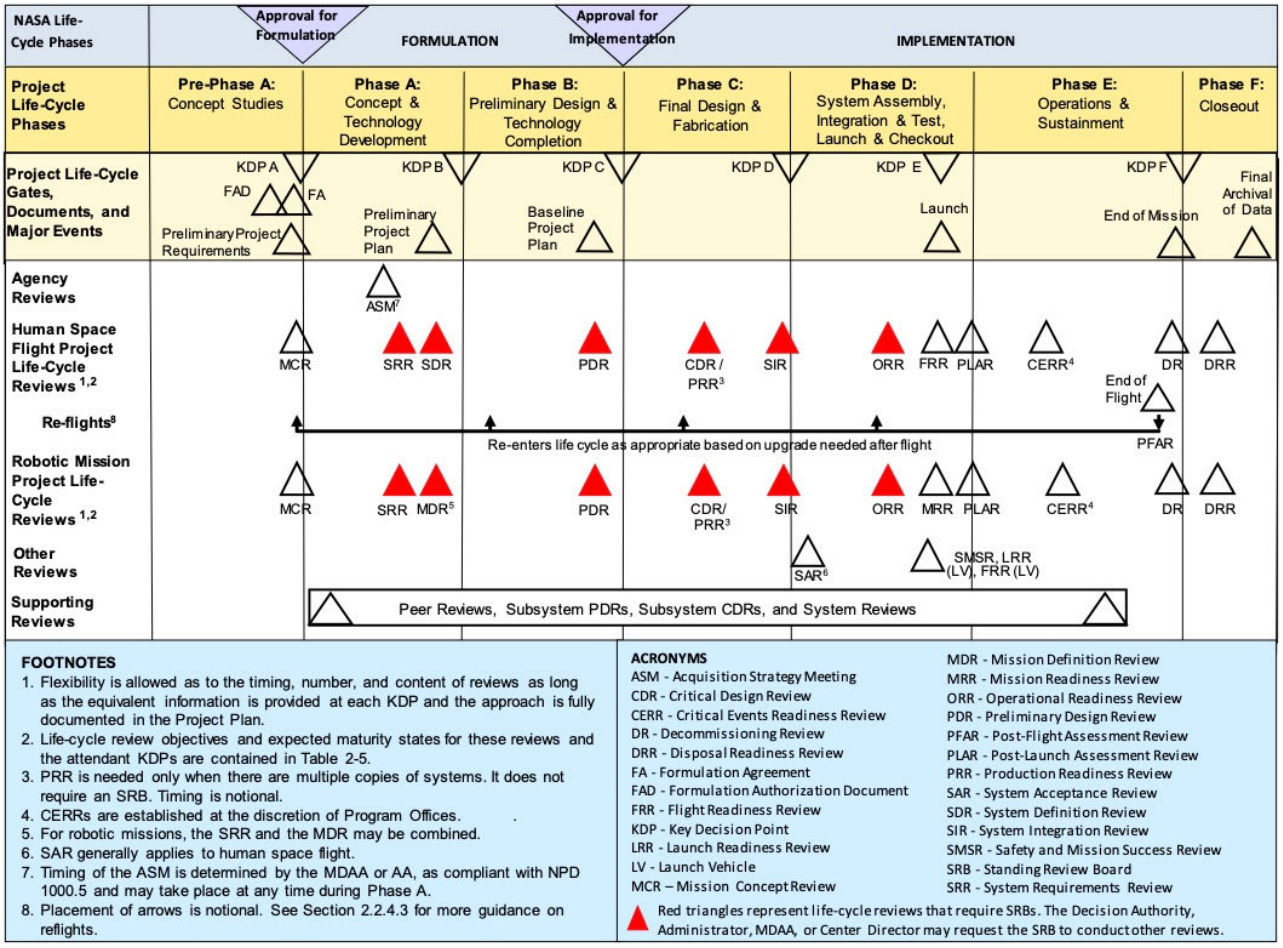
Formulation

- Pre-Phase A Concept Studies
- Phase A Concept and Technology Development
- Phase B Preliminary Design and Technology Completion

Implementation

- Phase C Final Design and Fabrication
- Phase D System Assembly, Integration & Test, and Launch
- Phase E Operations and Sustainment
- Phase F Closeout

The statement of work is structured by the NASA project life-cycle phases as outlined in NPR 7120.8 for NASA Research and Technology Development projects (Figure 3).



FOOTNOTES

1. Flexibility is allowed as to the timing, number, and content of reviews as long as the equivalent information is provided at each KDP and the approach is fully documented in the Project Plan.
2. Life-cycle review objectives and expected maturity states for these reviews and the attendant KDPs are contained in Table 2-5.
3. PRR is needed only when there are multiple copies of systems. It does not require an SRB. Timing is notional.
4. CERRs are established at the discretion of Program Offices.
5. For robotic missions, the SRR and the MDR may be combined.
6. SAR generally applies to human space flight.
7. Timing of the ASM is determined by the MDAA or AA, as compliant with NPD 1000.5 and may take place at any time during Phase A.
8. Placement of arrows is notional. See Section 2.2.4.3 for more guidance on reflights.

ACRONYMS

ASM - Acquisition Strategy Meeting
CDR - Critical Design Review
CERR - Critical Events Readiness Review
DR - Decommissioning Review
DRR - Disposal Readiness Review
FA - Formulation Agreement
FAD - Formulation Authorization Document
FRR - Flight Readiness Review
KDP - Key Decision Point
LRR - Launch Readiness Review
LV - Launch Vehicle
MCR – Mission Concept Review
MDR - Mission Definition Review
MRR - Mission Readiness Review
ORR - Operational Readiness Review
PDR - Preliminary Design Review
PFAR - Post-Flight Assessment Review
PLAR - Post-Launch Assessment Review
PRR - Production Readiness Review
SAR - System Acceptance Review
SDR - System Definition Review
SIR - System Integration Review
SMSR - Safety and Mission Success Review
SRB - Standing Review Board
SRR - System Requirements Review

Red triangles represent life-cycle reviews that require SRBs. The Decision Authority, Administrator, MDAA, or Center Director may request the SRB to conduct other reviews.

Figure 1 - Typical Project Management Process, NASA Project Life Cycle (Ref: NPR 7120.5)

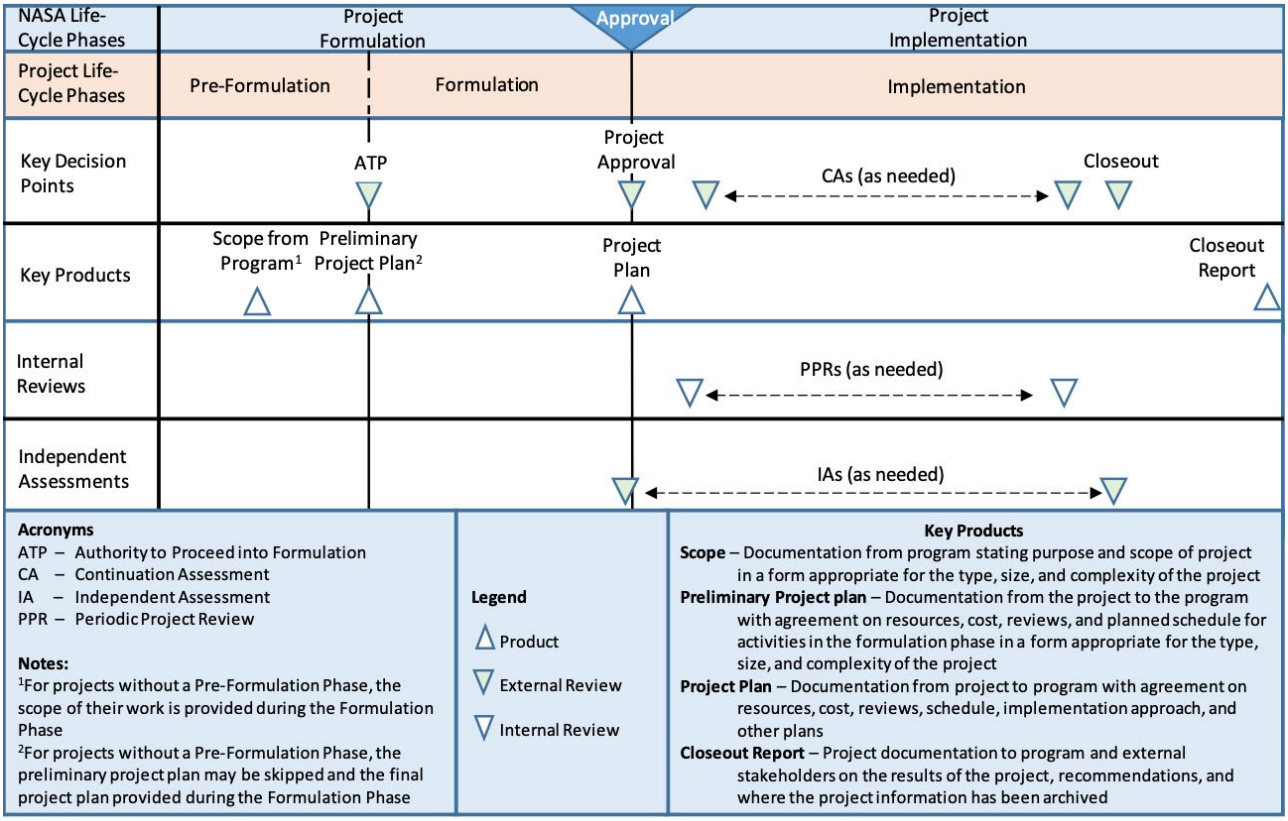


Figure 2 –NASA Research & Technology Project Life Cycle (Ref: NPR 7120.8A)

Requirements and end-item deliverables for each Base/Delivery Order will be defined based upon the life-cycle phase of the project. The development approach may be tailored as appropriate to most effectively meet the requirements of the particular deliverable.

2. SCOPE

The contract encompasses the development and delivery of technology development hardware and software, space flight hardware and software, ground support equipment, spares, as well as mission integration and operations, and sustaining engineering. As such, the contractor shall be responsible for the definition, design, development, analysis, fabrication, assembly, test, verification, delivery, and/or operation of space flight systems, associated support systems and equipment, and related ground development activities, that include research and technology developments and demonstrations. During execution of this scope, the contractor shall be able to conduct frequent and timely interactions either onsite or near onsite to GRC to ensure effective interactions between the contractor hardware development teams, and the GRC Base Order and Delivery Order Managers and/or Project Scientists to ensure the Principal Investigator's (PI's) science or other customer requirements are satisfied. In addition to conducting interactions with NASA, the contractor shall provide customer (e.g., PI and science team or other customers) access and use of hardware and/or software early in the development cycle as well as in the latter stages of hardware development. This contract scope can support all NASA GRC work content as described above and all NASA mission directorates as well as other agreements NASA has with other government agencies and non-government organizations.

Space flight hardware and research & technology development and demonstrations may include, but is not limited to:

1. Research investigations on the International Space Station and/or other space or suborbital platforms (commercial or government) including Lunar-based platforms and free-fliers, for, however not limited to, study phenomena in fluid physics, soft matter, combustion science, material science, bioscience and other microgravity areas and investigate commercial applications;
2. Applied research and technology investigations on the International Space Station and/or other space or suborbital platforms (commercial or government) including Lunar-based platforms and free-fliers, to accommodate space exploration requirements for, however not limited to, life support systems, power, propulsion, communications, navigation, radiation, human health, and energy storage and distribution;
3. Human Research investigations to include exercise countermeasures, exploration medical capability, computational modeling, and crew health risk assessments;
4. Acceleration measurement instruments that measure and characterize the acceleration environment of or within space flight systems and/or vehicles;
5. Sustaining engineering and operations of ISS or other space-based research investigations, technology demonstrations, facility class and individual payloads, acceleration measurement instruments, and other space related operations;
6. Flight hardware and software development for the ISS subsystems, space science satellite and robotic instruments, space flight vehicle subsystems, space flight test articles (e.g. payloads and satellites), and space communications systems that could fly on commercial or government launch vehicles;
7. Technology developments and/or demonstrations leading to advanced space flight systems in the areas of power, propulsion, in-space propulsion, lunar surface and in-situ resource applications, communications, navigation, and energy storage and distribution.

8. Advanced ground and suborbital systems in support of research, testing and technology development and/or the overall system development and operations.

Particular requirements and tailoring of this SOW for the Base and IDIQ portion will be defined in a Base/Delivery Order for each specific project's deliverables and milestones. The contractor shall, except as otherwise specified herein and/or in the Base/Delivery Orders, furnish all personnel, facilities, materials, services, and other items and functions necessary to complete the work. Each Base/Delivery Order will be complete upon acceptance of all required deliverables by the designated NASA Project Manager.

3. APPLICABLE AND REFERENCE DOCUMENTS

The nature of flight hardware development is such that conformance to various standards and codes will be specified if required. Those that are applicable will be specified in each Base/Delivery Order. Typical standards and codes, which may be required of the contractor, are the following:

- American Society for Testing and Materials (ASTM International) Standards
- Military Specifications and Standards
- American National Standards Institute (ANSI) codes as sponsored by American Society Of Mechanical Engineers (ASME)
- Department of Transportation Regulations
- NASA Standards and Handbooks
- Society of Automotive Engineers (SAE) and International Organization for Standardization (ISO) Standards

The NASA Office of Chief Engineer OCE has established a set of endorsed engineering standards for NASA Space Flight and Technology Development projects. These standards apply for spacecraft, launch vehicles, instruments developed for space flight projects, research and technology for infusion into space flight projects, critical technical facilities specifically developed or significantly modified for space flight systems, and ground systems that are in direct support of space flight operations. These endorsed technical standards are listed in the applicable documents Table 1 and are required for all portions of this Statement of Work unless deviation or waiver approval has been granted by NASA.

The contractor may propose alternatives to these standards if use of alternatives can lead to a better or less costly product that satisfies requirements and regulations. NASA will review the alternatives to determine if they are acceptable.

The contractor shall identify and acquire additional applicable documents, not explicitly called out herein, needed to meet the requirements of the base or delivery order. NASA will review the additional applicable documents for approval prior to implementation. The contractor shall be responsible for properly utilizing such documents.

The contractor shall ascertain the totality of the applicable documents and shall use each in accordance with the document's purpose. In the event of conflicting requirements, the requirements stated in the Base/Delivery Order shall take precedence.

Refer to the most current approved version of documents listed in Table 1, Table 2 or anywhere in this SOW. Table 2 identifies some key reference documents that define NASA's approach to developing and managing space flight and technology development programs.

See http://nodis3.gsfc.nasa.gov/ for the current versions of applicable and reference NASA policy and procedure documentation. See http://standards.nasa.gov for the current versions of the OCE Endorsed Engineering Standards (where multiple versions of a standard exist, the most recent version shall be used). See https://www1.grc.nasa.gov/grcdirectives/ for the latest GRC Policies and Procedures.

Table 1: Applicable specification and standards documents for the Prime Contract

Document Number	Document Title
NPD 2810.1	NASA Information Security Policy
NPR 6000.1	Requirements for Packaging, Handling, and Transportation for Aeronautical and Space Systems, Equipment, and Associated Components
NPR 7120.5	NASA Space Flight Program and Project Management Requirements
NPR 7120.8	NASA Research and Technology Program and Project Management Requirements
NPR 7123.1	NASA Systems Engineering Processes and Requirements
NPR 7150.2	NASA Software Engineering Requirements
NPR 8735.2	Hardware Quality Assurance Program Requirements for Programs and Projects
GLPR 8000.4	GRC Risk Management
GLPR 7120.5.20	GRC Project Deviation/Waiver Process
GLPR 7120.5.30	Space Assurance Requirements

Document Number	Document Title
GLPR 8739.1	GRC Software Assurance and Software Safety
GLP-QS-8715.1	NASA Glenn Safety Manual
GLM-FE-8500.1	GRC Environmental Programs Manual
Draft	Surveillance Plan
AFSPCMAN 91-710-V1-7	Range Safety User Requirements Manuals, Volumes 1 through 7- Air Force Space Command Range Safety
AIA/NAS NAS 410	National Aerospace Standard Certification and Qualification of Nondestructive Test Personnel
AIAA G-077-1998	Guide for the Verification and Validation of Computational Fluid Dynamics Simulations
AIAA S-080	Space Systems - Metallic Pressure Vessels, Pressurized Structures, and Pressure Components
AIAA S-081	Space Systems - Composite Overwrapped Pressure Vessels (COPVs)
AIAA S-110	Space Systems - Structures, Structural Components, and Structural Assemblies
AIAA S-111	Qualification and Quality Requirements for Space Solar Cells
AIAA S-112	Qualification and Quality Requirements for Space Solar Panels
AIAA S-113	Criteria for Explosive Systems and Devices Used on Space and Launch Vehicles
AIAA S-114	Moving Mechanical Assemblies for Space and Launch Vehicles
AIAA S-119	Flight Dynamics Model Exchange Standard
AIAA S-120	Mass Properties Control for Space Systems
AIAA S-121	Electromagnetic Compatibility Requirements for Space Equipment and Systems
AIAA S-122	Electrical Power Systems for Unmanned Spacecraft
FAA HF-STD-001	Human Factors Design Standard

Document Number	Document Title
IEEE 24765	Systems and Software Engineering - Vocabulary
EEE-INST-002	Instructions for EEE Parts Selection, Screening, Qualification, and Derating
MIL-STD-1472	DoD Design Criteria Standard - Human Engineering
MIL-STD-1542	Electromagnetic Compatibility and Grounding Requirements for Space System Facilities
MIL-STD-1553	Digital Time Division Command/Response Multiplex Data Bus
MIL-STD-1576	Electro explosive Subsystem Safety Requirements and Test Methods for Space Systems
MIL-STD-461	Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment
MIL-STD-464	Electromagnetic Environmental Effects, Requirements for Systems
MIL-STD-704	Aircraft Electric Power Characteristics
MIL-STD-810	Environmental Engineering Considerations and Laboratory Tests
SMC-S-008	Electromagnetic Compatibility Requirements for Space Equipment and Systems
SMC-S-016	Test Requirements for Launch, Upper-Stage and Space Vehicles
NASA-SPEC-5022	NASA Manufacturing and Test Requirements for Normally Closed Pyrovalves for Hazardous Flight Systems Applications
NASA-STD-1006	Space System Protection Standard
NASA-STD-1008	Classifications and Requirements for Testing Systems and Hardware to be Exposed to Dust in Planetary Environments
NASA-STD-2831	Metadata Standard for Data Discoverability
NASA-STD-3001, VOL. 1	NASA Space Flight Human-System Standard, Volume 1: Crew Health
NASA-STD-3001, VOL. 2	NASA Space Flight Human-System Standard Volume 2: Human Factors, Habitability, and Environmental Health
NASA-STD-4003	Electrical Bonding For NASA Launch Vehicles, Spacecraft, Payloads, And Flight Equipment

Document Number	Document Title
NASA-STD-4005	Low Earth Orbit Spacecraft Charging Design Standard
NASA-STD-4009	Space Telecommunications Radio Systems (STRS) Architecture Standard
NASA-STD-5001	Structural Design and Test Factors of Safety for Spaceflight Hardware
NASA-STD-5002	Load Analyses Of Spacecraft And Payloads
NASA-STD-5005	Standard for the Design and Fabrication of Ground Support Equipment
NASA-STD-5006	General Welding Requirements for Aerospace Materials
NASA-STD-5008	Protective Coating of Carbon Steel, Stainless Steel, And Aluminum On Launch Structures, Facilities, And Ground Support Equipment
NASA-STD-5009	Nondestructive Evaluation Requirements for Fracture Critical Metallic Components
NASA-STD-5012	Strength and Life Assessment Requirements for Liquid Fueled Space Propulsion System Engines
NASA-STD-5017	Design and Development Requirements for Mechanisms
NASA-STD-5018	Strength Design and Verification Criteria for Glass, Ceramics, and Windows in Human Space Flight Applications
NASA-STD-5019	Fracture Control Requirements for Spaceflight Hardware
NASA-STD-5020	Requirements for Threaded Fastening Systems in Spaceflight Hardware
NASA-STD-6001	Flammability, Offgassing, and Compatibility Requirements and Test Procedures
NASA-STD-6012	Corrosion Protection for Space Flight Hardware
NASA-STD-6016	Standard Materials and Processes Requirements for Spacecraft
NASA-STD-6030	Additive Manufacturing Requirements for Spaceflight Systems
NASA-STD-7001	Payload Vibroacoustic Test Criteria
NASA-STD-7002	Payload Test Requirements

Document Number	Document Title
NASA-STD-7003	Pyroshock Test Criteria
NASA-STD-7009	Standard for Models and Simulations
NASA-STD-7012	Leak Test Requirements
NASA-STD-8739.8	Software Assurance and Software Safety
SAE AS-22759	Wire, Electrical, Fluoropolymer-Insulated, Copper or Copper Alloy
SAE AS-4373	Test Methods for Insulated Electric Wire
SAE AS-50881	Wiring, Aerospace Vehicles
SAE AS-5698	Space Power Standard
SAE/EIA 649-2	Configuration Management Requirements for NASA Enterprises
SAE/EIA-649C	Configuration Management Standard
RTCA/DO-178	Software Considerations in Airborne Systems and Equipment Certification (only for aviation-related projects)

Table 2: Reference documents for the Prime Contract

Document Number	Title
SAE AS9100	Quality Management Systems - Requirements for Aviation, Space, and Defense Organizations
GLP-1120.1	GRC Technical Authority Implementation Plan (TAIP)
GLP-LS-7123.17	Trade Study Handbook
SP-2016-6105	NASA Systems Engineering Handbook

4. PERFORMANCE WORK STATEMENTS

The following describes what is required of the contractor for the successful implementation of the overall contract as well as mission-specific Base/Delivery Order requirements. The contractor shall deliver all data that is required by this contract including the Data Item Descriptions (DIDs) in accordance with the delivery schedule in the CDRL in Attachment J.1-B.

4.1. MANAGEMENT

The contractor shall be responsible for the overall management of the SpaceDOC III contract. As part of the management function, the contractor shall deliver the following contract level documents to NASA, per the schedule identified in the Contract Deliverable Requirements List (CDRL) for each DID, in Attachment J.1-B:

CDRL#	TITLE
CD-01	CONTRACTOR FINANCIAL MANAGEMENT REPORTING
CD-02	TECHNICAL REPORTING AND MANAGEMENT REVIEWS
CD-03	INFORMATION TECHNOLOGY SYSTEM MANAGEMENT PLAN
CD-04	INFORMATION TECHNOLOGY SECURITY MANAGEMENT PLAN
PM-01	SPACEDOC III MANAGEMENT PLAN
PM-02	RISK MANAGEMENT PLAN
PM-04	CONFIGURATION AND DATA MANAGEMENT PLAN
PM-06	CONTRACTOR BASE/DELIVERY ORDER WORK PLAN
PM-09	SYSTEMS ENGINEERING MANAGEMENT PLAN
V-08	SIMULATION SOFTWARE VERIFICATION AND VALIDATION PLAN
PA-01	SAFETY AND MISSION ASSURANCE PLAN
PA-11	SAFETY AND HEALTH PLAN

The contractor shall provide a management function for the monitoring, control, and reporting of the specific Base/Delivery Order efforts. The contractor shall develop and maintain a management plan for the overall contract in accordance with SpaceDOC III Management Plan (DID# PM-01) that describes the contract implementation approach, including the systems and processes, to provide overall coordination of contract management activities for accomplishing the Statement of Work.

The contractor's management function shall provide an integrated master schedule to NASA for each Base/Delivery Order, with milestones, activities, tasks, key design reviews/decision gates and the critical path out to the projected delivery date clearly defined, taking into account available resources. The contractor's schedule shall identify priorities of tasks, dependencies and relationships among tasks and schedule margin. The contractor's schedule shall also include similar information from subcontractors, where applicable, in sufficient detail to develop a realistic critical path. The schedule shall be updated and delivered

monthly in accordance with Technical Reporting and Management Review (DID# CD-02).

The contractor's management function shall provide reporting to NASA and real-time insight into status in accordance with the Contractor Financial Management Reporting (DID# CD-01), as well as technical and performance measurement of all contractor responsibilities and activities performed under the Base/Delivery Order.

The contractor shall deliver Base/Delivery Order monthly technical reports and contract-level monthly reports and reviews in accordance with Technical Reporting and Management Reviews (DID# CD-02).

The contractor shall implement appropriate management systems that prevent the improper dissemination of NASA, Government and/or commercial sensitive information. All contractor and subcontractor internal data, reviews, audits, meetings, and other activities pertinent to the execution of a Base/Delivery Order shall be open to NASA attendance to provide NASA insight. To facilitate NASA attendance the contractor shall provide reasonable and timely notification of events to NASA.

The contractor shall develop an Information Technology System Management Plan to document the cybersecurity controls employed for all information systems and resources used in support of the SpaceDOC III contract per the Information Technology System Security Plan (DID# CD-03). The contractor shall also develop an Information Technology Security Management Plan to describe the processes and procedures that will be followed to ensure appropriate cybersecurity controls are used to protect the confidentiality, integrity and availability of NASA data that is developed, processed, stored, or transmitted under the SpaceDOC III contract at the Glenn Research Center per Information Technology Security Management Plan (DID# CD-04).

The contractor shall develop a Simulation Software Verification and Validation Plan that describes processes that will be used to conduct Verification and Validation (V&V) of software used for modeling and simulation software per the Simulation Software Verification and Validation Plan (DID# V-08).

The contractor shall respond to all new and updated Base/Delivery Orders submitted by NASA with an integrated work plan in accordance with Contractor Base/Delivery Order Work Plan (DID# PM-06).

The following paragraphs describe detailed requirements for performance measurement, configuration management, property management, and review requirements that apply to all elements.

4.1.1. Cost Reporting

The contractor shall provide NASA with the necessary information to implement the Government Surveillance Plan to monitor product assurance, identify significant problems, and implement corrective action. The contractor shall provide monthly cost, projected cost, and

approach to controlling resources in accordance with Contractor Financial Management Reporting (DID# CD-01) and Technical Reporting and Management Reviews (DID# CD-02) for the contract. Additional Base/Delivery Order specific technical performance measurement requirements may also be identified in the Base/Delivery Order. The contractor shall participate in a monthly progress review meeting for each Base/Delivery Order with the identified NASA Project Manager (Base/Delivery Order technical manager) to review their cost analysis, schedule status, technical status, issues, and to conduct technical discussions to assure understanding of all Base/Delivery Order requirements.

4.1.2. Configuration Management

The contractor shall establish a configuration management process to control critical hardware, software, and documentation. The contractor shall develop a Configuration Management Plan that defines the specific processes in accordance with Configuration and Data Management Plan (DID# PM-04). The contractor shall also implement an engineering control system that shall review and approve changes to drawings, documentation, software design, software code, parts lists, assembly/handling procedures, test procedures and quality procedures. Any modifications to configuration managed material shall be documented in accordance with Configuration and Data Management Plan (DID# PM-04). In some cases, individual NASA Programs may require the contractor to utilize certain existing databases and software tools managed by the Government for input of design data, status, risk, etc.

The contractor shall have procedures in place to provide traceability of engineering models, prototypes, qualification and flight hardware, software and systems.

4.1.3. Property Management

The contractor shall maintain an inventory of all Government Furnished Property and of items purchased for Base/Delivery Orders for both GRC on-site and at contractor facilities per the Property Clauses of the contract in accordance with the Property Management Plan in Attachment J.1-G.

4.1.4. Systems Engineering Management

The contractor shall perform systems engineering in the conduct and management of the required technical effort for Base/Delivery Orders. The contractor shall develop a Systems Engineering Management Plan in accordance with Systems Engineering Management Plan (DID# PM-09) that demonstrates that proper procedures and processes are in place for the management of the various system engineering functions as defined in NPR 7123.1, “NASA Systems Engineering Processes and Requirements”. The contractor may develop an additional SEMP pre-tailored for all Technology Development orders if they determine this additional SEMP will provide cost and/or schedule benefits. Tailoring of the SEMP for specific Base/Delivery Orders is possible upon agreement by both the contractor and NASA. Waivers and Deviations to requirements shall be handled in accordance with Waivers and Deviations

(DID# PM-10).

The contractor shall be responsible for the submission of all change order proposals (in accordance with Engineering Change Proposals (ECPs) (DID# PM-05).

4.1.5. Reviews

The contractor shall provide engineering, management, documentation, and planning support for NASA design reviews required by NASA Headquarters, other NASA field centers and NASA GRC to certify hardware and software maturity readiness. NASA design reviews are based upon the project life cycle defined in NPR 7120.5, NPR 7120.8, and described in NPR 7123.1. The contractor shall also participate in other technical reviews based on the individual Base/Delivery Order, such as Verification and Safety Reviews and integration reviews with relevant launch vehicles and space or suborbital platforms.

Reviews shall be held at the location specified by the individual Base/Delivery Order. System Acceptance Reviews will normally be held at the location of the deliverable equipment so that it may be viewed and inspected prior to shipment. The contractor shall ensure that appropriate personnel attend each review. The baseline dates for each review and any modifications to the review requirements will be defined in the Base/Delivery Order to meet unique project requirements. No later than 8 weeks prior to each review the contractor shall develop and deliver a review plan for NASA acceptance. The contractor shall define the scope and content of the review in this plan consistent with NPR 7123.1 Appendix G Life-cycle and Technical Review Entrance and Success Criteria. Plan details can be tailored by agreement between the NASA PM and the Contractor. Review presentation packages shall be developed in accordance with Review Presentation Package (DID# D-01), unless otherwise defined in the Base/Delivery Order. Action Items from the reviews generated by NASA shall require written responses for closure from the contractor within 30 calendar days of receipt of the Engineering Panel or Review Board Report, unless specified otherwise in the review plan.

4.1.6. Indefinite Delivery Indefinite Quantity (IDIQ) Task Orders

In accordance with the task ordering procedures in this contract, the Contractor shall perform SpaceDOC III IDIQ tasks as initiated by written direction from the Contracting Officer. Content may include, but is not limited to: build to print orders, orders that include capital assets, and any content that does not fit under the scope of the other CLINs.

4.1.7. Export Control

1. In order to facilitate the possible need for discussions and information exchange with International Partners, the Contractor should support NASA in establishing cooperative relationships with up to two (2) International Partners to be identified by NASA.
2. It shall be the responsibility of the Contractor to seek and obtain Technical Assistance Agreements (TAAs) for technical interactions with any International Partners as required.

3. For the export of hardware, software or technical data (if required), the Contractor shall be responsible for obtaining the necessary authorization (export licenses, license exceptions, license exemptions) and conducting the export.
4. The Contractor should perform an export control assessment for all Data Item Descriptions shown in the CDRL, Attachment J.1-B.
    a. If a product is determined to contain information controlled by the International Traffic in Arms Regulations, the following statement shall be included on the product cover page:

International Traffic in Arms Regulations (ITAR) Notice

This document contains information which falls under the purview of the U.S. Munitions List (USML) as defined in the International Traffic in Arms Regulations (ITAR), 22 CFR §120-130, and is export-controlled. It shall not be transferred to foreign persons in the U.S. or abroad without specific approval of a knowledgeable NASA export control official, and/or unless an export license or license exemption is obtained/available from the Directorate of Defense Trade Controls, United States Department of State. Violations of these regulations are punishable by fine, imprisonment or both.

    b. If a product is determined to contain information controlled by the Export Administration Regulations and which requires a license or exception prior to export, the following statement shall be included on the product cover page:

Export Administration Regulations (EAR) Notice

This document contains information within the purview of the Export Administration Regulations (EAR), 15 CFR §730-774, and is export-controlled. It may not be transferred to foreign persons in the U.S. or abroad without specific approval of a knowledgeable export control official, and/or unless an export license or license exception is obtained/available from the Bureau of Industry and Security, United States Department of Commerce. Violations of these regulations are punishable by fine, imprisonment or both.

    c. If a product has been determined to be suitable for public release, it shall be so labeled.

4.1.8. Education and Public Outreach

The Contractor shall provide education and public outreach support to NASA to develop and disseminate communication materials such as fact sheets, images, photographs, or other information.

4.2. PRODUCT ASSURANCE

The contractor shall plan, implement and maintain a product assurance system to support all orders under the Contract. The governing Product Assurance requirements are defined in the

Space Assurance Requirements (SAR). Specific Orders may have additional product assurance requirements levied by carriers and/or launch vehicles. In addition, each order may tailor the SAR requirements.

The contractor shall prepare, implement, and maintain an overall contract Safety and Mission Assurance Plan in accordance with Safety and Mission Assurance Plan (DID# PA-01) to demonstrate how the SAR requirements will be implemented. The contractor shall develop SAR compliance matrices per the Base/Delivery Order to show how applicable product assurance requirements will be addressed.

The contractor is subject to periodic review by NASA GRC or its designated NASA representative(s) as defined in the Government's Surveillance Plan.

4.2.1. Quality Management

The contractor shall be certified to AS9100, in the process of becoming certified or, as a minimum, have an established proven effective quality program that is in accordance with FAR 52.246-11 Higher-level Contract Quality Requirement. In the absence of third-party certification of the Quality Management system, the contractor shall provide for additional audits. The contractor's Quality Management system shall meet the quality assurance requirements or other program quality assurance requirements of the documents specified in Section 3 of this SOW.

The Contractor shall implement a closed-loop system for identifying, documenting, controlling, and correcting failures and non-conformances for flight hardware/software development and GSE that interfaces with flight hardware/software, to ensure corrective action is taken to prevent recurrence in accordance with Problem Report and Corrective Action (PRACA) Plan (DID# PA-07). The Contractor shall report all non-conformities from the technical specifications which occur during flight hardware/software manufacture, assembly, or testing and GSE that interfaces with flight hardware/software in accordance with Nonconformance Report (DID# PA-12).

4.2.2. System Safety

The contractor shall assure the overall system safety of the design that eliminates, reduces, or minimizes safety risk to an acceptable level. The contractor shall perform hazard analyses in accordance with System Safety Hazard Analyses (DID# PA-03). The contractor shall deliver all safety documentation required by the applicable vehicle and/or carrier flight and ground safety requirements in accordance with their delivery schedules. The contractor shall support all reviews and meetings associated with this safety documentation. Any activity conducted at NASA GRC facilities shall be conducted in accordance with NASA Glenn Safety Manual (GLP-QS-8715.1) and the GRC Environmental Programs Manual (GLM-FE-8500.1). The contractor shall impose the applicable safety requirements on all subcontractors and suppliers.

The contractor shall provide an overall contract Safety and Health Plan in accordance with Safety and Health Plan (DID# PA-11). This plan shall address all hazards related to the work to

be performed at GRC, other NASA facilities, and the contractor's facilities, including hazardous exposures to contractors and NASA personnel, and plans to mitigate these hazards.

4.2.3. Materials and Processes

The contractor shall have a materials assurance process for documenting the Materials and Processes associated with the final design hardware using a Materials Identification and Usage List (MIUL) and Materials Usage Agreements (MUA). An MUA shall also be submitted for all materials on the MIUL that do not meet the requirements of NASA-STD-6016 in accordance with Materials Identification and Usage List (MIUL); Material Usage Agreement (MUA) (DID# PA-06). The materials assurance process must provide for certification of all parts and materials for composition and properties as defined by the design criteria. Materials used in applications that can be classified as limited life items, safety critical, and fracture critical shall be traceable through all critical processing procedures up to end-item application. The contractor shall verify that the space flight materials used meets all relevant safety requirements and can be flight certified by NASA.

For hardware developed under the contract, the contractor shall utilize only materials in the fabrication of space flight hardware that conform with the design, application and operational requirements. Depending on the vehicle and/or carrier, other program-specific materials requirements shall be addressed at that time, e.g. Orion, SLS, Gateway, commercial launch vehicles, and standalone hardware.

4.2.4. Reliability and Maintainability

The contractor shall perform all the reliability, availability, and maintainability engineering and assurance processes defined in the Space Assurance Requirements (SAR) document for projects and payloads on ISS or other space-based platforms. The contractor shall be responsible for imposing the Reliability and Maintainability (RAM) requirements on all subcontractors and suppliers and to integrate all subcontractor and supplier RAM products into a comprehensive compliance package as specified in the SAR.

For specific Base/Delivery Orders, the contractor shall be required to perform RAM assessments. In addition, the contractor shall conduct tests when required to demonstrate the ability of deliverables to survive mission simulation conditions, and be reliable/maintainable in the space environment.

4.2.5. Software Product Assurance

The contractor shall assure the management, safety, and control of all flight-related software/firmware (including that used for ground support or mission operations) and the software development requirements in accordance with NPR 7150.2 and NASA-STD-8739.8, Software Assurance and Software Safety Standard. The contractor shall develop and utilize a Software Assurance Plan and Metrics (DID# PA-10) to ensure the management, safety, and

control of the software products and the software development process (e.g., configuration management, risk management, performance, functionality, safety, reliability, verification & validation processes and non-conformance reporting).

4.2.6. Risk Management

The contractor shall maintain a risk management process to control critical flight hardware, software, and documentation, as well as risks to the overall program management. The contractor shall document their specific risk management process to be used in a Risk Management Plan in accordance with the Risk Management Plan (DID# PM-02). The contractor shall provide a status of critical risks in the Technical Reports in accordance with Technical Reporting and Management Reviews (DID# CD-02).

4.3. CONCEPT STUDIES

NASA will provide initial system level concept(s) for the Mission Concept Review (MCR) to meet the requirements as defined by the researcher and/or technologist (R/T), and identify any engineering feasibility issues and perform key tests that demonstrate the proposed engineering/science requirements can be satisfied. NASA will support the R/T's identification and refinement of the engineering/science requirements by designing and developing bench-top hardware (breadboards) and rigs for laboratory and/or low-gravity ground-based testing. The NASA development phases are defined in NPR 7120.5 for Space Flight Systems. These requirement documents shall be used as the set of initial requirements for each area of the project cycle. The following sections are provided to emphasize the key areas of activities that will be defined in a Base/Delivery Order for the Concept Studies phase of a project:

4.3.1. Key Activities

The contractor shall conduct system design and mission analyses as needed to produce feasible concept(s) that address the requirements and to evaluate potential mission carrier options. The concepts identify possible subsystems that address the project objectives and the key high-risk development areas as informed by a Technology Readiness Level (TRL) assessment. The mission analyses will include: technology alternatives, operational scenarios, risk identification, and infrastructure evaluations.

The contractor shall identify engineering feasibility issues based on the project requirements to determine a resolution approach and perform initial breadboard level testing as required. Engineering feasibility issues include: identification of fundamental capabilities required to meet project objectives, reduction of life-cycle costs, assessment of technical viability based on current industry capabilities, and assessment of the diagnostic methods utilized in prior work.

4.3.2. Reviews

The contractor shall provide a key review for the Concept Studies phase. The Mission Concept Review (MCR), or equivalent, typically affirms the mission need and examines the proposed mission's objectives and the concept for meeting the project objectives. The MCR is defined in NPR 7123.1 that includes the entrance and success criteria. Any tailoring of these reviews will be called out in the Base/Delivery Order.

4.3.3. Documentation/Deliverables

The contractor key deliverables during this phase of the project shall include but are not limited to a draft set of project requirements and a mission concept report/presentation that defines the project. Breadboard hardware and associated test reports/data from performing risk reduction activities shall also be provided to NASA. The draft project requirements and mission concept shall be documented as part of the MCR Presentation Package in accordance with Review Presentation Package (DID #D-01) per the Base/Delivery Order.

NPR 7120.5 defines deliverables typically generated in this phase. The CDRL in Attachment J.1-B contains the detailed description of content required for many of the deliverables. Any tailoring of the deliverables will be called out in the Base/Delivery Order.

4.4. CONCEPT AND TECHNOLOGY DEVELOPMENT

During this phase, the contractor shall thoroughly define project requirements and provide sufficient detailed definition of the project technical, management, budget, and institutional support plans needed to enable a firm NASA commitment to accomplish the project objectives on schedule and within budget. Emphasis shall be placed on accurately characterizing the complexity and scope of the project; demonstrating an understanding of project requirements; and identification and mitigation of high technical, acquisition, cost and schedule risks. The outcome of the Concept and Technology Development phase is to establish that the proposed mission/system architecture is credible and responsive to project objectives and constraints, including resources. The contractor shall ensure the engineering concept is sufficient and meets the detailed engineering requirements derived from the project requirements that have been determined. The contractor shall resolve major feasibility issues or establish feasibility resolution plans and provide a project plan and initial costs to enable NASA to assess the readiness of the project in order to enter the preliminary design phase. The NASA development phases are defined in NPR 7120.5 for Space Flight Systems and NPR 7120.8 for Technology Development. The contractor shall use the requirements documents as the set of initial requirements for each area of the project cycle. The following sections are provided to emphasize the key areas of activities that will be defined in a Base/Delivery Order for the Concept and Technology Development phase of the project:

4.4.1. Key Activities

The contractor shall define the fundamental system requirements based on engineering, science, potential carrier, operations, and safety and quality requirements. The selection and use of technical standards products and constraints on the project, including objectives, goals, and success criteria should be developed. The contractor shall determine the overall feasibility of the candidate project concept(s) that consider affordability, technology readiness, operations, infrastructure, content, risk, safety, reliability, and potential procurement strategies. The contractor shall utilize the technology readiness assessment to evaluate the fundamental technology requirements of the project concept. The contractor shall ensure that specified project objectives are met, project cost or risk is minimized, and identify where significant technology gaps exist. The contractor shall demonstrate scenarios in which it would be difficult for objective concepts to be realized.

The contractor shall develop an initial integrated concept of the project that includes the design constraints and interfaces of the recommended cargo carrier (commercial services such as, SpaceX, Northrop Grumman, Blue Origin etc.), destination (ISS, Gateway, Commercial Platform, Commercial Lunar Provider, etc.), or next higher-level element. The contractor shall provide an initial concept that includes sufficient detail showing the overall feasibility, compliance to the system requirements, integration compatibility, and subsystem level packaging. The contractor shall provide as required an integrated concept for the use of ground integration units or simulators to determine overall feasibility. The contractor shall identify the need for proper availability for testing to NASA.

The contractor shall minimize development risk based on identified engineering feasibility issues through the design and development of breadboards, as appropriate, to evaluate functional performance. Breadboard testing shall focus on determining whether the engineering concept meets the project requirements. The contractor shall identify concept limitations, alternate concepts, and technologies where project requirements are challenging. The contractor shall provide the results of the breadboard testing for NASA review. The contractor shall identify requirements for additional hardware breadboards of high-risk subsystem function(s), or special equipment necessary to reach the Preliminary Design & Technology Completion phase. The contractor shall identify and document findings in the System Definition Review (SDR) presentation package. The contractor shall formulate an overall engineering plan that defines and details the approach, schedule, hardware classification, and resource requirements, so that programmatic commitments can be made. The contractor shall provide a life cycle costing analysis necessary to produce the selected concept. Schedule and budget information shall be developed and presented as part of the SDR review package with a rough order of magnitude estimate for the life cycle costs and overall schedule that includes key milestones and an implementation approach to flight. The schedule shall be detailed to the next review milestone and identify the critical path.

4.4.2. Reviews

The key reviews for the Concept and Technology phase are the Systems Requirements Review (SRR) and Mission Definition Review/System Definition Review (MDR/SDR). The SRR examines the functional and performance requirements that are defined for the project and ensures that requirements and the selected concept will meet the project objectives. The SDR examines the proposed project formulation and the flow down of the functional elements of the system; key technologies and risks are identified and assessed. The MDR/SDR examines whether the proposed mission/system architecture is responsive to the program mission/system functional and performance requirements and whether requirements have been allocated to the next lower product layer. The SRR and the MDR/SDR are defined in NPR 7123.1 that includes the entrance and success criteria. Any tailoring of these reviews will be called out in the Base/Delivery Order.

4.4.3. Documentation/Deliverables

The contractor key deliverables during this phase of the project shall include but are not limited to a set of project requirements, and a mission concept report/presentation that defines the project. The contractor shall provide a compliance matrix for the established baseline concept. The selected concept shall be documented as part of the SRR Presentation Package in accordance with Review Presentation Package (DID #D-01) and a draft Operations Concept document in accordance with Operations Concept (DID# OP-09) per the Base/Delivery Order. The project architecture and allocation of requirements shall be documented as part of the MDR/SDR Presentation Package in accordance with Review Presentation Package (DID #D-01). Breadboard test reports/data from performing risk reduction activities shall be provided to NASA.

NPR 7120.5 defines deliverables typically generated in this phase. The CDRL in Attachment J.1-B contains the detailed description of content required for many of the deliverables. Any tailoring of the deliverables will be called out in the Base/Delivery Order.

4.5. PRELIMINARY DESIGN & TECHNOLOGY COMPLETION

During this phase, the contractor shall develop a preliminary design and technology development plan that can demonstrate acceptable risk at the system, subsystem and component level in compliance with system and project requirements. The outcome of the Preliminary Design and Technology Completion phase is to establish, through independent engineering-review, that the proposed engineering design solution for the project is expected to meet the performance and functional requirements at the configuration item level, the design is verifiable and does not pose major problems which may cause schedule delays or cost overruns, all interfaces and verification methodologies have been identified, and all system requirements have been allocated to the subsystem and component level and the flow down is adequate to verify

system performance. The NASA development phases are defined in NPR 7120.5 for Space Flight Systems and NPR 7120.8 for Technology Development. These requirement documents shall be used as the set of initial requirements for each area of the project cycle. The following sections are provided to emphasize the key areas of activities that will be defined in a Base/Delivery Order for the Preliminary Design and Technology Development phase of the project:

4.5.1. Key Activities

The contractor shall provide overall system architecture, identify all the external interfaces, develop an operations concept and equipment layouts, develop requirements for flight and ground support hardware and software, produce preliminary drawings, software design, mass properties, interface schematics, and preliminary materials & parts lists. The requirements for the design are defined in the specific Project Requirements Document and System Requirements Document in accordance with System Requirements Document (DID #R-01) or as identified in the Base/Delivery Order. The contractor shall perform engineering analyses (thermal, dynamic, vibration, optics, etc.) as required in the design of the mechanical, electrical, and system hardware. The contractor shall also develop a software design and initial programming in parallel with the hardware design.

The contractor shall also identify, design, and develop/procure any required ground support equipment necessary for the development, operation and handling of the project hardware. This shall include identifying any transportation and handling considerations that will impose requirements on the flight hardware or support equipment.

The contractor shall minimize system and/or subsystem development risk based on identified engineering feasibility issues through the design, development, and fabrication of system and/or subsystem-level mockups, breadboards, brassboards and prototype hardware. The contractor shall develop any hardware that is required to evaluate form, fit and/or functional performance, manufacturing techniques and compliance of system requirements to determine overall performance of the system. Risk reduction hardware development and testing should be focused on the details of the engineering project design in meeting all of the requirements defined in the project's system requirements. Any hardware limitations shall be identified, and alternate design prototypes should be built and tested in areas where meeting a system and/or subsystem requirement may be challenging. The results of the prototype testing shall be made available for NASA review and incorporated into the final design and if appropriate, the engineering model.

The contractor shall provide assurance that the preliminary design will meet all vehicle and/or carrier safety and verification requirements. The contractor shall perform safety hazard analyses to identify hazards and mitigation methods to assure that the proposed preliminary design does not violate any safety requirements, which will endanger human life or mission success. The contractor shall identify and design any simulators required for training, integration,

and operations to support the mission. The identified simulators and concepts for each shall be provided as part of the PDR presentation package.

The contractor shall perform reliability and maintainability analysis where appropriate to assure that the project's preliminary design will meet the mission requirements through reliable subsystems/components and/or through maintenance. Reliability analysis is based on sound methodology and presents realistic predictions for logistics planning and life cycle cost analysis. The results of this analysis shall be part of the PDR presentation package.

4.5.2. Reviews

The key reviews for the Preliminary Design and Technology Development phase are the Preliminary Design Review (PDR) and the Phase 0/1 Safety Review. The PDR demonstrates that the preliminary design meets all system requirements with acceptable risk and within cost and schedule constraints. The PDR establishes the basis for proceeding with detailed design. It will show that the correct design options have been selected, interfaces have been identified, and verification methods have been described. The PDR entrance and success criteria are defined in NPR 7123.1. Any tailoring of this review will be called out in the Base/Delivery Order. The Phase 0/1 Safety Review is dependent on the anticipated carrier/vehicle, such as the International Space Station, and shall conform to those specific review boards' requirements and will be specified in the Base/Delivery Order.

4.5.3. Documentation/ Deliverables

The contractor key deliverables during this phase of the project shall include but are not limited to an updated set of project requirements and mission concept report/presentation that defines the project. The contractor shall provide a compliance matrix for the preliminary design. The preliminary design shall be documented as part of the PDR Presentation Package (DID# D-01) per the Base/Delivery Order. Breadboard/Brassboard test reports/data from performing risk reduction activities shall be provided to NASA.

NPR 7120.5 defines deliverables typically generated in this phase. The CDRL in Attachment J.1-B contains the detailed description of content required for many of the deliverables. Any tailoring of the deliverables will be called out in the Base/Delivery Order.

4.6. FINAL DESIGN AND FABRICATION

The contractor shall develop a final design that demonstrates at the system, subsystem and component level compliance to the system consistent with vehicle and/or carrier, product assurance, and project requirements, as well as other applicable requirements identified in the Base/Delivery Order. During this phase the contractor shall begin fabrication of the test and flight components, assemblies, and subsystems. The performance standard for successful

completion of this work element occurs upon NASA approval at a Critical Design Review (CDR) and a System Integration Review (SIR), if required. The NASA development phases are defined in NPR 7120.5 for Space Flight Systems. The following sections are provided to emphasize the key areas of activities that will be defined in a Base/Delivery Order for the Final Design and Fabrication phase of the project:

4.6.1. Key Activities

The contractor shall generate complete system build-to specifications and drawings that include hardware and software. Requirement traceability establishing the linkage of all derived requirements shall also be generated. The contractor shall perform, where required, system level analyses and trade studies to optimize the operating design conditions; support the development of the final design; demonstrate overall compliance with requirements; support the verification activities; establish system performance; evaluate thermal, environmental and structural behavior (vibration, loads, etc.); determine reliability and maintainability; and support the integration of developed components.

The contractor shall develop an overall detailed reference design such that all requirements are achieved, unless specifically waived by NASA. As part of this final design effort, the contractor shall develop overall system schematics, layouts, interface requirements and drawings, ground support hardware, mass properties, volumetric characteristics, re-supply requirements, and resource requirements. The contractor shall develop a system layout showing the relationship of each component or subsystem, the system structure, harnessing, mounts and assembly requirements.

The contractor shall develop a software design and code based on the hardware design and requirements that may also include simulator software, training software and ground support software, based on carrier requirements, hardware requirements, and Government software development requirements. The contractor shall also develop the software design that includes software simulations and prototyping to eliminate any potential risks, which may hamper software coding, and integration.

As defined in the Base/Delivery Order, the contractor shall minimize development risk through the design, development, and fabrication of an engineering model. The contractor shall perform the testing and integration activities associated with the engineering model and/or component, subsystem, and system development required to validate the final design. The results of the testing and integration activities shall be made available for NASA review and incorporated into the final design.

The contractor shall develop a comprehensive verification program that includes plans and procedures to assure that the project hardware and associated software will meet all defined requirements. The Verification Plan(s) shall identify clearly where, how, and when each function and performance requirement is verified in the verification program before launch and, if applicable, how these requirements are again going to be verified on-orbit. The contractor

shall provide assurance that the final design will meet all vehicle and/or carrier safety and verification requirements.

The contractor shall assure that all the chosen materials for the hardware design meet safety requirements for corrosion resistance, stress corrosion cracking susceptibility, out-gassing, flammability, fluid compatibility, and off-gassing in habitable areas.

The contractor shall perform an integrated safety analysis of the final design that shows that there are no outstanding hazards, which cannot be controlled or are within an acceptable risk level if waivers are required.

The contractor shall perform the analysis and implementation planning necessary to define, prepare for and execute the operation of the project, including design or development of any equipment required for operations. The project schedule shall include at a minimum hardware and software simulator needs, data sets, integrated testing, turnover activities, operation activities with remote operations facilities, and training activities. The contractor shall prepare the project's operational requirements and plans, operations concepts, mission profiles, mission rules, crew procedures and timelines, and contingency plans. The contractor shall provide the carrier with required data sets per the carrier's integration template that includes operational requirements, configuration data, training requirements, data services, logistic support, and launch site requirements.

The contractor shall perform spares provisioning and maintenance strategies for the life of the equipment. The transportation and handling of the project hardware and associated ground support equipment shall be identified. The contractor shall provide a reliability analysis of the system hardware.

Upon completion of the appropriate lower-level CDR, the contractor shall initiate procurement and fabrication of flight article components, assemblies and/or subassemblies. The contractor shall also initiate the qualification and acceptance testing of flight article components, assemblies, and/or subsystems.

4.6.2. Reviews

The key reviews for the Final Design and Fabrication phase are the Critical Design Review (CDR), Systems Integration Review (SIR) and the Phase 2 Safety Review. The CDR demonstrates that the maturity of the design is appropriate to support proceeding with full-scale fabrication, assembly, integration, and test. The CDR is a lifecycle review for the project to determine if the technical effort is on track to complete the flight and ground system development and mission operations, meeting mission performance requirements within the cost and schedule constraints. Following the successful completion of the CDR, the system is baselined. Subsequent changes will require NASA approval. The SIR ensures that the system is ready to be integrated. Segments, components, and subsystems are available and ready to be integrated into the system. Integration facilities, support personnel, and integration plans and procedures are ready for integration. The CDR and SIR are defined in NPR 7123.1 that includes

the entrance and success criteria. Any tailoring of this review will be called out in the Base/Delivery Order. The Phase 2 Safety Review is dependent on the anticipated carrier/vehicle, such as the International Space Station and shall conform to that specific review boards' requirements.

4.6.3. Documentation / Deliverables

The contractor key deliverables during this phase of the project shall include but are not limited to a baseline set of project requirements and the final Verification Plan/Matrix. The final design shall be documented as part of the CDR & SIR Presentation Packages in accordance Review Presentation Package (DID# D-01) per the Base/Delivery Order. Engineering Model test reports/data from performing risk reduction activities shall be provided to NASA.

NPR 7120.5 defines deliverables typically generated in this phase. The CDRL in Attachment J.1-B contains the detailed description of content required for many of the deliverables. Any tailoring of the deliverables will be called out in the Base/Delivery Order.

4.7. SYSTEM ASSEMBLY, INTEGRATION & TEST, LAUNCH & CHECKOUT

During this phase, the contractor shall complete the assembly, test, verification, and delivery of the required hardware, software, and associated integration documentation required for launch. The outcome of the System Assembly, Integration & Test, Launch & Checkout phase is to provide an operational system that satisfies the project requirements. The performance standard for successful completion of this work element occurs upon NASA approval at either a Mission Readiness Review (MRR) or Flight Readiness Review (FRR) and a System Acceptance Review (SAR) with a Certification for Flight Readiness. Also, an Operational Readiness Review will be held to ensure the system is complete and ready for operations. The NASA development phases are defined in NPR 7120.5 for Space Flight Systems. The following sections are provided to emphasize the key areas of activities that will be defined in a Base/Delivery Order for the System Assembly, Integration & Test, Launch & Checkout phase of the project:

4.7.1. Key Activities

The contractor shall complete the assembly and test the flight unit(s) to ensure that it meets all requirements. The flight unit(s) shall be subjected to applicable test levels and durations for its intended operation in space as defined in the Verification Plan. All integrated testing shall be coordinated with the vehicle and/or carrier and identified on the project schedule.

The contractor may be required to fabricate, assemble, and test a qualification unit. The qualification unit shall consist of the same systems and subsystems as the flight unit and shall be verified to be physically and functionally identical to the flight unit. The primary function of the qualification unit is to demonstrate flight design margin through testing to qualification levels.

The qualification unit is not intended for flight unless otherwise specified in the Base/Delivery Order. The qualification unit shall be maintained under the same quality control and configuration management procedures as the Flight Unit.

The contractor shall perform mission and technical integration efforts necessary to assure delivery of a fully functional system (flight unit(s) and qualification and/or ground units if required per the Base/Delivery Order), which satisfies all applicable vehicle and/or carrier requirements. The contractor shall ensure compatibility of the major subsystems with each other and shall assure compatibility of the total system with all required test facilities, the selected carrier, and the associated transportation system. This effort shall also include development and/or support of the appropriate integration documentation in accordance with development and delivery of required interface and operational data in the appropriate vehicle and/or carrier integration format. The contractor shall support all vehicle, and/or carrier integration working groups and panels; and development of required safety, operation, and training documentation. Detailed analyses shall be performed as required in accordance with the selected vehicle and/or carrier requirements documents to demonstrate that the hardware design satisfies system requirements.

A ground unit may also be required (per the Base/Delivery Order) for ground integration activities, trouble shooting of the on-orbit hardware, and/or the checkout of proposed upgrades to the on-orbit hardware. This unit is typically identical to the flight unit but may not receive full flight qualification testing.

The contractor shall supply and maintain the spare parts required for the flight and ground-based hardware and related equipment as specified in the Base/Delivery Order and the project's sparing plan. All fabrication, inspection, checkout, acceptance test, and preparation for delivery requirements, applicable to deliverable hardware and software, shall also apply to the spare items furnished for both flight and ground units.

The contractor shall develop, verify, validate, and maintain all software necessary to control and utilize the hardware deliverables developed to Base/Delivery Order specifications. The contractor shall install, verify, and validate all software necessary for the operation of all developed hardware per the Base/Delivery Order such as the Ground Unit, Qualification Unit, Flight Unit, Trainers, interface verification, ground support equipment, and simulators. The contractor shall develop, verify, and validate all software necessary for post-processing of data after the on-orbit operation as specified in the Base/Delivery Order.

The contractor shall conduct all necessary activities to ensure the successful assembly of all hardware and software components and successful integration and checkout of all hardware and software with the selected vehicle and/or carrier. These activities shall be in accordance with applicable engineering requirements as well as vehicle and/or carrier interface documentation to ensure that hardware and software comply with all vehicles and/or carrier payload certification requirements, as well as to ensure that all science, operational, safety, and reliability requirements are met. Results of these activities shall be reported in accordance with the

hardware and software verification plans. The contractor shall provide data generated during functional checkout of fabricated systems and components as specified in the Base/Delivery Order. Specific Base/Delivery Orders may require assembly, installation, and system checkout in NASA facilities. The contractor shall inspect all work prior to delivery to ensure compliance to requirements.

The contractor shall conduct qualification, acceptance, and verification activities (test, analysis, inspections, demonstrations) on components, subsystems, combined assemblies, and integrated with the carrier. These activities shall be in accordance with the Master Requirements and Verification Compliance Plan; Master Requirements and Verification Compliance Matrix/Summary (DID# V-01) to assure that the payload hardware and associated software meets all defined requirements. The contractor shall verify integrated performance, assembly interactions, and interfaces, as appropriate. Unless furnished by NASA per the Base/Delivery Order, the contractor shall provide all test support equipment, test fixtures, ground support equipment, and simulators, required for the performance of the verification tests. The contractor shall generate and maintain a comprehensive requirements management, traceability and close-out system to ensure and document that all design and performance requirements are addressed by the verification program and all verification requirements are closed-out. The closeout system shall maintain Certificates of Conformance and comprehensive verification reports in accordance with the Individual Item Verification Report (DID# V-03). The software shall also be verified and validated in accordance with the Software Verification and Validation Plan (DID# V-04).

The contractor shall provide assurance that the project system meets all vehicle and/or carrier safety and verification requirements. The contractor shall perform an integrated safety analysis and test of the flight hardware that shows that all hazards are controlled to an acceptable risk level.

The contractor shall develop procedures for crew tended, untended, and off-nominal operations with the input and approval of project and carrier representatives, including appropriate safety panels. The contractor shall deliver all hardware, software and procedures required for operations capability as identified in the Base/Delivery Order, such as simulators or data processing equipment to support the mission.

The contractor shall determine the logistics support required for pre-flight, flight, on-orbit, return, post-flight, and ground operations of hardware and software. Based on the logistics support required, the contractor shall provide adequate flight and non-flight spares. The logistics planning shall include plans for the most efficient physical transfer of flight and non-flight items required in support of project operations. The contractor shall provide the physical packaging, handling, storage, and transportation of all flight and non-flight items. The contractor shall ensure that the hardware and packaging comply with NPR 6000.1.

The contractor shall develop, in conjunction with specific users, all training materials for the project, including project-specific training unit development as defined in the Base/Delivery Order. The contractor shall develop and support the installation of the project training unit at the

appropriate site for the vehicle and/or carrier, if applicable. The contractor shall work with the flight crew and the vehicle and/or carrier training organization to develop the requirements for crew training, if applicable. These requirements will drive the design and development for the project training materials. The contractor shall fulfill the training requirements for the training sessions, for any computer-based training and on-orbit training. The contractor shall provide project hardware and software training to the appropriate personnel in the operational/functional limitations and capabilities of the equipment for proper decision making and development of operational procedures.

The contractor shall be responsible for all ground servicing at the launch site to ensure the successful integration of all project hardware with the vehicle and/or carrier or transportation system. The contractor personnel shall actively participate in the launch processing activities and shall add/modify requirements, concur on procedures, analyze data, and make engineering recommendations and decisions required by conditions not within specifications. The contractor's launch site activities shall be in support of the hardware/software ground operations effort provided by launch site personnel. The contractor shall develop and implement launch site plans and procedures for the project hardware, support the development of the requirements for testing, servicing, and facility services required to process the hardware through pre-launch activities, monitor tests, evaluate test data, maintain records of the tests, provide engineering expertise to resolve hardware/software problems, and ensure the project hardware has been properly tested. Following verification of flight readiness, the flight hardware and associated documentation shall be provided to the launch element manager for pre-flight processing and launch.

4.7.2. Reviews

The key reviews for the System Assembly, Integration & Test, Launch & Checkout phase are the System Acceptance Review (SAR), Operational Readiness Review (ORR), either Mission Readiness Review (MRR) or Flight Readiness Review (FRR) and the Phase 3 Safety Review. The SAR verifies the completeness of the specific end products in relation to their requirements and assesses compliance with stakeholder expectations. The SAR examines the system, its end products and documentation, and test data and analyses that support verification. The SAR is a lifecycle review to authorize the shipment of the system to the designated operational facility or launch site.

The ORR examines the actual system characteristics and procedures used in the system's operation and ensures that all system and support (flight and ground) hardware, software, personnel, procedures, and user documentation accurately reflect the deployed state of the system. The MRR or FRR examines the system's readiness for a safe and successful flight or launch and for subsequent flight operations. It also ensures that all flight and ground hardware, software, personnel, and procedures are operationally ready.

The SAR, ORR and MRR or FRR are defined in NPR 7123.1 which includes the entrance

and success criteria. Any tailoring of this review will be called out in the Base/Delivery Order. The Phase 3 Safety Review is dependent on the anticipated carrier/vehicle, such as the International Space Station and shall conform to that specific review board's requirements.

4.7.3. Documentation / Deliverables

The contractor key deliverables during this phase of the project shall include but are not limited to flight and ground hardware, flight and ground software and all final verification data as defined in the Base/Delivery Order. The final demonstration that the system has sufficient technical maturity to authorize its acceptance for operational use or delivery to the launch site or operational environment shall be documented as part of the SAR Presentation Packages in accordance with the Review Presentation Package (DID# D-01) and the Acceptance Data Package (ADP) in accordance with the Acceptance Data Package (ADP) (DID# V-05) per the Base/Delivery Order. The system's readiness for a safe and successful flight or launch and for subsequent flight operations shall be documented in the FRR/MRR Presentation Package in accordance with the Review Presentation Package (DID# D-01). A demonstration that the deployed state of the system as operationally ready, including system and support (flight and ground) hardware, software, personnel, procedures, supporting capabilities, and user documentation shall be documented in the ORR Presentation Package in accordance with the Review Presentation Package (DID# D-01).

NPR 7120.5 defines deliverables typically generated in this phase. The CDRL in Attachment J.1-B contains the detailed description of content required for many of the deliverables. Any tailoring of the deliverables will be called out in the Base/Delivery Order.

4.8. OPERATIONS & SUSTAINMENT

During this phase, the contractor shall support on-orbit integration activities, hardware and software sustaining engineering, flight and ground data reduction, hardware and software real-time operations. The outcome of the Operations and Sustainment phase is to operate the project hardware and software in accordance with the goals and requirements of the project. The performance standard for successful completion of this work element occurs upon achieving the full success criteria. The NASA development phases are defined in NPR 7120.5 for Space Flight Systems. The following sections are provided to emphasize the key areas of activities that will be defined in a Base/Delivery Order for the Operations and Sustainment phase of the project:

4.8.1. Key Activities

The contractor shall be responsible for the real-time operations and any supporting activities of the project hardware and software in conjunction with the vehicle and/or carrier operations per the Base/Delivery Order. The contractor shall provide trained staff for mission support console operations. Appropriate personnel shall be on console when the project

equipment is active or other planned operations are being performed. The contractor shall be responsible for on-console support of on-orbit installation & set-up, check-out and verification of the project hardware and software, if applicable; the planning and scheduling of all project on-orbit operations; obtaining or requesting all necessary ground and on-orbit resources; and implementing and following the planned project operations. The contractor shall be prepared to respond to crew and ground team communications, and off-nominal situations. The contractor shall develop procedures to resolve on-orbit problems or anomalies.

The contractor shall provide mission operations support including coordination of real-time project requirements with the PI, the vehicle and/or carrier, and other appropriate entities; acquire and process real-time data according to pre-determined requirements; support the correlation of data with mission events; provide appropriate personnel to support on-console mission operations and data analysis at the NASA or carrier mission control center; preparation of data products for data dissemination including general and specific mission summary reports; preparation of unique data analysis reports for the project; maintain engineering/scientific information databases; and participate in working group interchanges as defined in the Base/Delivery Order.

The GRC TSC is a secure, multipurpose facility designed to provide dedicated support for simultaneous training, simulations, and real-time operations of space experiments on-board the ISS, support Artemis operations to return astronauts to the Moon by 2024, and support Orion operations that will take astronauts to deep space. For Base/Delivery Orders that utilize the TSC the contractor shall supply on-site staff to support relevant activities.

The contractor shall be responsible for ground installation & set-up, check-out and verification of the project hardware and software; the planning and scheduling of all hardware and software ground operations; and implementing and following the planned operations.

The contractor shall conduct appropriate analyses, data evaluations, and ground tests to maintain the on-orbit system. This includes the tracking of limited life items and consumables for safety and/or mission assurance reasons; incorporating upgrades as required; standard reporting of the on-orbit project hardware and software performance; developing trend analyses using on-orbit systems reports and other available data; and implementing the project maintenance plan designed to maintain the full operational capability of the hardware and software.

4.8.2. Reviews

The key reviews for the Operations and Sustainment phase are the Post-Launch Assessment Review (PLAR), the Critical Event Readiness Review (CERR) and the Decommissioning Review (DR). The PLAR is a post-deployment evaluation of the readiness of the system to proceed with full, routine operations. The CERR confirms the project's readiness to execute the mission's critical activities during flight operation. The DR confirms the decision to terminate or decommission the system and assesses the readiness of the system for the safe

decommissioning and disposal of system assets.

The PLAR, CERR and DR are defined in NPR 7123.1 which includes the entrance and success criteria. Any tailoring of this review will be called out in the Base/Delivery Order.

4.8.3. Documentation / Deliverables

The contractor key deliverables during this phase of the project shall include but are not limited to Mission Status Reports, Anomaly Resolution Procedures, and Data Analysis Reports. The project's readiness for operations and mission critical activities, and decommissioning shall be documented as part of the PLAR, CERR and DR Presentation Packages in accordance with the Review Presentation Package (DID# D-01) per the Base/Delivery Order.

NPR 7120.5 defines deliverables typically generated in this phase. The CDRL in Attachment J.1-B contains the detailed description of content required for many of the deliverables. Any tailoring of the deliverables will be called out in the Base/Delivery Order.

4.9. CLOSEOUT

During this phase, the contractor shall support the return of data and any returned samples and/or hardware. Also, the contractor shall determine what items need to be archived and which items need to be disposed from the project.

4.9.1. Key Activities

The contractor shall complete analysis and archive mission and science data, archive project data and documentation, document lessons learned in accordance with the Lessons Learned Report (DID# PA-17), implement the Decommissioning/Disposal Plan, and dispose all project assets.

4.9.2. Reviews

The key review for the Closeout phase is the Disposal Readiness Review (DRR). The DRR confirms the readiness for the final disposal of the system assets.

The DRR is defined in NPR 7123.1, which includes the entrance and success criteria. Any tailoring of this review will be called out in the Base/Delivery Order.

4.9.3. Documentation / Deliverables

The contractor key deliverables during this phase of the project shall include but are not limited to turnover of any and all remaining project data and assets. The project's readiness for closeout shall be documented as part of the DRR Presentation Packages in accordance with the Review Presentation Package (DID# D-01) per the Base/Delivery Order.

NPR 7120.5 defines deliverables typically generated in this phase. The CDRL in

Attachment J.1-B contains the detailed description of content required for many of the deliverables. Any tailoring of the deliverables will be called out in the Base/Delivery Order.

4.10. RESEARCH AND TECHNOLOGY

Projects identified in the Base/Delivery Order to meet NPR 7120.8 requirements for Research and Technology (R&T) development shall follow the life-cycle phases according to Figure 3. These types of projects typically perform basic or applied research with goals including testing hypothesis and theories, expanding fundamental knowledge base, technological breakthroughs, and advancing new technologies to the point where they are ready for use by a customer or beneficiary. Some R&T projects demonstrate technologies in a lab environment, and some R&T projects are formulated for technology demonstration in spaceflight/launch vehicle environment.

The R&T projects typically are formulated with smaller budgets and short schedules when compared to NPR 7120.5 spaceflight projects, so quality and mission assurance practices will be scaled down proportionally and optimized appropriately with greater tolerance for technical and programmatic risks compared to space flight projects.

For R&T projects, safety requirements are absolute, while mission assurance and quality practices need to be evaluated using risk analyses, scaled and applied in proportion to the project's programmatic constraints, goals, and tolerance for risk. Reasonable and informed acceptance of technical risk are an accepted characteristic of R&T development and demonstration.

4.10.1. Formulation

During this phase, the contractor shall develop a preliminary design and technology development plan that can demonstrate acceptable risk at the system, subsystem and component level expected in compliance with system and project requirements as defined in the Base/Delivery Order.

4.10.1.1. Key Activities

The outcome of the R&T Formulation phase is to perform a Technology Readiness Assessment, define the overall R&T requirements, develop an overall plan for implementation of the R&T requirements, and determination of the key risks involved in achieving the R&T objectives.

4.10.1.2. Reviews

The key review for this phase is the Independent Assessment. The contractor shall present at the Independent Assessment the overall implementation plan, their assessment of the technology,

the overall cost and schedule, along with the key risks to mission success. Also, key safety requirements shall be defined by site, carrier or launch vehicle as applicable.

4.10.1.3. Documentation / Deliverables

A key document deliverable by the contractor is the plan (i.e., Project Plan) that describes technical and management approach in sufficient detail on how the project will develop the R&T product(s) within cost and schedule. The plan should be of sufficient detail for the project to manage its work through the Implementation Phase and to measure its progress and performance. In addition to the required information, the plan may also include the research or technical approach, technology needs derived from mission concept studies, metrics for tracking progress, Work Breakdown Structure, planned reviews, resource requirements, a schedule showing key milestones and deliverables, risk management approach or dissemination of the project results.

4.10.2. Implementation

During this phase, the project is implemented as described in the Project Plan and executed according to the planned cost (phasing) and schedule commitments. Project end products are developed, analyzed, verified to meet requirements, validated against stakeholder expectations, and delivered/transitioned as defined in the Base/Delivery Order.

4.10.2.1. Key Activities

The outcome of the Implementation Phase in the overall implementation of the plan and development of the R&T products that culminates in the closeout activities, including data/information archiving, as needed to end the program. The contractor shall develop the defined end products that are verified to meet product requirements, validated against NASA expectations, and delivered or transitioned per the Base/Delivery Order.

4.10.2.2. Reviews

The key reviews during this R&T Implementation Phase are Periodic Project Reviews (PPR), Independent Assessments (IA), Continuation Assessment Review, Safety Reviews, and Closeout Review.

The PPRs are determined by the project and conducted within the project per the Base/Delivery Order. PPRs for the project may be informal discussion or can be in the form of reviews with entrance and success criteria and are internal to the project. The project may also schedule their own Independent Assessments if determined by the project to be beneficial. The contractor at a PPRs shall provide the technical progress, cost and schedule performance, issues and concerns, current risks, and any recommendations on changes to the project. For large projects, particularly those demonstrating technology in space, PPRs may be structured like the NPR 7120.5 technical reviews. For R&T projects (even for technology demonstrations in space) the contractor shall perform these reviews and avoid time-consuming, expensive, unnecessary review formality.

These reviews typically would involve a Combined Systems Requirements Review/Systems Definition Review (SRR/SDR), Critical Design Review (CDR), Mission Readiness Review/Flight Readiness Review (MRR/FRR).

The contractor, as defined in the Base/Delivery Order shall be required to support Independent Assessment Reviews with NASA to provide an opportunity for subject matter experts to review and provide feedback on the overall progress and technical approach of the activities.

The contractor shall support a NASA Continuation Assessment Review as defined in the Base/Delivery Order, to determine the overall progress of the project against the defined plan and requirements, and recommendations to any changes going forward along with the risks. The review shall provide technical progress summary, cost and schedule summary, top risks, and continued suitability in meeting the project requirements.

The Closeout Report is a summary of what was accomplished in the project. Project should document to NASA the results of the project, recommendations, and the archiving of the project data.

4.10.2.3. Documentation / Deliverables

The key document and deliverable by the contractor is defined in the plan (i.e., Technical Execution Plan) that defines the delivery schedule of the documentation and deliverable hardware/software. The contractor shall provide all review documentation along with documentation of the data obtained in validating the R&T goals and requirements.

4.11. GLENN CONTRACT WORK CONTROL SYSTEM (GCWCS)

NASA will provide an internal automated work control system for managing and tracking all NASA issued work under the SpaceDOC III Contract. The GCWCS will include NASA work requirements issued as both Base Orders and Indefinite Delivery Indefinite Quantity (IDIQ) Delivery Orders. The GCWCS is an Oracle database web application.

The Contractor role is read only, with a requirement to submit the following: responses to Base and Delivery Order requests in accordance with Contractor Base/Delivery Order Work Plan (DID# PM-06), and monthly technical reports in accordance with Technical Reporting and Management Reviews (DID# CD-02) for each active or in-progress order.

The Contractor's response shall consist of:

- **Completing an online cost and Work Year Equivalent (WYE) chart** for each order action, and uploading a minimum of 3 documents for each order response in the GCWCS: Work Plan (Word document) and two versions of the Cost Estimate (Excel).

- **Responses to Order Requests**
  Work Plan content - Basic Information:

- Order and modification number, Date of Submission
- Order contacts: Contractor Order Lead name and contact information
- Contractor technical contact name and contact information
- Period of Performance, Current Order Action Cost, Total Order Cost

Work Plan content – Technical Information:

- Content will be consistent with Contractor Base/Delivery Order Work Plan (DID# PM-06)

Cost Estimate Content: In preparing the cost estimate responses, the Contractor shall review Appendix A which includes "Contractor's Order Response – Cost Estimates".

1st Cost estimate (Full Cost Estimate): Complete cost estimate including all rates. Full cost estimate will allow for VIEW ONLY to: Contracting Officer (CO), Contracting Officer's Representative (COR), and Office of Chief Financial Officer (OCFO – Code B)

2nd Cost estimate (Sanitized Cost Estimate): Sanitized version of the cost estimate. Sanitized cost estimate will allow for VIEW to all GCWCS users.

There is no provision in the GCWCS system to interface with a Contractor's business system.

Access to the GCWCS will be provisioned to the Contractor during Contract Phase-in period and will include training.

Details of the GCWCS are described in Appendix A.

APPENDIX A
Glenn Contractor Work Control System (GCWCS)

The Government will provide an internal automated web-based GCWCS system for managing and tracking all Government work requirements issued under the SpaceDOC III Contract. The GCWCS will include Government work requirements issued as both Base and Indefinite Delivery Indefinite Quantity (IDIQ) Delivery Orders. The GCWCS is an Oracle database web application. The application currently does not have an interface to a Contractor's business system.

Declarations

1. The GCWCS is considered the official record of work requirements requested for the SpaceDOC III Contract.
2. The Contractor's response in the GCWCS is considered the official Contractor's proposal response to Government requested work requirements.
3. The NASA BO/DO Manager proposal review and approval is considered the official Government/contractor proposal technical review.
4. Once the order action is approved by either the Contracting Officer (CO) or Contracting Officer's Representative (COR), the order action and the Contractor's response is the approved document to which the Contractor will perform the work requirement.

Note: All initial work requirements (orders) will be loaded into the GCWCS by the Government at the beginning of Contract Phase-in period. The Contractor shall prepare the order action response as described in Section 4.11 of the contract statement of work (SOW) in accordance with the Contractor Base/Delivery Work Order Plan (DID# PM-06). All Contractor responses to initial order requirements are due in the GCWCS no later than 14 calendar days after issuance to the Contractor in the GCWCS.

Role Titles and Descriptions

The following are roles established in the SpaceDOC GCWCS and brief role descriptions.

CO: Review, approve, or reject order actions

COR: Review, approve, or reject order actions and has COR Administrative role. Administrative role includes:

- Making changes to any entry field prior to the Contractor's response submission
- Rejecting order actions for BO/DO Manager and Codes B and Q
- Ability to assign or unassign backup BO/DO Managers and Technical Representatives (TRs)
- Take any action for BO/DO Managers
- Cancel an order or modification in progress prior to final approval
- Add comments to any order action in the 1st pass routing.

BO/DO Manager: Enter new order or modification requirements in the GCWCS. Also can review, approve, or reject Contractor responses and establish their own backup TM.

Technical Representative (TR): Higher level oversight for GRC Organizational Codes F, K, L, M, T. Review, approve, or reject order actions.

Code B: Office of Chief Financial Officer (OCFO) representatives. Review, approve, or reject order actions. Can route to various Funds Approver for funds confirmation.

Funds Approver: Organizational approvers of funds, and has read/write capability to the order action WBS (Work Breakdown Structure) table.

Code Q: Safety and Mission Assurance (S&MA) Directorate representatives. Review, approve, or reject order actions. Can route to various Code Q Reviewers.

Code Q Reviewer: S&MA representatives. Review, comment, and approve order actions.

Read Only User: Government user that has a *need to know* information in the GCWCS. Read only access is approved by the COR.

Contractor: Contractor representatives designated to review Government work requirements. Complete online fields for order summary chart, submit responses to order actions (Work Plan, Full and Sanitized cost estimates), and upload monthly technical reports for all approved and in-progress orders as defined in SOW section 4.11 in accordance with the Contractor Base/Delivery Order Work Plan (DID# PM-06). Contractor representatives will be provisioned access during the Phase-in period through the NASA Access Management System (NAMS). Training will be provided during Contract Phase-in period.

Types of Order Actions in the GCWCS

The following are the various types of order actions that will be processed in the SpaceDOC III GCWCS, entered by BO/DO Managers or their backups.

New Base Order (BO): Base order – technical activities supporting the overall mission of the Center, as described in the SpaceDOC III Statement of Work.

New Delivery Order (DO): IDIQ Delivery order – non-recurring, one-time, non-routine activities supporting the overall mission of the Center, as described in the SpaceDOC III Statement of Work.

Types of Order Modifications

Change: Allows for work content changes within the current order period of performance

Extension: Allows for the extension of work requirements through the Contract period of performance

Travel Modification: Allows the BO/DO Manager to enter a travel modification

Change BO/DO Manager Modification: Allows the BO/DO Manager to change the BO/DO Manager of record on an order

Cancel Modification: Allows the order to be cancelled during the order approved period of performance

Close Modification: Allows the order to be closed either at the completion of the work requirement or after the period of performance end date

Typical Order Action Routing All orders and modification actions will have 2 routing passes. Some modification types have truncated routing. This depicts new order routing as an example.

1st Pass reflects the routing from the initial Government (BO/DO) work requirement entry through CO or COR approval such that the Contractor can prepare and submit their response.

1st Pass Routing: BO/DO Manager, TR, Code Q, COR, e-mail to Contractor

2nd Pass reflects the approval routing from the time the Contractor submits the response through CO or COR approval for work performance to begin.

2nd Pass Routing: Contractor response submitted, BO/DO Manager, TR, Codes B/Q simultaneously (Code B can route to Funds Approvers, Code Q can route to Code Q Reviewers), CO or COR approval of order action for performance to begin, e-mail to Contractor.

Home Screen Choices

Users in each role will have their own home screen with a variety of choices based on their required duties.

A representative listing of home screen choices are:

***Mandatory GCWCS Training*:** Each role must review the training before actions can be taken in the GCWCS

***SpaceDOC III Contract Statement of Work (SOW)*:** Link to SpaceDOC III Contract SOW

My Approval Queue: Provides a list of orders for which the role has a pending review/approval action

My Orders: For BO/DO Managers and TRs, a list of orders associated with the BO/DO Manager /TR

Orders in Progress: A list of all orders in progress in one of the 2 routing passes

Start New Base Order

Start New Delivery Order

Order Extension Instructions

All Orders: A list of all orders in the GCWCS by categories: Approved (then sorted by DO, DO), In- Progress, Cancelled, or Closed

My Reports: Repository of the user's reports created using the search function

Search GCWCS*:* Allows a search on any GCWCS field, also allows for reports to be generated for selected search criteria

My Backup BO/DO Managers/TRs: Allows the BO/DO Managers and TRs to assign or unassign backups to take actions on their behalf

***My Monthly Technical Reports*:** Provides a list of all Monthly Reports for each order assigned to the TM

Link to SpaceDOC III Order Survey: For BO/DO Managers to enter order surveys when requested by the COR

Contractor's Order Response – Cost Estimate

For each work requirement entered into the GCWCS, the Contractor shall prepare and upload 2 cost estimates. One is a full cost estimate and the second, a sanitized cost estimate. For each order, 2 cost estimates will be uploaded, a full cost estimate and a sanitized cost estimate. Each cost estimate will be formatted for separate Government fiscal years. In the event the technical requirement crosses fiscal years, a second tab on the cost estimate will be added for the following fiscal year. A sample for each cost estimate and blank template samples will be provided at a later date.

All cost estimate responses will include the following basic information:

Order number, Modification number, Government fiscal year annotation

Contractor's technical contact, including name, phone number and email address

For each month, the estimate will show the Contractor's accounting month dates, and the number of potential hours that can be worked in each month, with a total for the entire fiscal year.

Additional cost estimate data shall be consistent with the Contractor Base/Delivery Order Work Plan (DID# PM-06).