

**Statement of Work
For
Exploration Flight Projects Support**

1.0 Scope

The contractor shall provide specialized engineering, technical, and program/project support and leadership expertise for Marshall Space Flight Center (MSFC) Science and Missions Systems, including but not limited to the Exploration Flight Projects Office. The scope of this work includes, but is not limited to the areas of Project Management, Systems Engineering and Integration, Vehicle Integration, Research, Design, Fabrication, and Analysis.

The contractor shall perform duties as identified/assigned by the Task Order Monitor, including but not limited to:

1. Requirements development, allocation and management support.
2. Analysis of integrated vehicle elements and associated subsystems.
3. Verification planning and reporting activities.
4. Unique discipline related research and analyses.
5. Representation at Technical Interchange Meetings [Integrated Product Teams, Tabletop Reviews, and Engineering Review Boards (ERBs)].
6. Hardware design, fabrication, and testing.
7. Systems and Vehicle Integration across vehicle elements.

2.0 Task Order Management and Reporting

A. Contractor Management

The Contractor shall provide the planning, coordination, technical direction, and surveillance of the activities necessary to assure disciplined performance of work and timely application of resources for the accomplishment of all tasks issued under the order. The Contractor shall be responsible for maintaining communication with each supported organization and alerting the Contracting Specialist immediately of any problems that would prevent meeting established milestones.

B. Data Deliverables

The contractor shall report and document this work and fulfill the requirements of associated Data Requirement Descriptions (DRD's) as outlined in Data Procurement Document (DPD) 1170 (Attachment J-2). The contractor shall determine the data restriction that applies to each data deliverable and mark or transmit the data restriction in accordance with section 2.3.3 of the Data Procurement Document.

1. The Contractor shall submit a Monthly Status Report in accordance with DRD 1170MA-003. Any presentation, reports, analyses or technical memorandum that is developed during the execution shall be pre-coordinated with the Task Order Monitor and final copies provided to the Task Order Monitor.

The Contractor shall provide NASA with necessary information on project progress to allow the Government to monitor product assurance, identify significant problems, and implement corrective action as applicable based on the Contractor's performance.

The Contractor shall develop and maintain a Work Breakdown Structure (WBS) defining all task elements contained in this Task Order and in accordance with established GSA rates per hours worked.

2. The Contractor shall submit a Badged Employee and Remote IT User Listing in accordance with DRD 1170MA-001.
3. The Contractor shall submit a Contractor Employee Clearance Document in accordance with DRD 1170MA-002.
4. The Contractor shall submit a Position Risk Designation for Non-NASA Employees in accordance with DRD 1170MA-004.
5. The contractor shall submit a Contractor Information Technology Security Program Plan (CITSPP) that documents how the contractor will be responsible for information and IT security in accordance with DRD 1170CD-001.
6. The contractor shall establish and implement an industrial safety, occupational health, and environmental program that (1) prevent employee fatalities, (2) reduce the number of incidents, (3) reduce the severity of employee injuries and illnesses, and (4) protects the environment through the ongoing planning, implementation, integration and management control of these programs in accordance with DRD 1170SA-001. The SHE Plan shall address each of the following MSFC SHE core program requirements in detail that are applicable to the contracted effort:
 - a. Management leadership and employee involvement.
 - b. System and worksite analysis.
 - c. Hazard prevention and control.
 - d. Safety, health and environmental training.
 - e. Environmental compliance.
7. The contractor shall report mishaps and safety statistics to the MSFC Industrial Safety Office in accordance with DRD 1170SA-002. The contractor shall submit direct to the NASA Incident Reporting Information System (IRIS) or shall use the forms listed in section 15.4 of DRD 1170SA-002 or electronic equivalent to report mishaps and related information required to produce the safety metrics.

3.0 Technical Requirements

The contractor shall be responsible for information and information technology (IT) security when physical or electronic access to NASA's computer systems, networks, or IT infrastructure is required or when NASA information is stored, processed, generated

or exchanged with NASA or on behalf of NASA, regardless of where the information resides.

All data files and reports electronically delivered shall comply with Technical Standard 1194.21 of the Rehabilitation Act of 1973, Section 508.

3.1 Service Module Design and Development – Closed December 2008

Perform independent technical analyses on Service Module Integrated System and Subsystems, including, but not limited to:

1. Review of associated Crew Exploration Vehicle (CEV) / Orion Project Review documentation such as the System Engineering Management Plan (SEMP), System Requirements Document (SRD), System Definition Review (SDR) Process Plan, Master Verification Plan (MVP), Operations Concept (Ops Con) Document, Constellation Architecture Requirements Document (CARD).
2. Development and review of Service Module-level documentation.
3. Review of relevant NASA policies, processes, and procedures as they apply to Service Module with recommendations for inclusion in program implementation.
4. Review and assessment of propulsion related concepts.
5. Perform risk assessments and develop associated mitigation plans.

Support technical meetings and reviews of Service Module Integrated System and Subsystem, including, but not limited to:

1. Participation in all CEV / Orion Project and lower level Reviews, including but not limited to, System Design Review (SDR), Preliminary Design Review (PDR), Critical Design Review (CDR), Flight Readiness Review (FRR).
2. Attendance at all required NASA and Prime Contractor Technical Interchange Meetings (TIMs), Integrated Product Team meetings, Tabletop Reviews, and Engineering Review Boards (ERBs), as directed.
3. Support all planned and unplanned meetings with MSFC, GRC, and the Prime Contractor, as directed.

Develop and maintain informal communications including, but not limited to:

1. Establish working relationships and technical dialogue with the GRC Service Module Project Office, the JSC CEV/Orion Project Office, the KSC Ground Operations Office, and the Prime Contractor and subs.
2. Assist Service Module management in tracking, projecting, coordinating, and allocating resources available to achieve goals and objectives.
3. Prepare and provide informal reports that include, but are not limited to, weekly notes, monthly status reports, etc.

3.2 Upper Stage Element Management Support – Closed July 2010

3.3 Integrated Avionics Support

Project Management and Engineering Support to Upper Stage Avionics and Software Subsystem Project Office (JP30), which includes but is not limited to:

- The Contractor shall coordinate with the Engineering Directorate and industry support teams to assist the US Project Office in developing and meeting long-term planning for US Avionics Systems production.
- The Contractor shall support the US design reviews by coordinating and participating in the review.
- The Contractor shall support the development of the data products for US Avionics Systems by reviewing and providing comments to the developers, managers and team leads.
- The Contractor shall assist the integrated product teams in the generation of requirements and verification items for the US Avionics and Software subsystem.
- The Contractor shall analyze comments and coordinate the mitigation of RIDS provided against the US data products during the review cycles.
- The Contractor shall support project planning and scheduling activities.
- The contractor shall review and coordinate the US A&SW Project Office (PO) review of Ares I/Upper Stage Change Requests (CRs) along with Boeing Upper Stage Production Contract Data Requirements (DRs) and Boeing Instrument Unit Avionics Contract DRs.
- The Contractor shall support the US Project Office in coordinating with engineering the risk assessments for the Avionics and Software IPT.
- The Contractor shall support coordination of engineering in the development of the Component End Item specifications for the US Avionics and Software subsystem/components.
- The Contractor shall support coordination of engineering in the development of the Avionics and Software Subsystem Test Plan(s) and inputs into the US Test Plans.
- The Contractor shall assist the US Project Office in monitoring and overseeing the US Instrument Unit Avionics Contractor activities and products.

3.4 US SE&I Management Support – Closed January 2009

3.5 Altair - Lunar Surface Access Module Support – Closed February 2009

3.6 Upper Stage Test Office Support – Closed July 2010

3.7 Upper Stage Structures and Thermal Management Support – Closed September 2010

Project Management and Engineering Support to Upper Stage Structures and Thermal (S&T) Subsystems, which includes but is not limited to:

- The Contractor shall coordinate with the Engineering Directorate and industry support teams to assist the US Project Office in developing and meeting long-term planning.
- The Contractor shall support the US design reviews by coordinating and participating in the review.
- The Contractor shall support the development of the data products for US S&T by reviewing and providing comments to the developers, managers and team leads.
- The Contractor shall assist the integrated product teams in the generation of requirements and verification items for the US S&T subsystems.
- The Contractor shall analyze comments and coordinate the mitigation of RIDS provided against the US data products during the review cycles.
- The Contractor shall support project planning and scheduling activities.
- The contractor shall review and coordinate the US Project Office (PO) review of Ares I/Upper Stage Change Requests (CRs) along with Boeing Upper Stage Production Contract Data Requirements (DRs).
- The Contractor shall support the US Project Office in coordinating with engineering the risk assessments for the S&T IPT.
- The Contractor shall support coordination of engineering in the development of the S&T Test Plan(s) and inputs into the US Test Plans.
- The Contractor shall assist the US Project Office in monitoring and overseeing the US S&T engineering activities and products.

3.8 Main Propulsion Systems Project Management – Closed October 2009

3.9 Altair - System Eng Supp - MSFC Vehicle Integration M&A

This task is in support of Altair Lander Project in the implementation of systems engineering processes and data using collaborative tool(s) identified. The task supports systems engineering process development and implementation; collaborative tool configuration in applying systems engineering processes in the tool; data collection/capture; initial system engineering assessment; implementation strategy and database deployment strategy/plan.

The Contractor shall provide subject matter expertise in the following areas: the system engineering processes cover the system engineering life cycle from collecting stakeholder needs, goals, and objectives to operational, functional, and physical modeling (diagramming techniques) for system complexity and interface awareness; support alternative solution configuration management as the system design process narrows its point design solutions; closing processes support integration, testing and verification of the systems against the initiating requirements imposed by the customer; the process development effort uses modeling techniques of the collaborative tools to capture process models, organization models, and system design models; allocation and cross correlation of these models in the tools provides the frame work necessary to produce a System Engineering Management Plan (SEMP) and process implementation documentation.

3.10 ET Managerial, Programmatic and Technical Support

To provide National Aeronautics and Space Administration (NASA), MSFC with technical support and subject matter expertise to the Shuttle Project Office (SPO) management and technical staff in conjunction with the External Tank (ET) Foam Loss investigations. Duties will include reviewing and assessing assigned ET Project technical activities or issues related to the Foam Loss investigation and providing comments and recommendations regarding those activities or issues. This support can also be rendered to other MSFC and Level II organizations whose functions relate to the ET Project.

3.11 US MFG & ASSY Support – Closed July 2010

3.12 MSFC-NESC TDTs Materials

The Contractor shall provide technical support to participate as a member of the NASA Engineering and Safety Center's Materials Technical Discipline Team (TDT). As a member of this team of discipline experts, the individual will participate in team meetings, provide expert advice and guidance to the team leader, conduct independent peer review of technical reports and prepare appropriate sections of team reports and findings. The schedule of meetings is to be developed in coordination with the team leader and the rest of the team, and will be conducted mostly through teleconferencing. Travel for one annual face-to-face meeting at a domestic location is expected.

The contractor shall perform tasks such as, but not limited to:

- Participate in team teleconferences and team meetings as required.
- Make and/or express expert opinion on material of interest.
- Submit draft sections of team reports and other written products.
- Submit findings/comments to the Materials Technical Discipline Team and the NESC.

3.13 MSFC NESC OSC Testing Assessment

As a member of the NESC team, the contractor shall perform tasks such as, but not limited to:

- Review existing Taurus II rocket design, modeling, and analyses data provided by Orbital Sciences Corporation.
- Perform an independent assessment on data received and identify improvements in test plans, design, and/or operations. Provide feedback to NESC team and/or team lead.

- Attend and participate face-to-face team meetings at either or both NASA Wallops Flight Facility in Wallops Island, Virginia and Orbital Sciences Corporation offices in Dulles, Virginia.
- Participate via telecon in regularly-scheduled team meetings (anticipated to occur weekly, and anticipated to last less than two hours each), to assess and discuss relevant topics.
- Provide draft written sections of a technical report, to include findings, observations and recommendations, as requested by the team lead.
- Participate via telecon in an out brief of assessed findings, observations and recommendations, to the NESC Review Board.
- Participate via telecon in an out brief of assessed findings, observations and recommendations, to the stakeholder.

3.14 Nano-Energetic Propellant Project (NEPP) System Analysis Support

The Contractor shall perform tasks such as, but not limited to:

- Perform Systems Analysis for missions such as: low cost access to space; interplanetary transfer stages; upper stage engines for launch vehicles; booster stages for launch vehicles.
- Provide a First Order level analysis effort on each mission.
- Define mission capability based on State-of-Art (SOA) propulsion and propellant. Define SOA propellant requirements.
- Identify how mission capability can be enabled, greatly enhanced, or expanded, if “game-changing” propellant is available. Provide “game-changing” propellant requirements. Examples include: if propellant can be manufactured via ISRU method; Additional missions can be performed because of the availability of game changing propellant.
- Identify vehicle systems impacts including: Increased payload capability; reduced vehicle size requirement; identify key vehicle subsystems that will need modification to enable “game-changing” propellants.

3.15 Space Launch Systems Support

(Authorization to proceed with this subtask will be provided by the Contracting Officer in written direction.)

Provide technical support to program/project office management for strategic planning of technology projects, concept development, requirements analysis, verification planning, systems engineering and integration, test and evaluation, risk management, and technical review products development. Provide program/project office engineering support for the management, trade studies, development, integration, and verification, validation and accreditation of modeling and simulation tasks for exploration architectures including space and launch vehicle systems, ground support systems and operations.

4.0 Travel

The contractor shall travel as requested to accomplish each technical requirement. Any travel must be approved by the Contractor Officer's Technical Representative (COTR) or task order technical monitor, prior to travel.

The contractor's monthly report shall contain travel detail to include travel destination, dates of travel, number of people who traveled, and purpose of the travel.

5.0 Materials

No materials are currently required for this order. However, this may change based on the customer's requirements as directed by the Contractor Officer's Technical Representative (COTR) or task order technical monitor. Any materials being purchased must be approved by the Contracting Officer prior to purchase.

6.0 Reserved

7.0 Personnel Skill Levels

The Contractor shall provide skills at a level to perform the subtasks in this order.

8.0 Technical Milestones and Deliverables

Specified under Section 2-B of the SOW; any additional deliverables for specific subtasks are specified under Section 3.0.