

**Statement of Work
For
PROPULSION SYSTEMS DIVISION
Liquid Engine & Main Propulsion Systems**

1.0 Scope

The Contractor shall provide specialized engineering support to the Marshall Space Flight Center (MSFC) Engineering Directorate including, but not limited to, the Liquid Engine & Main Propulsion Systems Branch. The contractor shall provide engineering expertise for the design and analysis of complex propulsion systems for rocket propulsion in support of the design and integration for various vehicle elements. This support includes, but is not limited to, all phases of the design process; trade studies, conceptual and detail design and analysis, development, integration, test and operational support.

The contractor shall provide specialized engineering support facilitating the design, development, configuration management and certification of integrated propulsion systems for spacecraft and launch vehicles.

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 Requirements Descriptions (DRDs)

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) 1172 (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 1172MA-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 1172MA-001.
3. The Contractor shall submit a Contractor Employee Clearance Document in accordance with DRD 1172MA-002.
4. The Contractor shall submit a Position Risk Designation for Non-NASA Employees in accordance with DRD 1172MA-004.
5. The contractor shall prepare a Contract Information Technology Security Program Plan (CITSPP) that documents how the contractor will be responsible for information and IT security in accordance with DRD 1172CD-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 1172SA-001. The SHE Plan shall address each of the following MSFC SHE core program requirements in detail that are applicable to the contracted effort:
 - i. Management leadership and employee involvement.
 - ii. System and worksite analysis.
 - iii. Hazard prevention and control.
 - iv. Safety, health and environmental training.
 - v. Environmental compliance.
7. The contractor shall report mishaps and safety statistics to the MSFC Industrial Safety Office in accordance with DRD 1172SA-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 1172SA-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, 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.

Tasks shall be defined as follows:

3.1 Integrated Main Propulsion Systems (MPS) Systems Engineering and Integration (SE&I) – Closed July 2010

The contractor shall provide MPS systems engineering support for development of the Integrated MPS concepts, requirements, analyses, and the integration of the MPS to meet the integrated system requirements.

The contractor shall provide integrated products to the Upper Stage Project Office and Chief Engineer such as the Systems Requirements Document, System Definition Document, Interface Requirements Documents, and Verification Plans. Facilitate integration both internally between MPS subsystems and externally with the Upper Stage, Upper Stage Engine, and Ground Operations.

The contractor shall provide requirements definition and flow down support including developing the necessary MPS requirements and incorporating these requirements into the proper documentation as required. Provide support to the development of the Upper Stage System to MPS integration requirements including the identification of issues where a pushback on requirements from the MPS to Upper Stage is needed. Support the development of detailed validation and verification plans. Provide evaluation of the test plans to ensure all the intended system verification objectives can be accomplished.

The contractor shall provide assessments of designs, both internal and from other Upper Stage IPT's, including addressing the impact of design to the Integrated MPS performance and functionality. The contractor shall identify the technical risks associated with the design including any potential safety concern. The contractor shall provide support for integrated MPS trade studies and issue resolution and actively participate in study activities, including coordination with the other Upper Stage IPTs.

The contractor shall provide support to the development of the MPS FMEA, fault tolerance requirements, reliability requirements and assessments and hazard definitions as required. The contractor shall coordinate with the other Upper Stage IPTs to provide an integrated system assessment.

The contractor shall assist the project and IPT leaders with specialized engineering and testing tasks, milestones and product planning to meet the project overall schedules. The contractor shall support specialized activities associated with planning and test readiness reviews. The contractor shall support test data reviews and analysis.

3.2 Upper Stage Engine (USE) Systems Engineering and Integration (SE&I) – Closed April 2009

The contractor shall provide J-2X engine systems engineering support for development of the integrated engine concepts, requirements, analyses, and the integration of the engine with the MPS to meet the integrated system requirements.

The contractor shall provide integrated products to the Upper Stage Engine (USE) Project Office and Chief Engineer. The contractor shall participate in the development and review of project documentation such as the Systems Requirements Document, System Definition Document, Interface Requirements Documents, and Verification Plans. The contractor shall facilitate integration both internally within the engine and externally with the Upper Stage and Ground Operations.

The contractor shall provide requirements definition and flow down support including developing the necessary J-2x engine requirements and incorporating these requirements into the proper documentation as required. Provide support to the development of the Upper Stage Engine to MPS integration requirements including the identification of issues where a pushback on requirements from MPS or Upper Stage is needed. Support the development of detailed validation and verification plans. Provide evaluation of the test plans to ensure all the intended system verification objectives can be accomplished.

The contractor shall provide assessments of designs, both internal and from other IPT's, including addressing the impact of design to the Integrated engine system performance and functionality. The contractor shall identify the technical risks associated with the design including any potential safety concern. The contractor shall provide support for engine trade studies and issue resolution and actively participate in study activities, including coordination with the other IPTs.

The contractor shall provide support to the development of the USE FMEA, fault tolerance requirements, reliability requirements and assessments and hazard definitions as required. The contractor shall coordinate with the other engine subsystems and the Upper Stage IPTs to provide an integrated system assessment.

The contractor shall assist the project and IPT leaders with specialized engineering and testing tasks, milestones and product planning to meet the project overall schedules. The contractor shall support specialized activities associated with planning and test readiness reviews. The contractor shall support test data reviews and analysis.

3.3 Upper Stage Roll Control – Closed December 2008

The contractor shall provide specialized engineering support facilitating the design, development, configuration management and certification of the Ares Launch Vehicle Upper Stage Roll Control integrated propulsion systems. This also includes tasks associated with successful preparation and execution of major design reviews (e.g. PDR and CDR) and the development of specific engineering documentation associated with the above tasks.

3.4 Upper Stage Reaction Control – Closed December 2008

The contractor shall provide specialized engineering support facilitating the design, development, configuration management and certification of the Ares Launch Vehicle Upper Stage Reaction Control integrated propulsion systems. This also includes tasks associated with successful preparation and execution of major design reviews (e.g. PDR

and CDR) and the development of specific engineering documentation associated with the above tasks.

3.5 Ares I-X RoCS IPT – RESERVED

3.6 Ares V ED Study MPS Development – Closed December 2008

3.7 LSAM – Spacecraft Development M&A – to be completed September 2010

3.8 Ares V CLV Program Management & Administration

The contractor shall provide expertise for performing system level technology, concept evaluation, and advanced architecture development for various size launch vehicle propulsion systems.

3.9 Ares V – Lab View Programming Support – Closed May 2010

3.10 NASA MSFC Propulsion Systems Design and Integration Support

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

The objective of this subtask is to provide expertise for performing system level technology and concept evaluation, analysis, and maturation, detailed system development and propulsion component integration, test verification planning, evaluation, and certification. This support also includes providing sustaining engineering and operations support for space transportation propulsion systems.

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 subtask are specified under Section 3.0.