

Statement of Work
For
PROPULSION COMPONENT DESIGN AND DEVELOPMENT
Valves, Actuators, & Ducts Design & Development

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 Valves, Actuators, & Ducts Design & Development Branch. The contractor shall provide specialized engineering expertise, technical expertise, program/project support for propulsion system components including but not limited to valves, actuators, lines, ducts, fluid systems, and miscellaneous components design and development for launch vehicles, spacecraft systems, sub-systems and 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 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) 1169 (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 1169MA-003. Any presentation, reports, analyses or technical memorandum that is developed during the execution shall be pre-coordinated with the task order lead and final copies provided to the task order lead.

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 1169MA-001.

3. The Contractor shall submit a Contractor Employee Clearance Document in accordance with DRD 1169MA-002.
4. The Contractor shall submit a Position Risk Designation for Non-NASA Employees in accordance with DRD 1169MA-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 1169CD-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 Upper Stage Main Propulsion System (MPS) Liquid Oxygen System – Closed June 2010

The contractor shall utilize architectural concepts to define valves, actuators, lines, ducts, miscellaneous fluid components, and fluid system requirements for propulsion systems including but not limited to the Ares I Upper Stage Liquid Oxygen System.

The contractor shall utilize the Pro Engineer computer-aided design tool to translate architectural concepts into functional designs for propulsion systems including but not limited to the Ares I Upper Stage Liquid Oxygen System.

The contractor shall provide specialized conceptual development and design of MPS Liquid Oxygen System valves, actuators, lines, ducts, miscellaneous fluid components, and fluid systems by performing trade studies and supporting the development of computer models, technical reports, test activities, anomaly assessment/resolution, and other miscellaneous products associated with day-to-day team activities.

The contractor shall support the development and design of specialized conceptual and high level requirement definition and analysis by developing operational concepts, integration methodologies, component descriptions and specifications, schematics, preliminary component designs, development and verification test plans, test procedures, and technical reports for the design and evaluation of valves, actuators, lines, ducts, miscellaneous fluid components, and fluid systems.

The contractor shall perform specialized valves, actuators, lines, ducts, miscellaneous fluid component, and fluid system analyses (pressure drop, surge pressure, strength, flexibility, structural dynamics, etc.), material selection, manufacturing technique selection, component selection, component sizing, and computer aided design modeling.

The contractor shall assist the project and Integrated Product Team (IPT) leaders with specialized engineering and testing tasks, milestones and product planning to meet the project overall schedules and planning. The contractor shall provide specialized support at test planning and test readiness reviews. The contractor shall support test data reviews and test analysis.

The contractor shall use prior program experience to identify necessary tasks and products required for successful development and certification of Ares I Upper Stage propulsion elements. The contractor shall assist the government in the formulation and planning of specialized development, verification, and certification plans for human-rated propulsion systems for Ares I.

3.2 Upper Stage Main Propulsion System (MPS) Liquid Hydrogen System – Closed June 2010

The contractor shall utilize architectural concepts to define valves, actuators, lines, ducts, miscellaneous fluid components, and fluid system requirements for propulsion systems including but not limited to the Ares I Upper Stage Liquid Hydrogen System.

The contractor shall utilize the Pro Engineer computer-aided design tool to translate architectural concepts into functional designs for propulsion systems including but not limited to the Ares I Upper Stage Liquid Hydrogen System.

The contractor shall provide specialized conceptual development and design of MPS Liquid Hydrogen System valves, actuators, lines, ducts, miscellaneous fluid components, and fluid systems by performing trade studies and supporting the development of computer models, technical reports, test activities, anomaly assessment/resolution, and other miscellaneous products associated with day-to-day team activities.

The contractor shall support the development and design of specialized conceptual and high level requirement definition and analysis by developing operational concepts, integration methodologies, component descriptions and specifications, schematics, preliminary component designs, development and verification test plans, test procedures, and technical reports for the design and evaluation of valves, actuators, lines, ducts, miscellaneous fluid components, and fluid systems.

The contractor shall perform specialized valves, actuators, lines, ducts, miscellaneous fluid component, and fluid system analyses (pressure drop, surge pressure, strength, flexibility, structural dynamics, etc.), material selection, manufacturing technique selection, component selection, component sizing, and computer aided design modeling.

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 and planning. The contractor shall provide specialized support at test planning and test readiness reviews. The contractor shall support test data reviews and test analysis.

The contractor shall use prior program experience to identify necessary tasks and products required for successful development and certification of Ares I Upper Stage propulsion elements. The contractor shall assist the government in the formulation and planning of specialized development, verification, and certification plans for human-rated propulsion systems for Ares I.

3.3 Upper Stage Main Propulsion System (MPS) Pressurization and Pneumatic System – Closed June 2010

The contractor shall utilize architectural concepts to define valves, actuators, lines, ducts, miscellaneous fluid components, and fluid system requirements for propulsion systems including but not limited to the Ares I Upper Stage Pressurization and Pneumatic System.

The contractor shall utilize the Pro Engineer computer-aided design tool to translate architectural concepts into functional designs for propulsion systems including but not limited to the Ares I Upper Stage Pressurization and Pneumatic System.

The contractor shall provide specialized conceptual development and design of MPS Upper Stage Pressurization and Pneumatic System valves, actuators, lines, ducts, miscellaneous fluid components, and fluid systems by performing trade studies and supporting the development of computer models, technical reports, test activities, anomaly assessment/resolution, and other miscellaneous products associated with day-to-day team activities.

The contractor shall support the development and design of specialized conceptual and high level requirement definition and analysis by developing operational concepts, integration methodologies, component descriptions and specifications, schematics, preliminary component designs, development and verification test plans, test procedures, and technical reports for the design and evaluation of valves, actuators, lines, ducts, miscellaneous fluid components, and fluid systems.

The contractor shall perform specialized valves, actuators, lines, ducts, miscellaneous fluid component, and fluid system analyses (pressure drop, surge pressure, strength, flexibility, structural dynamics, etc.), material selection, manufacturing technique selection, component selection, component sizing, and computer aided design modeling.

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 and planning. The contractor shall provide specialized support at test planning and test readiness reviews. The contractor shall support test data reviews and test analysis.

The contractor shall use prior program experience to identify necessary tasks and products required for successful development and certification of Ares I Upper Stage propulsion elements. The contractor shall assist the government in the formulation and planning of specialized development, verification, and certification plans for human-rated propulsion systems for Ares I.

3.4 Upper Stage Engine (J-2X) Valves, Actuators, Lines, Ducts, Miscellaneous Fluid Components, and Fluid Systems – Closed April 2008

The contractor shall utilize architectural concepts to define, or assist in the definition of valves, actuators, lines, ducts, miscellaneous fluid components, and fluid systems requirements for the Upper Stage Engine.

The contractor shall utilize the Pro Engineer computer-aided design tool to translate architectural concepts into functional designs, or to provide engineering insight relating to functional designs, for the Upper Stage Engine.

The contractor shall provide specialized development, design, and engineering insight, relating to Upper Stage Engine valves, actuators, lines, ducts, miscellaneous fluid components, and fluid systems, by performing trade studies and supporting the development of computer models, technical reports, test activities, anomaly assessment/resolution, and other miscellaneous products associated with day-to-day team activities. The contractor shall support major product reviews, such as Preliminary Design Reviews and Critical Design Reviews.

The contractor shall provide and support development, design, and insight engineering relating to specialized conceptual and high level requirement definition and analysis by developing operational concepts, integration methodologies, component descriptions and specifications, schematics, preliminary component designs, development and verification test plans, test procedures, and technical reports for the design and evaluation of valves, actuators, lines, ducts, miscellaneous fluid components, and fluid systems.

The contractor shall perform specialized valves, actuators, lines, ducts, miscellaneous fluid component, and fluid systems analyses (pressure drop, surge pressure, strength, flexibility, structural dynamics, etc.), material selection, manufacturing technique selection, component selection, component sizing, and computer aided design modeling. The contractor shall review and assess specialized valves, actuators, lines, ducts, miscellaneous fluid component, and fluid systems analyses (pressure drop, surge pressure, strength, flexibility, structural dynamics, etc.), material selection, manufacturing technique selection, component selection, component sizing, and computer aided design modeling.

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 and planning. The contractor shall provide specialized support at test planning and test readiness reviews. The contractor shall support test data reviews and test analysis.

The contractor shall use prior program experience to identify necessary tasks and products required for successful development and certification of the Upper Stage Engine. The contractor shall assist the government in the formulation and planning of specialized development, verification, and certification plans for human-rated propulsion systems for Ares I.

3.5 Upper Stage Thrust Vector Control (TVC) System and Components

The contractor shall utilize architectural concepts to define, or assist in the definition of TVC system and TVC components requirements for the Upper Stage.

The contractor shall utilize the Pro Engineer computer-aided design tool to translate architectural concepts into functional designs, or to provide engineering insight relating to functional designs, for the Upper Stage TVC system and TVC components.

The contractor shall provide specialized development, design, and engineering insight, relating to the Upper Stage TVC system and TVC components, by performing trade studies and supporting the development of computer models, technical reports, test activities, anomaly assessment/resolution, and other miscellaneous products associated with day-to-day team activities. The contractor shall support major product reviews such as Preliminary Design Reviews and Critical Design Reviews.

The contractor shall provide and support development, design, and insight engineering relating to specialized conceptual and high level requirement definition and analysis by developing operational concepts, integration methodologies, system and component descriptions and specifications, schematics, preliminary system and component designs, development and verification test plans, test procedures, and technical reports for the design and evaluation of the Upper Stage TVC system and TVC components.

The contractor shall perform specialized TVC system and TVC components analyses (pressure drop, surge pressure, strength, flexibility, structural dynamics, etc.), material selection, manufacturing technique selection, component selection, component sizing, and computer aided design modeling. The contractor shall review and assess specialized TVC

system and TVC components analyses (pressure drop, surge pressure, strength, flexibility, structural dynamics, etc.), material selection, manufacturing technique selection, component selection, component sizing, and computer aided design modeling.

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 and planning. The contractor shall provide specialized support at test planning and test readiness reviews. The contractor shall support test data reviews and test analysis. The contractor shall assist the project and IPT in the coordination, requirements definition, design, development, and buildup of special test equipment and facilities required for TVC system and TVC components testing.

The contractor shall use prior program experience to identify necessary tasks and products required for successful development and certification of Upper Stage systems. The contractor shall assist the government in the formulation and planning of specialized development, verification, and certification plans for human-rated systems for Ares I.

3.6 First Stage Thrust Vector Control (TVC) System and Components – Closed April 2008

The contractor shall utilize architectural concepts to define, or assist in the definition of TVC system and TVC components requirements for the First Stage.

The contractor shall utilize the Pro Engineer computer-aided design tool to translate architectural concepts into functional designs, or to provide engineering insight relating to functional designs, for the First Stage TVC system and TVC components.

The contractor shall provide specialized development, design, and engineering insight, relating to the First Stage TVC system and TVC components, by performing trade studies and supporting the development of computer models, technical reports, test activities, anomaly assessment/resolution, and other miscellaneous products associated with day-to-day team activities. The contractor shall support major product reviews such as Preliminary Design Reviews and Critical Design Reviews.

The contractor shall provide and support development, design, and insight engineering relating to specialized conceptual and high level requirement definition and analysis by developing operational concepts, integration methodologies, system and component descriptions and specifications, schematics, preliminary system and component designs, development and verification test plans, test procedures, and technical reports for the design and evaluation of the First Stage TVC system and TVC components.

The contractor shall perform specialized First Stage TVC system and TVC components analyses (pressure drop, surge pressure, strength, flexibility, structural dynamics, etc.), material selection, manufacturing technique selection, component selection, component sizing, and computer aided design modeling. The contractor shall review and assess specialized TVC system and TVC components analyses (pressure drop, surge pressure, strength, flexibility, structural dynamics, etc.), material selection, manufacturing technique selection, component selection, component sizing, and computer aided design modeling.

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 and planning. The contractor shall provide specialized support at test planning and test readiness reviews. The contractor shall support test data reviews and test analysis. The contractor shall assist the project and IPT in the coordination, requirements definition, design, development, and buildup of special test equipment and facilities required for First Stage TVC system and TVC components testing.

The contractor shall use prior program experience to identify necessary tasks and products required for successful development and certification of First Stage systems. The contractor shall assist the government in the formulation and planning of specialized development, verification, and certification plans for human-rated systems for Ares I.

- 3.7 Ares I FS Reaction Control Systems (RoCS) Propellant Subsystems - Closed April 2008**
- 3.8 Ares I FS Reaction Control Systems (RoCS) Thruster Subsystem (Valves) - Closed April 2008**
- 3.9 Ares I FS Reaction Control Systems (RoCS) Pressurization Subsystem - Closed April 2008**
- 3.10 Ares I Integrated US Reaction Control System (RCS) - Closed April 2008**
- 3.11 Ares I US Reaction Control System (RCS) Propellant Subsystems - Closed April 2008**
- 3.12 Ares I US Reaction Control System (RCS) Thruster Subsystem - Closed April 2008**
- 3.13 Ares I US Reaction Control System (RCS) Pressurization Subsystem - Closed April 2008**
- 3.14 Upper Stage Integrated TVC – Closed March 2010**
- 3.15 MSFC NESC TDT's Propulsion**

The contractor shall provide a full time individual to design and develop components including valves, lines and ducts for various propulsion systems on the Constellation program. This includes but is not limited to writing specifications, test plans, interface documents, schedules, coordinating reviews, and travel for TIM's.

3.16 MSFC DME Advanced Valves & Controls

The contractor shall provide Advanced Valves and Controls support.

3.17 LAS Propulsion – Closed March 2010

3.18 MSFC Valves, Actuators, & Ducts Design and Development 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 specialized engineering expertise, technical expertise, program support, and leadership expertise for valves, actuators, lines, ducts, fluid systems, and miscellaneous component design and development 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 subtasks are specified under Section 3.0.