

Task Order 18-12 Rev. 1

1.0 Title of Effort: Multi Purpose Crewed Vehicle (MPCV) Support

2.0 Task Description:

The contractor shall provide engineering and analytical expertise to the MPCV Project.

2.1 SOW Reference: Section 5.0 and 6.0

2.2 Requirements

2.2.1 Management and Program Assurance

Assist in management of schedule, product delivery, and tasks in areas of MPCV requiring safety & mission assurance consideration.

2.2.2 System Safety

Provide engineering expertise in the area of system safety, through the subsystem level, for the MPCV avionics system. Evaluate systems engineering solutions to technical issues, provide inputs to hazard analyses, and evaluate and assess risk associated with the Project's approach to designing and operating the MPCV avionics architecture.

- a. Identify risks from MPCV safety data package/hazard analysis requiring review, assessment, or further analysis by Project technical forums.
- b. Evaluate SR&QA deliverables for compliance with Program/Project requirements.
- c. Identify impacts to program and element hazards or potential new hazards resulting from project activities.
- d. Provide recommendations to Project Boards/Panels regarding safety implications of hardware/software design and operations.
- e. Develop SR&QA requirements for the technical performance of the MPCV avionics system with respect to safety and mission assurance.
- f. Identify missing or non-compliant S&MA requirements as well as performance requirements that cannot be verified.
- g. Provide coordination and resolution of changes or issues dealing with Program/Project SR&QA requirements.
- h. Evaluate risks to project success posed by pending Program/Project decisions during DDT&E and report results to the MPCV SR&QA Manager.

2.2.2.1 MPCV Boards, Panels, Working Groups

- a. Provide technical support to the MPCV SR&QA Panel.
- b. Provide technical support to the MPCV safety review process..
- c. Provide technical support to Orion Subsystem Product Teams (SPTs)
- d. Perform/provide qualitative and/or quantitative risk assessments of the baselining of, or changes to, program/project requirements and element interface requirements or specifications.

- e. Identify impacts to documented Hazard and CIL risk mitigation controls posed by changes, waivers, issues, or decisions pending at Program/Project boards, panels, and working groups.
- f. Evaluate qualitative and/or quantitative risk assessments provided by MPCV elements/project offices for items that represent an increase in risk to MPCV safety and mission success.

2.2.2.2 Hardware Design Evaluation & Review

- a. Evaluate deliverables and assess overall technical risk as part of major Program and project design review milestones. Verify compliance to Program/Project SR&QA technical and programmatic requirements. Develop review item dispositions and/or comments and participate in the resolution of issues related to safety and mission success.
- b. Identify potential hazards, evaluate proposed hazard controls, and evaluate methods for verification of hazard controls. Participate in system-level trades studies to identify and evaluate risks with overall objective of reducing or eliminating risks to safety and mission success.

2.2.3 Reliability, Maintainability, and Supportability

Provide engineering expertise in the areas of reliability, maintainability and supportability, through the subsystem level, for the MPCV avionics system.. In this regard, JSC evaluates systems engineering solutions to technical issues, provides inputs to hazard analyses, Failure Modes and Effects Analysis (FMEA)/Critical Items List (CIL), and evaluates and assesses risk associated with the Project's approach to designing and operating the MPCV avionics architecture.

- a. Identify risks from MPCV FMEA/CIL effort requiring review, assessment, or further analysis by Project technical forums.
- b. Evaluate SR&QA deliverables for compliance with Program/Project requirements.
- c. Identify impacts to program and element FMEA/CILs or potential failure modes resulting from project activities.
- d. Identify potential critical items list failure modes, causes, effects, methods of verification, and acceptance rationale.
- e. Provide recommendations to Project Boards/Panels regarding reliability implications of hardware design .
- f. Assist in development of SR&QA requirements for the technical performance of the MPCV avionics system with respect to safety and mission assurance.
- g. Provide coordination and resolution of changes or issues dealing with Program/Project SR&QA requirements
- h. Evaluate risks to project success posed by pending Program/Project decisions during DDT&E and report results to the MPCV SR&QA Manager.
- i. Develop an integrated Program Quantitative R&M database and document the work performed. Continue soliciting data needs and inputs from other NASA centers including MSFC, JPL, and GSFC.
- j. Work with PRA community to ensure the Program Quantitative R&M database can also meet their needs for LOC and LOM evaluations.
- k. Perform analyses and trades for the fault tree regime to support design decisions. The Program Quantitative R&M Database will feed both R&M and PRA analyses.

2.2.3.1 MPCV Boards, Panels, and Working Groups

- a. Provide technical support to the MPCV SR&QA Panel.
- b. Provide technical support to the MPCV safety review process.
- c. Provide technical support to the S&MA Cross Program Integration Team (CPIT).
- d. Provide technical support to cross program and MPCV PRA working groups and panels.
- e. Perform/provide qualitative and/or quantitative risk assessments of the baselining of, or changes to, program/project requirements and element interface requirements or specifications.
- f. Identify impacts to documented Hazard and CIL risk mitigation controls posed by changes, waivers, issues, or decisions pending at Program/Project boards, panels, and working groups.
- g. Evaluate qualitative and/or quantitative risk assessments provided by MPCV elements/project offices for items that represent an increase in risk to MPCV safety and mission success.

2.2.3.2 Hardware Design, Evaluation and Review

- a. Evaluate deliverables and assess overall technical risk as part of major Program and project design milestones. Verify compliance to Program/Project SR&QA technical and programmatic requirements. Develop review item dispositions and/or comments and participate in the resolution of issues related to safety and mission success.
- b. Identify potential hazards, evaluate proposed hazard controls, and evaluate methods for verification of hazard controls.
- c. Participate in system-level trades studies to identify and evaluate risks with overall objective of reducing or eliminating risks to safety and mission success

2.2.3.3 Reserved

2.2.3.4 Reserved

2.2.3.5 Analysis

Work as part of the Probabilistic Risk Assessment (PRA) team to develop assigned portions of the MPCV PRA to be integrated into the system- and architecture-level models.

- a. Interface with the appropriate project and prime contractor work force to ensure the collection of failure and operation related data for relevant failure modes and corresponding subsystem success criteria.
- b. Provide system modeling and data analysis expertise to the development of the model and reduction and application of probability data.
- c. Oversee and review all PRA system modeling and analysis performed by the prime contractor, International Partners, , including Orbital Flight Test 1 (OFT-1), Ascent Abort 2 (AA-2), and other potential flight tests requiring PRA support.
- d. Support cross programs PRA working groups and MPCV PRA working groups.

Work as part of the Probabilistic Risk Assessment (PRA) team to develop the integrated MPCV/SLS/GO PRA and the Ground Operations PRA.

- a. Interface with the appropriate project and prime contractor work force to ensure the collection of failure and operation related data for relevant failure modes and corresponding subsystem success criteria.

- b. Provide system modeling and data analysis expertise to the development of the model and reduction and application of probability data.
- c. Provide support to answer residual questions and RFIs from HQ and external sources with respect to Loss of Crew/Loss of Mission analysis.
- d. Provide analytical support to future Program-level trades, studies, and decisions such as the Human Exploration Framework Team (HEFT), Human Spaceflight Architecture Team (HAT), ISTAR, International Partners, and the Human Exploration Operations Mission Directorate (HEOMD).
- e. Provide analytical support in developing LOC/LOM requirements for future programs and missions.

3.0 PERIOD OF PERFORMANCE: October 1, 2011 – September 30, 2012

4.0 ESTIMATED COSTS:

Contractor may provide travel, training, materials, and other non-labor resources as necessary to support task order requirements. Training may include selected professional discipline-based or spaceflight-based conferences with approval of the TMR.