

Task Order 14-12 Rev. 1

1.0 TITLE OF EFFORT: International Space Station Safety and Mission Assurance

2.0 TASK DESCRIPTION:

The contractor provides S&MA support and management for the coordination and integration of International Space Station (ISS) Safety and Mission Assurance (S&MA) tasks. These tasks assure definition and implementation of appropriate safety, reliability, and maintainability programs in support of ISS Program S&MA task direction and those tasks specifically funded via *Program Change Directive. These tasks include performing analyses, assessments, reviews, and evaluations; preparing and presenting reports and briefings; monitoring and evaluating ISS on-orbit operations in near-real-time as a part of the Mission Evaluation Room (MER) team; and participating in Program meetings.

2.1 SOW REFERENCE: Section C, Subsections 5.0

2.2 REQUIREMENTS

2.2.1 Safety

2.2.1.1. Integration

Provide support to the Space Station Division in the strategic and cost planning of tasking and risk management.

- a. Support the S&MA flight readiness review process by: identifying and raising all concerns or known or potential constraints or exceptions to endorsement; providing technical evaluation of selected topics; presenting such evaluations to senior S&MA management as required; collecting, preserving, and providing, as requested, evidence of S&MA endorsement completion; and participating in S&MA readiness review processes to identify potential topics of discussion.
- b. In support of annual Planning, Programming, Budgeting, and Execution (PPBE) development, provide a Budget Requirements and Basis of Estimate document which includes current Government fiscal year budgeted Equivalent Person (EP) levels for each task in this task order and forecasted EP requirements for each task for next five Government fiscal years. The BOE for out year projections shall include qualitative rationale for EP estimates for each task.
- c. In support of NASA requirements for management and quality metrics, the contractor shall propose, develop, provide, and maintain selected metrics for administration of NE resources, assessment of ISS S&MA processes, assessment of the ISS program, and other objectives as required by the Chief of the ISS Division and directed within the scope of this Task Order by the COTR.
- d. Change Request Process Management, Integration and Costing
 1. Cost Evaluation of Change Requests.
 2. Provide CR Receipt Desk for S&MA Assigned CRs.
- e. Support S&MA CR Review Panel Support the JSC S&MA and ISS risk management processes.

2.2.1.2. Vehicle

Provide S&MA subsystems expertise by performing technical and requirements compliance assessments of associated Safety, R&M and Operations products. Subsystems expertise to be provided includes Environmental Control and Life Support Systems (ECLSS), Environments (ENV), Electrical Power Systems (EPS), Structures and Mechanisms (S&M), Thermal Control Systems (TCS), Crew Health Care Systems (CHeCS), and Flight Crew Equipment (FCE). In addition, provide initial transitional training to civil servant Vehicle Subsystem Engineers at request for Guidance, Navigation, and Control (GN&C), Propulsion (PROP), and Communication and Tracking (C&T).

- a. Design Review Participation*
 - i. Assess PDR/CDR data packages for compliance to S&MA requirements.
 - ii. Represent Review Item Discrepancies (RIDs) for S&MA to review boards as required.
- b. Change Request Evaluation
 - i. Perform Technical Evaluation of Change Requests.
 - ii. Review IDRD Up/Down Manifest CR.
 - iii. Participate in Increment Safety Tag up.
- c. Vehicle SPRT Participation and PRACA Assessment
 - i. Assess PRACA when opened, proposed for closure, for applicability to flight, as required for system assessment.
 - ii. Participate in Technical Forms such as SPRT and associated splinters.
 - iii. Facilitate Bi-weekly Sub-system Status Tag up with NE customer.
 - iv. Identify to Quality PRACAs with potential impacts to flight in support of CoFR.
- d. Board and Panel Participation
 - i. Provide Technical Input to the NE T&V Control Panel Representative and ASCB Representative.
 - ii. Participate in System Safety Working Group, SMAP, ODAR and JSAP.
 - iii. Provide input to STRR Assessments.
- e. Vehicle Hazard Analysis/NCR Assessment
 - i. Evaluation of Safety Data Packages.
 - ii. Participate in Safety Review Panel as required.
- f. Perform Vehicle FMEA/CIL Assessment
 - i. Perform FMEA/CIL Review.
 - ii. Participate in FMEA/CIL Resolution.
- g. Vehicle Flight Operations Support
 - i. Provide Real-time Operation Support.
 - ii. Participate in NE Flight Lead Pre-Flight Briefings (IP and COTS).
 - iii. Provide CoFR Support to NE Flight Leads as requested.
 - iv. Participate in ARTs/FITs/MER meetings as required.
 - v. Participate/Conduct NE Requested Special Studies.
 - vi. Participate in S&MA Flight Readiness Reviews

2.2.1.3. Software

Provide S&MA expertise in the assessment and assurance of software safety technical and process requirements.

- a. Software Development Milestone Safety Assessment
 - i. Perform a safety assessment of specified software milestone reviews.

- a) Assess open safety content, provide priority recommendations, and assure inclusion of high priority changes for Content Reviews.
 - b) Review Technical Design Review (TDR) documentation to ensure CBCS required capabilities are included.
 - ii. Verification
 - a) Assess Verification Compliance Notices (VCNs) for evidence of compliance to CBCS requirements.
 - b) Assess SSP 50038 related Data Assessment Report (DAR) submittals.
- b. Computer Based Control System Safety Assessment
 - i. Perform a safety assessment of contractor/IP provided Computer Based Control System (CBCS) compliance matrices.
 - ii. Review CBCS matrix to assess plans for showing that software complies with SSP 50038 requirements.
- c. Hazardous and Critical Command List Assessment
 - i. Perform a safety audit of Boeing recommendations for Hazardous Command List (HCL), and Critical Command List (CCL) in accordance with the NASA approved process.
 - ii. Assure that all commands are correctly classified.
 - iii. Coordinate discrepancies with MOD/Boeing Safety.
 - iv. Assure IP Hazardous Commands Lists are provided in a manner to allow incorporation into the HCL.
 - v. Update and maintain the HCL in accordance with CSWG dispositions.
 - vi. Perform assessment of "Command from Scratch" commands to verify that commands conform to SSP 50038 safety requirements.
- d. Station Program Note Assessment
 - i. Perform safety assessment of Station Program Notice (SPN) to assure no safety impacts from workarounds.
 - ii. Represent S&MA in the ISS Program Dispositioning Process.
 - iii. Provide disposition recommendations of Severity 1 SPNs to the CSWG.
- e. Software Change Request Assurance
 - i. Assess completeness and validity of software provider Software Change Requests (SCRs) safety recommendation documentation.
 - ii. Provide an evaluation of the recommended severity and rationale including concurrence or non-concurrence and counter-proposal if needed.
 - iii. Provide the assurance evaluations to the NASA S&MA Representative to the JSRP and the NASA SW Safety Lead.
 - iv. Develop and provide metrics indicating the quality of the reviews provided by the developer.
- f. Program Readiness and Change Request Costing
 - i. Provide cost assessments for Change Requests.
 - ii. Coordinate with Operations and Vehicle on topics requiring Software inputs.
- g. Participate in the following:
 - i. Avionics and Software Telecon
 - ii. As Backup SCSRP when necessary
 - iii. Hazardous Command List hazard report data backfill
- h. Surveillance of Government Furnished Equipment (GFE) projects:
 - i. Define Maintenance Software Assurance Requirements
 - ii. Ensure changes to software safety requirements are identified, documented, traced and controlled.
 - iii. Analyze changes for consistency, completeness, correctness and testability of requirements

- iv. Analyze changes for impact on software safety
- v. Evaluate the impact of changes on the reliability of software products
- vi. Ensure the maintenance process yields the correct products
- vii. Conduct surveillance of GFE maintenance activities.

2.2.1.4 Operations

Provide S&MA expertise in the assessment and assurance of operations flight products.

- a. MER Support:
 - i. Perform flight operations engineering.
 - ii. Participate in ARTs/FITs/MER Meetings.
 - iii. Perform and provide assessments, analyses, and recommendations to the MER Manager, IMMT, CSO, and S&MA management as required.
 - iv. Perform analysis of all required flight operations products.
 - v. Perform focused flight operations engineering during alternate shift hours for high on-orbit activity (i.e. docking or undocking of visiting vehicles, stage EVAs, and robotic activity).
 - vi. Participate in flight operations engineering simulations.
 - vii. Respond to Safety of Flight on-orbit events that occur during off-nominal hours.
 - viii. Provide a nominal daily shift report and periodic status notifications.
 - ix. Provide periodic briefings or status notifications to the IMMT and CSO.
 - x. Prepare agenda and participate in Leads meetings.
 - xi. Perform Console Handbook updates
- b. Integrated S&MA analyses:
 - i. Perform ISS Specific Safety Assessments.
 - ii. Perform USOS Airlock and Russian based Operations Safety EVA/Robotics Assessments for stage EVA's.
 - iii. Perform Visiting Vehicle Docked Operations Safety Assessments.
 - iv. Perform MRR Assessments.
- c. NE Flight Lead Pre-flight Readiness Review attendance (IP and COTS flights)
- d. OCADs, CILs, and SPNs
 - i. Evaluate OCADs and verify implementation.
 - ii. Verify implementation of CILs in Flight Rules and Procedures.
 - iii. Evaluate SPNs and verify implementation in Procedures.
- e. Flight Product Evaluation for Operational Safety Controls assigned to ISS Operations Safety
 - i. Evaluate Volume B Generic Flight Rules.
 - ii. Evaluate Volume E Generic Flight Rules.
 - iii. Evaluate COTs Generic Flight Rules.
 - iv. Evaluate Volume F Generic Flight Rules.
 - v. Participate in JFRCB Meetings.
 - vi. Participate in JPRCB/SSPCB PCN Review Meetings.
 - vii. Provide closed loop accounting to the SRP when operations product discrepancies are encountered.
 - viii. Evaluate Safety of Flight Generic Procedures.
 - ix. Evaluate Post-FOR Flight Rules.
 - x. Evaluate Post FOR Flight Procedures.
- f. Operational forums, working groups, and boards
 - i. Participate in On-Orbit Configuration Working Group.

- ii. Participate in EVA JOPs.
- g. Evaluate Program and Ground Change Request for Operational impacts

2.2.1.5 Safety Panels

- a. Perform Meeting Coordination and Data Management in support of the PSRP, SRP, and R&MWG.
 - i. Coordinate and schedule meetings and agendas
 - ii. Coordinate, Distribute, and Develop meeting products and associated support
 - iii. Manage data, databases, and websites and ensure compliance with Export Control Program Policy
- b. Provide Technical Review, Preparation, and Support of data products in support of PSRP and SRP
 - i. Review and comment on data
 - ii. Develop and Manage Safety Data in support of the CoFR Process
 - iii. Provide technical expertise to the various S&MA Panels and working groups
 - iv. Provide Support & Implementation of Requirements Documents & Change Requests
 - v. Provide technical coordination with other NASA centers, contractors, programs, projects, and international partners/participants S&MA organizations to facilitate a clear and consistent understanding of topics, issues, and actions.

2.2.2 Reliability, Maintainability, Logistics & Maintenance

- a. Reliability and Maintainability Engineering
 - i. Assess HW Providers Limited Life Item (LLI) and Preventative Maintenance Assessments (PMA) at the piece part level.
 - ii. Assure manifested hardware has a LLI when required per JPD 315.
 - a) This assessment is not expected to determine correctness of LLI but is to verify the required assessment has been completed by the data provider. Hardware that is 'not-first-flight' hardware, Payloads, EVA shall be excluded from the LLI assessment.
 - iii. Assure the hardware provider's Preventative Maintenance Assessment (PMA) meets requirements.
 - a) Hardware that is 'not-first-flight' hardware, Payloads, EVA shall be excluded from the PMA assessment.
 - iv. Evaluate International Partner (IP) HW to assure LLI/PMA products exist at the element level excluding re-flight hardware.
 - v. Evaluate HW Manifested on visiting vehicle for LLI/PMA excluding re-flight hardware.
 - vi. Assure all FMEA/CILs meet program requirements, and that all critical items are baselined in accordance with the critical items approval process defined in SSP 30234. Work Instruction OE-SMA-003 establishes the methods for assuring the completeness and technical accuracy of the International Space Station (ISS) Failure Mode and Effect Analysis and Critical Item List (FMEA/CIL).
 - vii. Assure all R&M Requirement Verification Closure Notices (VCNs) are reviewed and approved.
 - viii. Assure approval of stage/assembly single failure points (US flight only).
 - ix. Assure all R&M risk items impacting the Flight are identified and documented.

- b. Logistics and Maintenance Engineering
 - i. Logistics Support Analysis Assessment
 - a) Evaluation of Logistics Support Analysis Records (LSARs).
 - b) Evaluation of maintenance procedures for Removal and Replacement (R&R) of ORUs.
 - c) Evaluation of LSAR Sustaining Process (LSP) sheets.
 - d) Evaluation of Illustrated Parts Breakdown (IPB).
 - e) Evaluation of core maintenance procedures, technical data, and source data for safety, incorporation of maintainability data, validity, and accuracy
 - f) Participate in periodic LSAR reviews
 - ii. Support the Logistics Engineering Operations Working Group (LEOWG) and Maintenance and Resupply (M&R) Team
 - a) Evaluate completeness of Annex 1 & 2 Change Requests for Safety.
 - b) Assess Spares Plan for on-orbit required maintenance

2.2.3 Accident Precursor Analysis (APA)

Provide S&MA Vehicle Subsystem and Operations expertise in the identification of unrecognized accident potential or underappreciated vulnerabilities such that mitigation or risk acceptance rationale can be provided to key decision makers. Provide APA process administration (Facilitating, scribe, schedule coordination and logistics).

- a. Evaluate IFIs and PRACAs to develop the anomaly caseload
- b. Generalize/Categorize Anomalies
- c. Perform Evidence Gathering
- d. Conduct "Index-based" Grading
- e. Perform Observation and Trending
- f. Support Risk Modeling
- g. Consolidate Results
- h. Present results to Program/Project Management

2.2.4 ISS Government Furnished Equipment Safety & Reliability

Provide Safety and Reliability support for GFE and ISS payloads.

- a. Participate in development and modification of hardware to identify and discuss hardware criticality assessments and define S&MA requirements. Identify design problems and provide design solutions or improvements,
- b. Participate in design reviews, review provided data and documentation, and provide RID'S on S&MA-related issues and deficiencies.
- c. Identify potential hazards, evaluate proposed hazard controls, and evaluate methods for verification of hazard controls.
- d. Identify potential critical items list failure modes, causes, effects, methods of verification, and acceptance rationale.
- e. Track and provide status on requirements verification, system qualification, and design certification activities.
- f. Identify missing or non-compliant S&MA requirements as well as performance requirements that cannot be verified.

- g. Develop preventative maintenance assessments (PMA) to assure that the appropriate actions are in place to maintain hardware functionality.
- h. Conduct S&MA assessments, prepare presentations, and present results of those assessments to S&MA management, project management, and the ISS Program for discussion.
- i. Assure that hardware operational uses, operating limits, hazard controls, and fault tolerance are verified prior to flight
- j. In accordance with JSC 28035, participate in problem/anomaly investigations during all phases of a project to assure that the problems are appropriately documented; adequate and appropriate investigation is planned and conducted to identify both proximate and root causes; interim and final closure rationale is acceptable; corrective action (if taken) is appropriate and effective; closure documentation (including trend coding) is thorough and complete; and visibility of the problem/anomaly is elevated to the appropriate S&MA management level.
- k. Support operational use of flight GFE. Participate in development of CHIT's that ensure compliance with hazard report and performance requirements.
- l. Submit operational constraints for flight equipment projects. Assure the operational constraints are officially approved for each flight in the Operational Control Agreement Database (OCAD), and verify proper implementation.
- m. Provide for operational support to the MER as needed to resolve issues.
- n. Generate and Track re-flight letters to show compliance with SSP 30599.
- o. Coordinate the review, approval, and tracking of certificates and re-flight letters for U.S. GFE cargo.
- p. Coordinate with International Partners the safety and reliability processes, templates, and requirements for U.S. cargo.
- q. Evaluate data and information exports to ensure compliance with Export Control Regulations.
- r. Lead U.S. GFE cargo discussions in teleconferences supporting the IP launch preparations as the discussions related to certification of U.S. GFE assets.
- s. Supply special assessments and involve subject matter experts as required.
- t. In accordance with NT CWI 004, conduct a risk assessment for shipments with open issues requiring NT management concurrence.

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.