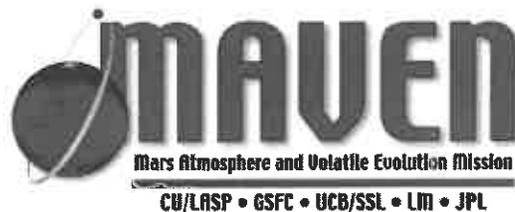




***Mars Atmosphere and Volatile Evolution  
(MAVEN) Mission***

***Statement-of-Work (SOW)  
For Risk Reduction Phase and Phase B  
Revision 2***

***March 26, 2009***



**Goddard Space Flight Center  
Greenbelt, Maryland**

## ARTICLE 1. STATEMENT OF WORK AND DELIVERY INSTRUCTIONS

### 1.0 Phase B – Risk Reduction & Formulation System Definition and Preliminary Design

The Contractor shall provide the resources necessary to complete risk reduction activities culminating in a MAVEN Project System Requirements Review / Mission Definition Review (SRR/MDR). The Contractor shall provide the resources necessary to support the MAVEN Project to define and complete the definition of the preliminary design, and the plans for development, manufacture, test, verification and operation of a Flight System, which consists of the integrated spacecraft and science payloads, in accordance with the requirements set forth in Attachments G through L:

Attachment G	MAVEN Mission Requirements Document, Spacecraft Requirements
Attachment H	Applicable/Reference Documents List
Attachment I	Contract Data Requirements List
Attachment J	Mission Operations Requirements
Attachment K	Government Furnished Property List
Attachment L	Mission Assurance Requirements

In the performance of this effort, which culminates in a MAVEN Project Preliminary Design Review (PDR), the Contractor shall:

#### 1.1 Risk Reduction Activities

- 1.1.1 Perform early development of the MAVEN-specific PTE algorithms implement on the MRO testbed.
- 1.1.2 Initiate early development of a spacecraft hardware test bed environment and integration of instrument hardware interface components.
- 1.1.3 Perform early development of system fault trees with focus area on Mars Orbit Insertion (MOI)
- 1.1.4 Perform initial Computational Flow Dynamics Analysis for Mars Orbit Science Phase
- 1.1.5 Define Spacecraft requirements in support of SRR/MDR

#### 1.2 Flight System Design and Development

Perform design, analysis and documentation tasks to develop the preliminary Flight System designs and prepare the preliminary integration, test, launch and operations plans for the Flight System.

- 1.2.1 Perform preliminary design tradeoffs and analyses to establish

the Flight System baseline design that provides the required functions, performance and accommodations for science payloads as defined in Attachment G.

- 1.2.2 Define the spacecraft requirements and generate detailed spacecraft and subsystem functional, design, interface and performance specifications with verification matrices.
- 1.2.3 Develop a Flight System design to a Preliminary Design Review (PDR) level, including subsystems, interfaces, and flight software.
- 1.2.4 Develop spacecraft subsystem, assembly and payload design/test environments for all mission phases.
- 1.2.5 Provide preliminary launch vehicle interface definitions and support GSFC in the development of the launch vehicle Interface Requirements Document (IRD).
- 1.2.6 Prepare preliminary plans for assembly, integration, test, verification, and launch operations. This includes, but is not limited to definitions of:
  - 1.2.6.1 Spacecraft and Flight System verification and spacecraft and Flight System integration, test and launch operations.
  - 1.2.6.2 Assembly, Test and Launch Operations (ATLO) testbeds
  - 1.2.6.3 All ground support equipment, including hardware and software, necessary to verify that the Flight System meets all technical requirements.
  - 1.2.6.4 The unique tooling, special test equipment and special handling equipment necessary for Flight System fabrication, assembly, test, and launch operations.
  - 1.2.6.5 The parts inventory and stores approach
- 1.2.7 Provide preliminary plan for simulator and testbed development, including, as a minimum, the following:
  - 1.2.7.1 Software development, testing and verification.
  - 1.2.7.2 System test and verification.
  - 1.2.7.3 Fault protection development, testing and verification.
  - 1.2.7.4 ATLO testing and software verification and validation.

- 1.2.8 Identify and, upon receipt of GSFC approval, procure and develop flight system, testbed and support equipment long lead-time items required to meet agreed to completion schedules leading to delivery of the Spacecraft.
- 1.2.9 Develop the spares approach and prepare a detailed spares list.

### 1.3 Payload Accommodation and Interface Definition

Conduct and coordinate spacecraft interface definition activities with Payload providers and GSFC to develop the engineering and science payload accommodation approach and generate preliminary interface designs, specifications and agreements including, as a minimum, the following:

- 1.3.1 Perform configuration tradeoffs and analyses to establish accommodations for each payload, including the evaluation and assessment of interactions between payload elements.
- 1.3.2 Prepare, maintain and update as necessary interface control documentation for each payload element in accordance with Attachment I.
- 1.3.3 Incorporate preliminary payload-provided mechanical configuration, structural and thermal models with the preliminary Spacecraft models and provide relevant integrated model results to payload providers.
- 1.3.4 Conduct planning and coordination with payload providers and GSFC to establish preliminary payload and spacecraft interface design verification, test plans and requirements during ATLO.

### 1.4 Ground Systems Development

- 1.4.1 Participate with and support GSFC Mission Operations architecture and interface definition activities.
- 1.4.2 Initiate preparation of preliminary mission operations plans, requirements and support concepts in accordance with Attachments G, I and J.
- 1.4.3 Support GSFC in the development of the Flight System to Ground System Interface Requirements Control Document (ICD).
- 1.4.4 Identify the Ground System hardware and software necessary to support the flight operations, including sequence validation, and performance analysis of the Flight System.

- 1.4.5 Identify the testbeds and associated capabilities needed to support development, test and maintenance of the Ground System, spacecraft command blocks (macros) and command sequences.

## 1.5 Program Management and Reporting

- 1.5.1 Assign a Program Manager who is responsible for all Contractor effort and shall have authority commensurate with that responsibility.
- 1.5.2 Implement a reporting program in accordance with Attachment I.
- 1.5.3 Prepare, update and maintain a listing of program risk items including technical, schedule and cost risks, and provide risk mitigation options and cutoff dates in accordance with Attachment I.
- 1.5.4 Accept "in-scope" technical direction only from the GSFC Contracting Officer (CO). Direction will be in written form, such as a Technical Direction Memorandum (TDM)
- 1.5.5 Maintain technical liaison between MAVEN Project personnel and the Contractor's equivalent personnel to permit the timely involvement in relevant technical issues.

## 1.6 Meetings and Reviews

Conduct or support meetings and reviews with GSFC, payload providers, NASA and other project participants and submit the deliverables in accordance with Attachment I, including the following:

- 1.6.1 Conduct Contractor Meetings and Reviews in accordance with the GSFC approved Review Plan
  - 1.6.1.1 Monthly Management Reviews (MMRs) at the Contractor's facility, in accordance with the requirements of Attachment I.
  - 1.6.1.2 Technical and programmatic splinter meetings between GSFC and Contractor representatives at the Contractor's facility or by other means mutually agreeable to GSFC and the Contractor.
  - 1.6.1.3 Flight System Design Team meetings with GSFC participation via telecon.
  - 1.6.1.4 Inheritance Reviews at Contractor's facility of existing designs/hardware/software for use on MAVEN.
  - 1.6.1.5 Lower-level (system, subsystem and assembly) Peer Reviews of hardware and software designs, where

deemed necessary, prior to PDRs.

1.6.1.6 Subsystem Preliminary Design Reviews (PDRs), including software and fault protection.

1.6.2 Participate in and/or support GSFC project and NASA meetings and reviews including the following:

1.6.2.1 Technical and Project team telecons and working meetings, such as mission assurance, software, integration and test, fault protection and subsystems.

1.6.2.2 Interface and requirements telecons and working meetings for the payloads, launch vehicle and the ground system.

1.6.2.3 Management/programmatic/cost/status telecons and working meetings with GSFC and NASA.

1.6.2.4 Quarterly Reviews at GSFC as requested

1.6.2.5 Key meetings and reviews at the payload provider's facilities

1.6.2.6 System Requirements Review/Mission Concept Review (SRR/MCR) at GSFC.

1.6.2.7 Spacecraft Preliminary Design Review (PDR) at the Contractor's facility.

1.6.2.8 Confirmation Review (CR) at GSFC and NASA HQ.

1.6.2.9 Project and Flight System Preliminary Design Review/Non Advocate Review (PDR/NAR) at GSFC.

## 1.7 Program Plans and Data

1.7.1 Prepare and submit all data to GSFC as defined in Attachment I, "Contract Data Requirements List".

1.7.2 Implement provisions of the plans required in Attachment I subsequent to GSFC approval.

## 1.8 Information, Data, Records and Storage

1.8.1 Transfer all deliverable documentation to a GSFC database system, which is internet accessible and is configuration-controlled.

1.8.2 Establish a method to provide access by internet to authorized

MAVEN Project personnel for working data products in accordance with PM-001. A GSFC or Contractor electronic database system or combination of both can be used. If a Contractor database is used, maintain access protection for the system, including an access control list for all authorized MAVEN Project personnel.

- 1.9 Provide technical and cost estimates for Phases C/D and Phase E Implementation.
- 1.10 In order to comply with the Section 508 Standards for Electronic and Information Technology, the contractor shall perform all software application development, including the development of code, in compliance with the technical standards delineated in Code of Federal Regulations (CFR) Part 1194.21 Software Applications and Operating Systems. Also, the contractor shall perform all web development in compliance with the technical standards delineated in CFR Title 36, Subpart B Technical Standards, Part 1194.22 Web-based Intranet and Internet Information and Applications