Goddard Space Flight Center

Mission Assurance Requirements for Space Flight Projects

Michael Kelly
Chief, Mission Support Division
NASA/GSFC/Code 320
October 17, 2012

Mission Assurance Requirements

What are the origins of GSFC's mission assurance requirements?

- The beginning point is the set of Agency-level requirements that appear in NPDs, NPRs, NASA standards, and other agency and industry standards – developed from best practices of government and industry
- The requirements also include GSFC's own best practices – the results from many years of success in developing and operating space flight missions
- GSFC places a project-specific set of requirements on projects – the document is referred to as the MAR, the acronym for Mission Assurance Requirements

There are approximately 50 documents in the Headquarters safety and mission assurance document tree – a subset is applied to GSFC-managed missions

Project Mission Assurance Requirements

How is a MAR developed for a specific project?

- The first step is to know the Agency's classification of the project as Class A, B, C, or D and the overall mission requirements – this will include the mission's Level 1 requirements, which, for example, may include the expected scientific data to be collected over time
- Mission classification and its effect on mission assurance is determined by the Agency guidelines in *NPR 8705.4 Risk Classification for NASA Payloads*
- In general, the differences between the classes affects the reliability program and EEE parts control program the most, while system safety is unaffected

The mission class is determined by a combination of the importance of the data to be collected, visibility of the mission, and costs

Project Mission Assurance Requirements

Goddard Space Flight Center

How is a MAR developed for a specific project? (continued)

- GSFC maintains *320-MAR-1001 Standard Mission Assurance Requirements* – this is the baseline for a project MAR with tailoring guidance for specific mission classes and other permitted options
- The MAR is prepared as a set of requirements for the specific flight project or operational ground system – tailoring is done based on an evaluation of the mission requirements, including cost and schedule
- The MAR is placed under project configuration management – it forms part of the contract, along with a statement of work, for spacecraft, instruments, major assemblies and subassemblies, and ground systems

Particular emphases in Project MARs prior to 2009 may be, to some extent, traced to the experience of the personnel involved in its preparation

Standard Mission Assurance Requirements

Goddard Space Flight Center

320-MAR-1001 Standard Mission Assurance Requirements addresses the following topics in the sections that form a MAR:

1. General
2. Quality Management System
3. System Safety
4. Probability Risk Assessment & Reliability
5. Software Assurance
6. Ground Systems & Equipment
7. Risk Management
8. Systems Reviews
9. System Performance Verification
10. Workmanship
11. EEE Parts
12. Materials and Processes
13. Contamination Control
14. Metrology & Calibration
15. GIDEP Alerts and Problem Advisories
16. End Item Acceptance Data Package

Project MARs contain all of the above sections with the requirements tailored to the project's classification and Agency guidelines

Current GSFC Initiatives to Improve MARs

Goddard Space Flight Center

- GSFC's safety and mission assurance organization is reviewing and evaluating its requirements with respect to the current environment under which missions are being proposed and formulated
- This is part of a concerted focus with the Center's program and engineering organizations to maximize the return on investment and minimize costs
- The following slides identify some of the efforts being considered

Two additional baseline documents are in development – one for operational ground systems and a second for Class D missions

Current GSFC Initiatives to Improve MARs

1. Benchmark with aerospace prime contractors and university partners for best practices and ideas
2. Streamline the number of deliverables by either modifying requirements for delivery or by combining deliverables where practicable
3. Review the time of delivery to ensure it reflects the proper point in the project schedule
4. Increase the flexibility of the developer to use other standards or specifications when it makes sense; examples include calibration standards, workmanship standards, and the developer's best practices
5. Decrease the number of waivers needed by modifying requirements and in some cases by having GSFC request an Agency waiver to requirements
6. Develop standard baseline requirements for operational ground systems with industry participation to ensure realism and consistency

Current GSFC Initiatives to Improve MARs (cont'd)

7. Improve the ability to use previously developed products for new projects, including items or processes that were acceptable but no longer approved
8. Modify testing requirements to better align test regimens to performance requirements
9. More effective tailoring of government mandatory inspections and witnessing to minimize adverse cost and schedule effects
10. More effective specification and tailoring of software assurance processes and requirements based on mission classification
11. Streamline government participation in developer activities such as the EEE parts control, materials and processes controls, and material and failure review boards
12. Streamline deliverable reports and test results to require only those that are most relevant and important to the delivered items

Contact Information

The current version of *320-MAR-1001 Standard Mission Assurance Requirements* is available to NASA users from the following URL:

http://sma.gsfc.nasa.gov/msd/mar.php

For more information regarding GSFC's mission assurance requirements contact:

Mike Kelly (michael.p.kelly@nasa.gov) 301-286-0662

Dave Cleveland (david.g.cleveland@nasa.gov) 301-286-3282

Questions?