

# Safety and Mission Assurance Rotation Training (SMART) Handbook

**SMART**

**MISSION ASSURANCE EXCELLENCE – Adding Value to  
GSFC Programs and Projects Through Collaboration**



## Document Change History

Document	Version	Date	Change Description
First Edition	Final	10/29/09	

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# SMART Handbook

## 1. Program Description

### 1.1. SMART Program Overview

The Safety and Mission Assurance Rotation Training program is designed to provide Goddard's Flight Project managers and engineers with safety and mission assurance tools and skills that can be used to foster mission success. This program will instill safety, reliability, and quality concepts, values, and skills in flight program personnel over a 6-month to 2-year period. This will be accomplished through enabling skills training, mentoring by senior level reliability, safety, or quality engineers; technical and leadership coursework; case study review/analysis; and on-the-job training through rotational assignments. Participants completing this program will have additional skills to facilitate career advancement.

This program centers on rotating program participants into an SMA job assignment that is commensurate with their interest, experience, and skills. Enabling skills training will be provided prior to starting rotational assignments to facilitate participant start-up in their new job. Assignment terms are flexible to accommodate the participant's situation, interests, and constraints. For example, some assignments can be full-time or part-time; they can be based on a designated period of performance, completion of a task, or completion of a project phase. In-process training is targeted to skills required to be successful in the rotational assignment.

The SMART Program is administered by the GSFC Safety and Mission Assurance (SMA) Directorate, Code 300, and consists of a Board of Directors, Advisory Board, mentors, mentees, and Support Staff.

### 1.2. Mission Assurance Rotation Program Objectives:

- Improve the ability of flight program managers, instrument engineers, systems engineers, and instrument managers to increase the safety, reliability, and quality of systems by providing them safety and mission assurance tools and processes
- Attract flight project personnel responsible for the design, fabrication and integration, and systems engineers to the SMART
- Train participants to use SMA tools/processes to design-in safety, reliability, and quality elements early on during system design
- Expand participants thinking beyond cost and schedule issues to thinking in terms of failure space
- Foster collaboration between Flight Projects, Engineering, and SMA Directorates; obtain participant feedback on how Code 300 processes can be improved to add value to Flight Project objectives
- Increase participant's value to GSFC facilitating new career opportunities

### 1.3. SMART Process

The SMART process is implemented in three phases. The overall process flow is shown in Figure 1, which displays the process elements and in Figure 2 which displays the responsibilities of the people involved in the SMART process.

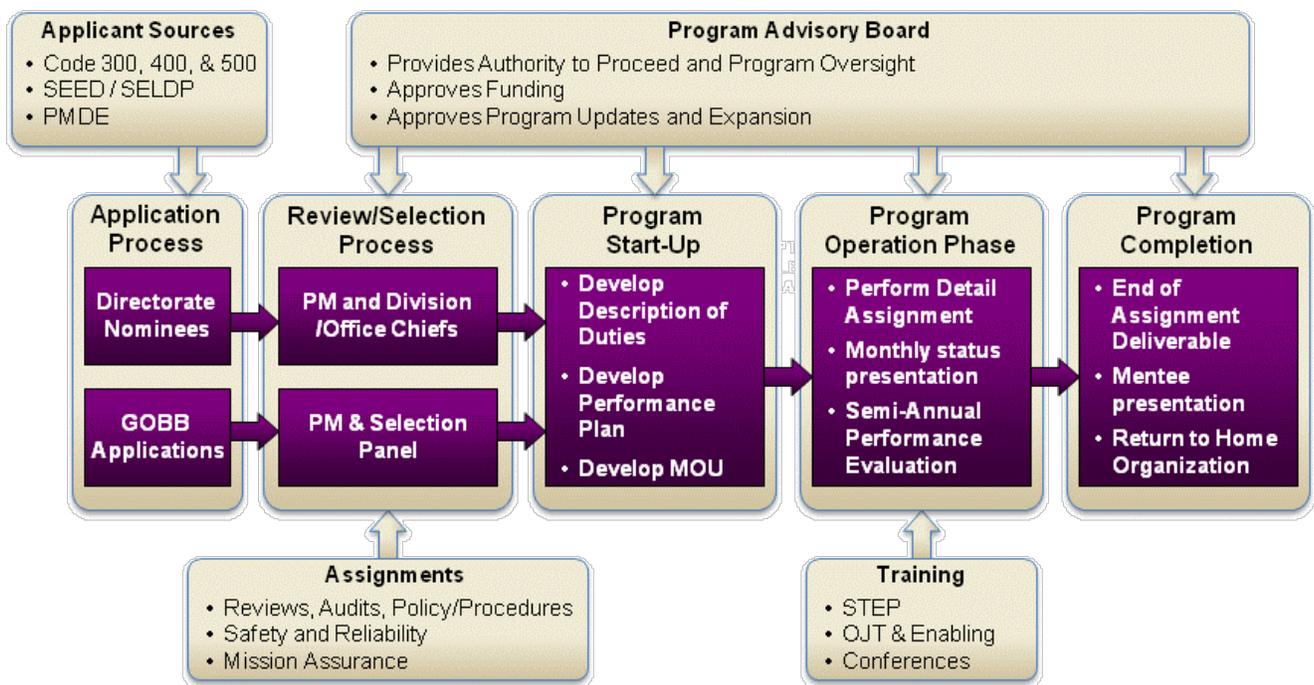
Phase 1 activities include the development and posting of SMART opportunities to the GSFC Opportunity Bulletin Board (GOBB). The opportunities are based on the available rotational assignments within Code 300. Interested candidates are encouraged to submit applications with the approval of their supervisor. Another candidate pathway is through direct nomination to

the SMART by Code 400 or 500. Phase 1 includes assessment and matching of qualified candidates and nominees to the available rotational assignments. These candidates and nominees will become SMART mentees.

Phase 2 consists of program start-up and operational activities. Start-up includes detailing qualified candidates to rotational assignments, identification of mentors, and conducting a program orientation session. The orientation session introduces the mentee to Code 300 personnel; describes the rotational assignment; and defines roles, responsibilities, and program process. A MOU documenting roles and responsibilities will be developed and agreed upon. A competency assessment will be performed and used as an input to the development of a performance plan. This plan identifies training, activities, reports, milestones, and presentations the mentee will perform. During program performance reviews and presentations will be conducted. These are intended to monitor program effectiveness and identify needed modifications as appropriate to ensure the program is effectively implemented and successful.

Phase 3 contains a final review of each rotational assignment. An end-of-assignment presentation is developed that includes program highlights and is presented to the Advisory Board by the mentee.

**Figure 1. SMART Process Flow**



**Figure 2. SMART phases, related activities and responsibilities for process members and participants.**

Activities	Phase 1: Candidate Selection / Assignment	Phase 2: Program Initiation and Performance	Phase 3: Graduation
	<ul style="list-style-type: none"> <li>• Develop Position Descriptions (GOBB)</li> <li>• Receive applications</li> <li>• Select and assign participants</li> </ul>	<ul style="list-style-type: none"> <li>• Conduct                             <ul style="list-style-type: none"> <li>○ Program orientation</li> <li>○ Monthly review meetings</li> <li>○ Progress Reviews</li> <li>○ Competencies Assessment</li> </ul> </li> <li>• Develop Performance Plan</li> <li>• Develop MOU</li> </ul>	<ul style="list-style-type: none"> <li>• Develop end-of-assignment report</li> <li>• Advisory Board Presentation</li> </ul>
<b>Responsibilities</b>			
Program Manager	<ul style="list-style-type: none"> <li>• Prepare Semiannual GOBB Announcement</li> <li>• Select applicants and matches to openings</li> <li>• Assign mentor</li> </ul>	<ul style="list-style-type: none"> <li>• Manage /coordinate program</li> <li>• Support Performance Plan development</li> <li>• Attend Semi-annual mentee Progress Review</li> <li>• Present program updates</li> <li>• Conduct monthly review meetings</li> <li>• Develop and sign MOU</li> </ul>	<ul style="list-style-type: none"> <li>• Evaluate Performance Plan versus results</li> <li>• Attend Advisory Board presentation</li> <li>• Approve return-to-home organization</li> </ul>
Advisory Board	<ul style="list-style-type: none"> <li>• Provide executive oversight</li> <li>• Approve funding</li> </ul>	<ul style="list-style-type: none"> <li>• Provide authority to proceed</li> <li>• Receive yearly program updates</li> </ul>	<ul style="list-style-type: none"> <li>• Attend Advisory Board Presentation</li> <li>• Approve program updates</li> </ul>
Administrative Officer	<ul style="list-style-type: none"> <li>• Issue GOBB announcement</li> <li>• Manage / controls application process</li> </ul>	<ul style="list-style-type: none"> <li>• Process and monitor detail re-assignment</li> <li>• Process training requests</li> </ul>	<ul style="list-style-type: none"> <li>• Terminate re-assignment detail</li> </ul>
Applicant/ Mentee	<ul style="list-style-type: none"> <li>• Prepare and submit application</li> </ul>	<ul style="list-style-type: none"> <li>• Jointly the Applicant and mentor:                             <ul style="list-style-type: none"> <li>○ Determine Enabling Training</li> <li>○ Develop Performance Plan</li> <li>○ Prepare / Present Pre-MSR Report</li> <li>○ Develop/ attend semi-annual review</li> </ul> </li> <li>• Mentor provides technical oversight</li> <li>• Both sign MOU</li> </ul>	<ul style="list-style-type: none"> <li>• Prepare end-of-assignment report</li> <li>• Give Advisory Board Presentation</li> </ul>
Mentor	<ul style="list-style-type: none"> <li>• Serve as Technical Lead</li> <li>• Identifies required competencies</li> <li>• Technical contributors to Pre-assessment evaluation</li> </ul>		<ul style="list-style-type: none"> <li>• Assist in development of end-of-assignment report</li> </ul>
Supervisor	<ul style="list-style-type: none"> <li>• Sponsor applicant</li> <li>• Performance Assessment</li> </ul>	<ul style="list-style-type: none"> <li>• Develop Performance Plan with mentor</li> <li>• Support Mentee per the Performance Plan</li> <li>• Conduct semi-annual Mentee review</li> <li>• Sign MOU</li> </ul>	<ul style="list-style-type: none"> <li>• Attend Advisory Board Presentation</li> </ul>

## **2. Program Elements**

### **2.1. Target Applicants**

- The target applicants for the SMART program are flight project and engineering personnel responsible for the design, fabrication, integration and mission; for example: flight project managers, systems managers, systems engineers, and instrument managers.
- This program is open to NASA employees GS-14 to GS-15 who have engineering or science Bachelors degree or equivalent.
- Nominees should understand the flight project lifecycle, have exposure to systems engineering competencies, and have experience in leading projects or significant engineering efforts.

### **2.2. Application Processes**

- Code 400 and 500 can nominate personnel for the SMA Rotational Program
- NASA personnel can individually respond to SMART announcement of openings that will be announced periodically through GOBBS.
- An applicant review will determine if the nominee meets the program requirements and has the appropriate background and experience to be successful in the program.

### **2.3. Participant Selection**

A selection panel will be established for GOBBS applicant review. The panel selects candidates for entry into the SMART as Mentees. Mentees are chosen using the GOBB process. See Appendix B for a listing of selection and ranking criteria and Appendix C for rotational assignment position descriptions.

The participant selection will be conducted as follows:

1. Interviewing of qualified nominees by the selection panel. The interview will focus on ensuring the nominees have adequately demonstrated technical competence, understanding of the flight system development process, leadership behaviors, and aptitudes of highly successful NASA program or project leaders.
2. Matching of qualified, selected individuals to available rotational assignments.

### **2.4. Rotational Assignment Skills Assessment**

The participation process starts with an assessment of current experience and technical skills to the requirements of the designated rotational assignment. These assessments will be used to identify strengths and areas of development needed for program participants.

- Mentees are assessed by Program Manager and assigned mentor.
- Safety, reliability, and quality experience, knowledge, and skills assessed against the rotational job assignment.
- Enabling training will be identified during the assessment period. This training is intended to provide the applicant necessary skills and process understanding to succeed in the designated rotational job assignment.

### **2.5. Competencies**

- The mentor will determine the required competencies for the rotational job assignment; see Appendix D for a listing of competencies for various position descriptions.

## **2.6. Performance Plan**

- Purpose of the Performance Plan is to develop a program plan that is unique to the mentee and that defines objectives, training, rotational assignment, and periodic reports/presentations to the Advisory Board.
- The Performance Plan is developed by the mentee and the assigned mentor; it is approved by the Program Manager
- The Performance Plan contains the following elements:
  - Rotational assignment responsibilities
  - Required tools and processes
  - Success measures
  - Reporting and assessment process
  - Advisory Board presentation outline
  - Required Enabling training and training sources
  - Performance milestones
- The appendices A (SMA Activities Listing by Functional Area), D (SMA Competency Areas Relevant to Rotational Assignments), E (Technical Course Listing for Rotational Assignment Areas), and F (NASA SMA Reference Documents) are included in this handbook to facilitate the development of the Performance Plan.
- Graduation is based on completion of the assignment.

## **2.7. Enabling Training**

- The purpose of this training is to ensure the mentee has the necessary skills to perform effectively in the rotational assignment.
- During the first month of the rotation assignment the mentee will complete the STEP Level 1 training.
- Enabling training includes required skills to effectively perform in the rotation assignment. They are primarily technical; for example, for reliability position training on RELEX software may be required.
- Enabling training should be completed within 3 months of the start of the rotational assignment.
- The mentor is responsible for identification of enabling training for the specific rotational assignment.

## **2.8. Coursework**

Appendix E contains a listing of coursework that can be considered for inclusion in the performance development plan pending evaluation of assignment responsibilities and the mentee experience and skills.

## **2.9. Job Rotation**

The goal of rotational job assignments is to both use and reinforce Safety and Mission Assurance skills learned. Rotational assignments place the Mentee within the SMA organization in order to perform a designated task related to a flight project. The Mentee will work under the direction and guidance of an assigned mentor. Assignments will be selected based on the Mentee's experience and will supplement areas where the Mentee has little or

no experience. In a rotational assignment the Mentee remains detailed to the SMART Program Manager but is assigned to the SMA organization.

- Assignment Selection
  - Potential assignments include: Systems Review Manager, Chief Safety and Mission Assurance Officer, Safety Manager, Reliability Engineer, and Operations Analyst
  - Applicant selection is based on participant's mission assurance experience and existing skills
- Assignment Period
  - Assignments are 6- to 12-month periods
  - Assignments can be extended based on future requirements and mentee availability.

## **2.10. Reviews**

Mentees will prepare and present to the Advisory Board periodic progress reviews and a final program review as part of the program deliverables.

The status reviews will focus on following areas:

- Status of items included in the Performance Plan
- Assessment of support provided to the Mentee
- Recommendations and requests for enhancing effectiveness of this program for future participants

The final program review will be presented to the Advisory Board and will focus on the following areas:

- Leading and Managing Change
- Leading and Managing People
- Achieving Results
- Resource Management
- Communications and Teamwork

### 3. SMART Organization

The SMART program’s organization structure consists of an Advisory Board, mentors, and mentees.

The role of the Advisory Board is to advise the SMART Program Manager on program issues, changes, curriculum, and attend Mentee rotational presentations. The Advisory Board consists of senior managers from Codes 300, 400, and 500.

#### 3.1. SMART Advisory Board

The SMART Advisory Board is responsible for the management and operation of this program. This includes the program schedule, resources, and process. It approves development plans and it establishes rotation job positions. The team serves as the interface to GSFC management and other GSFC organizations. The Advisory Board consists of a Chairperson, Co-Chairperson, Program Manager, and others.

The board members and associated information is shown in Figure 3.

*Figure 3: SMART Advisory Board members.*

SMART Title	Name	Code	Organization Name	Title
Program Sponsors	George Morrow	400	Flight Projects Directorate	Director Of
	Orlando Figueroa	500	AETD Directorate	Director Of
	Marcus Watkins	300	Safety and Mission Assurance Directorate	Director Of
Chairperson	Maria So			Deputy Director
Advisor	Eric Issac			Associate Director
Program Manager	Pradeep Sinha			Assistant to the Director
Co-Chairperson	Robert Sticka	324	Institutional Assurance Branch	Branch Chief
Advisor	Mike Delmont	320	Mission Support Division	Chief
Advisor	Mike Kelly	302	Institutional Support Office	Acting Chief
Advisor	Cindy Fryer	305	Resource Analysis Office	Chief
Advisor	Mark Goans	301	System Review Office	Chief
Program Administration	Jeanine Doherty	300	Safety and Mission Directorate	Administrative Officer
Ad hoc	Ed Armatucci	500	SEED	Program Manager
Ad hoc	John Wolfgang	400	Flight Projects	Assistant Director

#### 3.2. Program Manager Responsibilities

- Manages SMART Program including budget and resources
- Selects SMART Program Participants
- Approves rotational assignments
- Prepares and presents program status to the Advisory Board
- Provides technical program oversight
- Participates in development and approves mentee’s Performance Plan
- Manages the recruitment and selection of candidates
- Negotiates participants to mentor assignments
- Monitors and guides SMART participant while they are assigned to the SMART
- Develops the Memorandum of Understanding (MOU) between the mentee supervisor, mentee, and mentor

#### 3.3. Mentors

- Mentors must want to and be self-motivated to be successful as a mentor
- Guide SMART participants through the SMART process, assessment, and development plan generation
- Participate in the formal participant review to the Management Committee
- Provide shadowing opportunities to the participants
- Recommend participants for graduation

### **3.4. Mentees**

- Generate with mentor a Performance Plan and report progress quarterly
- Regularly meet with mentor and provide consultation
- Meet and complete the Performance Plan
- Complete a rotational assignment
- Participate in a graduation out-brief with the SMART program manager

### **3.5. Program Administrator**

- Maintains list of rotational assignments in Code 300
- Manages the recruitment and selection of candidates
- Coordinates training

### **3.6. Program Support**

- Provides SMART operational support
- Develops and implements program upgrades and modifications
- Conducts Orientation Sessions
- Maintains SMART Website

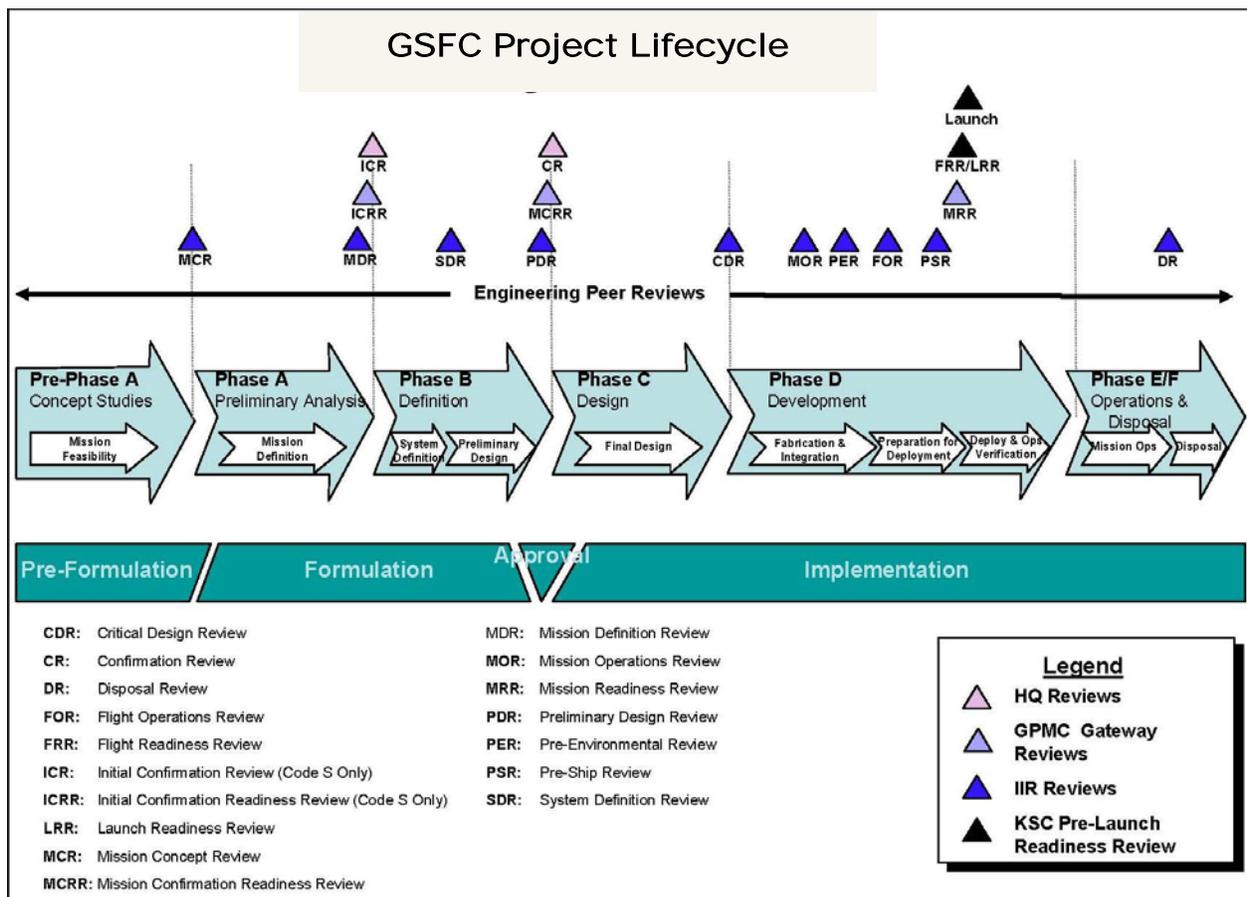
## 4. Mentoring Process

Mentoring is the process for supporting the Mentee in the SMART process and in the rotational assignment. Mentors are discipline experts. They help to identify competency gaps, provide direction and guidance, and they guide the Mentee through the technical performance of the rotational assignment.

## 5. Technical Program

The technical program consists of enabling courses and technical training needed to perform in the rotational assignment. This assignment will be within the SMA Directorate supporting SMA processes and reviews throughout the project lifecycle from formulation through implementation as shown in Figure 4. Appendices A through F provide additional information, such as SMA activities, nominee selection and ranking criteria, guidelines, competency areas, courses, and applicable documents.

Figure 4. GSFC Project Life Cycle Showing Project Independent Reviews.



# APPENDICES

## Appendix A: SMA Activity Listing by Functional Area

### 1. Configuration Management (CM) Program

- Configuration Management Plan
- Baseline GDS Requirements
- CM Control of Commercial off the Shelf (COTS)
- CM Control of Software

### 2. Contamination Control

- Contamination Control Program
- Contamination Control Plan
- Material Screening
- Establish & Verify Material Outgassing Data
- Thermal Vacuum Bakeout of Hardware
- Independent Evaluation of Contamination Control
- Contamination Control Verification Process

### 3. Design Verification

- System Performance Verification Plan
- Environmental Verification Plan
- System Performance Verification Matrix
- Environmental Test Matrix
- Complementary Environmental Test Matrix
- Environmental Verification Specification
- Environmental Test Plan
- Final System Performance Verification Report
- Verification Activity Reports
- Verification Test Activities Procedures
- Flight System Verification Program
- COTS Management Plan
- Sub-Tier Supplier COTS
- Suitability of COTS Software
- Compliance of Heritage Hardware

### 4. Electrical, Electronic and Electromechanical (EEE) Parts & ESD

- EEE Parts Stress Analysis
- Parts Materials and Processes (PMP) EEE Part Identification
- Review of EEE Analysis
- Electrostatic Discharge (ESD) Control Program
- Parts Materials and Processes ESD Control Plan
- ESD Packaging of Electronic Hardware
- ESD Control
- Verification of Work Areas

### 5. Ground Data System Assurance Program

- GDS Quality Plan
- GDS Management Program
- Engineering Peer Reviews
- Requirements Verification Matrix
- Defect Prevention Program/Plan
- Configuration Reviews Functional / Physical Configuration Audits
- Interface Tests - GDS Software & Database Management Systems
- Process for Verification and Validation of Database Systems
- Qualification of Test Tools
- Waivers for Identifying / documenting all Non-conformances
- Data Delivery Packages
- Integrated System Engineering Process
- Identify and Mitigate Security Risks in GDS
- GDS Reliability & Maintainability Predictions
- GDS Reliability Models
- Maintainability Validation Demonstration Tests
- Certification of GDS System Installation
- GSFC Review of Ground Operations Procedures
- Launch Site Ground Operations Procedures

- GDS Electromagnetic Compatibility (EMC) Control Test Plan
- EMC Interface Control Documents

### 6. Nonconformance Reporting (NCR)

- Nonconformance Review Process
- Material Review Board (MRB)
- Investigate Nonconformance
- Non Minor Nonconformance

### 7. Orbital Debris Assessment

- Orbital Debris Assessment Report
- Limit Orbital Debris Generation
- Perform Orbital Debris Assessment

### 8. Parts, Materials and Processes Program

- Parts Materials Processes Control Program (PMPCP)
- Parts Materials Processes Control Board (PMPCB)
- PMP Incoming Test and Inspection
- PMP Inspection and Test Plan
- Analysis of Failures
- Failure Analysis Report
- Corrosion Prevention and Control Plan
- Defective Parts and Materials Control Program
- PMP Qualification
- PMP Vendor Surveillance and Audit Plan
- Shelf Life Control Program
- Shelf Life Control Plan
- Traceability Control Plan
- Certification of Personnel
- As Designed Parts Materials and Processes List
- Project Approved Parts Materials and Process List
- Non Destructive Tests
- Fastener Material Test Reports
- Inorganic Materials and Composites Usage List
- Polymeric Materials Limited Shelf Life Control Process
- Polymeric Materials and Composites Usage List
- Qualification Plan and Procedure
- Established PMP Manufacturing Baseline
- Limited Life Plan
- Alternate Quality Conformance Inspection (QCI) & Small Lot Sample Plans
- Destructive Physical Analysis (DPA) Plan
- Alternate DPA Standards
- Parts Derating
- Radiation Hardness Assurance Program Plan
- Radiation Hardness Review
- Parts Screening Data Package
- Lubricated Mechanisms Life Test Plan
- Lubrication Usage List
- Procedure Qualification Record (PQR)
- Operator Qualification Test Record
- Material Process Utilization List
- Material Usage Agreement
- Fastener Control Plan
- Flammable Materials Usage List
- PMPCB approval of Policies & Procedures for Surveillance and Audit
- Radiation Hardness Assurance (RHA) Program
- Review of Laboratories & Analysis Facilities by PMPCB
- Testing at NASA White Sands Test Facility (WSTF)
- Determination of Material Flammability and Toxic Outgassing
- Qualification Proof Testing
- Raw Material Certificate of Compliance

- Stress Corrosion Cracking Criteria
- Pedigree Review for Parts Older Than x Years
- 8. Quality Management System (QMS)**
  - Quality Manual
  - ISO 70 Compliance of Testing and Calibration Laboratories
  - Applicable to Software and Firmware
  - Failure Reporting
  - Quality Assurance (QA) and Safety Requirements Flow down
- 9. Reliability and Maintainability**
  - Reliability & Maintainability Program Plan (RMPP)
  - Failure Modes Effects Analysis (FMEA) Document
  - Fault Tree Analysis
  - Probabilistic Risk Assessment (PRA)
  - Critical Items List (CIL) reference to FMEA
  - Reliability Analysis
  - Parts Stress and De-rating Analysis
  - Limited Life Analysis
  - Trend Analysis
  - Reliability Testing
  - Trade-Off Analysis
  - Maintenance Logic Diagrams
  - Fault Tolerance and Management
  - Worst Case Analysis
  - Black/White Box Testing
  - Reliability Assessment Reports
  - Maintainability Modeling Report
  - Maintainability Analysis
  - Maintainability Demonstration Plan
  - Maintainability Predictions
  - Maintainability Data Collection System
  - Maintainability Demonstration Test Reports
  - Maintainability Demonstration Tests
- 10. Risk Management**
  - Risk Informed Decision Making (RIDM)
  - Risk Management Plan
  - Continuous Risk Management System
  - Risk Surveillance Plan
- 11. System Safety**
  - System Safety Implementation Plan
  - Safety Data Packages
  - Safety Program
  - System Safety Analysis
  - Tracking of GDS Residual Hazards
  - Safety Compliance
  - Hazard Reports
  - Verification Tracking Log
  - Launch Site / Ground Operations Procedures
  - Launch Site Safety Plan
  - Identification of Hazardous Operations
  - Safety Non Compliance Waiver Request
  - Letter of Safety Compliance
  - Compliance of Heritage Hardware to requirements
- 12. Software Assurance**
  - Software Quality Assurance (SQA) Plan
  - Software Safety Program
  - Verification & Validation Plan
  - Software Engineering Reviews
  - Software Quality Assurance
  - Software Quality Engineering Program
  - Software Nonconformance Reporting & Corrective Action (NRCA) Process
  - Software Reliability Program
- Software Continuous Risk Management System (CRMS)
- NASA Independent Verification & Validation (IV&V) Review
- Safety Related Deficiencies
- Software Safety Program for Safety Critical Software
- Software Security Program
- GSFC Software Waiver
- Software Functional Requirements for Government Furnished Equipment (GFE)
- Verification of Software Design and Engineering Techniques
- 13. Workmanship Standards**
  - Workmanship Program
  - Certification of Personnel
  - Use of NASA Workmanship Standards
  - Printed Wiring Boards
  - Printed Wiring Board (PWB) Test Coupons
  - Document Procedures to Implement Standards
- 14. Lessons Learned & GIDEP**
  - Lessons Learned at PDR
  - Post Mortem Lessons Learned
  - Government Industry Data Exchange Program (GIDEP)
    - Failure Experience Data Reports
- Supply Change Management**
  - Gold Rules
  - Lessons Learned
  - Outreach
  - Center databases (SOARIS, SAS, PFR, NCR)
  - AS9100 and ISO 9001
  - Internal Audits
  - Supplier Assessments
  - Configuration Management
  - Mission Operation Assurance
  - Training

### Appendix B: Nominee Selection and Ranking Criteria

Rating Factor	Maximum Points	Selection Consideration
Experience	30	<ul style="list-style-type: none"> <li>• Rating on relevant past experience, technical and leadership</li> <li>• Understanding and participation in project lifecycle development</li> <li>• Discipline and competency</li> <li>• Ability to provide measurable results for GSFC</li> <li>• Major accomplishments, awards, and results achieved</li> </ul>
Management Endorsement	25	<ul style="list-style-type: none"> <li>• Is this nominee considered an individual to lead programs and projects</li> <li>• Nominees will be rated on management endorsement, alignment of individual needs to Center program needs</li> <li>• How quickly will learning be applied</li> </ul>
Developmental Preparation	20	<ul style="list-style-type: none"> <li>• How well candidate is prepared to make maximum use of the SMART developmental opportunity</li> <li>• The recommended training and development to be successful</li> <li>• Nominees will be rated on degree, certification, relevant engineering training, other professional development, and leadership development</li> </ul>
Maturity, Judgment and Attitude	25	<ul style="list-style-type: none"> <li>• To what level does the candidate meet leadership and technical competencies</li> <li>• Ability to use critical and systems thinking</li> <li>• Understanding of NASA's strategic vision</li> </ul>
Total Points	100	

## Appendix C: Rotational Assignment Position Descriptions

### **Systems Review Manager (1 year)**

**Description:** The Systems Review Manager is assigned to the Safety and Mission Assurance Directorate, Systems Review Office. The work involves managing the systems review process for the assigned areas of responsibility, including defining overall review guidelines and developing the review programs for specific projects, chairing the reviews, reporting the results and following up on related actions.

**Qualifications:** Desirable experience is 10 years providing engineering, systems development, and project management to NASA flight projects or programs. Desirable experience is two years in a management role. Desirable experience is in technical areas such as requirements definition, design, requirements management, or interface management with discipline expertise in several of the following areas: avionics, mechanical, or guidance, navigation, and control. Achieved and operating successfully at the GS-14 level. Ability to successfully negotiate with flight projects criteria, recommendations, and technical issues. Requires the ability to work collaboratively.

A core competency required for this position is the ability to lead a multi-disciplined team covering discipline areas such as avionics, mechanical, and guidance, navigation, and control.

Expertise in several of the following discipline area: avionics, mechanical engineering, GNC, or high-level systems development.

**Special Skills:** Special skills desired are dependent on the specific rotational assignment and will include strong engineering skills, in-depth knowledge of the GSFC Project Lifecycle, competency in Team Dynamics and Management and Leadership.

### **CSO (1 year)**

**Description:** The Chief Safety and Mission Assurance Officer (CSO) is assigned to a GSFC flight program or project and serves as the single point of contact for mission assurance matters. The CSO is responsible to his/her assigned project(s) for the development and management of the project mission assurance program. The mission assurance program includes the system safety, reliability, quality assurance, software assurance, parts control, materials and process control, environmental verification, contamination control, and design review aspects of the project. The CSO has the responsibility and authority to lead and coordinate the project mission assurance team, consisting of civil servants and contractors with specific technical expertise in each the SMA areas. The CSO will serve on the project senior management team and will matrix directly to the Project Manager. The CSO will coordinate the development of mission assurance requirements, manage the performance of mission assurance analyses/testing, and assure the verification of these requirements throughout the project lifecycle. The project mission assurance program is applied to those design, fabrication, assembly, integration, and test operations performed at GSFC and at off-site contractor facilities. The work involves engineering, analysis, testing, and other mission assurance functions from design through flight operations with the objective of increasing the safety and mission success of GSFC projects.

**Qualifications:** Desirable experience is 10 years providing engineering, systems development, and project management to NASA flight projects or programs. Desirable level of experience is of two years in a management role of a technical area such as requirements definition, design,

requirements management, or interface management. Achieved and operating successfully at the GS-14 level.

**Special Skills:** Special skills desired are dependent on the specific rotational assignment and will include strong engineering skills, in-depth knowledge of the GSFC Project Lifecycle, competency in Team Dynamics and Management and Leadership. Applicants should have demonstrated capability in leading a major engineering effort.

#### **Reliability Engineer/Project Reliability Lead (6 months to 1 year)**

**Description:** Serves as the reliability consultant to NASA programs and works independently with other NASA Centers and HQ. The work involves establishing, maintaining, and evaluation reliability engineering and assurance programs through all phases of complex engineering systems, development from design through operation use. The focus is providing leadership to GSFC programs and projects by assisting them to design-in reliability, availability, and if required, maintainability to their systems. The work also includes task leadership for numerous reliability, maintainability, and risk assessment functions: ensuring adequacy and consistency of work across all GSFC projects. Duties may also include monitoring contractors engaged in this work. The engineer will focus on development and implementation of a reliability, availability, and maintainability (RAM) plan for his/her assigned project, and then leading the project team through the process of identifying failure modes and mitigating. This will entail use of analysis tools, verification techniques, and soft skills to deliver value to the project.

**Qualifications:** Desirable experience is 5 years in any of the engineering fields. Preferably, experience will be on GSFC programs and projects in either the systems engineering or project engineering areas.

**Special Skills:** Special skills desired are excellent people skills, good analytical skills, and understanding of the GSFC project engineering lifecycle.

#### **Safety Engineer/Project Safety Manager (1 year)**

**Description:** The project safety manager is responsible for ensuring that system safety is designed into all systems for a particular GSFC project. This entails focusing on hazard identification and mitigation. The work involves advising on, coordinating, monitoring, and maintaining surveillance over engineering systems safety programs, as well as performance hazard analysis and generating safety data packages, for all aerospace and aeronautical programs through definition, design and development, and operations of space systems, launch, aerospace and aeronautical vehicles, and /or associated ground and support equipment. Duties may also include monitoring contractors engaged in this work.

**Qualifications:** Desirable experience is 5 years in any of the engineering fields. Preferably, experience will be on GSFC programs and projects in either the systems engineering or project engineering areas.

**Special Skills:** Special skills desired are excellent people skills, good analytical skills, and understanding of GSFC project engineering lifecycle.

#### **Supply Chain Manager (6 to 12 months or one audit)**

**Description:** The work involves engineering and quality assurance functions for GSFC and provides integrated technical leadership for mission assurance issues across multiple projects related to mission contractors and suppliers. The incumbent serves as one for the Supply Chain Managers for Goddard. The incumbent supports the Chief of the Institutional Support Office who is responsible for the development and management of a comprehensive process to track mission assurance issues across all Goddard projects, identify and analyze trends, and

develop corrective action plans to improve the quality of procured systems, spacecraft, instruments, components, parts and materials.

The incumbent must exercise a high degree of initiative, creativity, and sound engineering and management judgment in the development and implementation of this process. Close coordination with individual Chief Safety and Mission Assurance Officers, Project Managers and the Applied Engineering and Technology Directorate, DCMA and other organizations is essential for successful performance.

**Qualifications:** Desirable experience is 5 years of GSFC project and program experience. A degree in engineering or equivalent is also desired. Experience with quality process and knowledge of the GSFC quality management system is a plus.

**Special Skills:** Special skills desired are excellent people skills, good analytical skills, and understanding of GSFC project engineering lifecycle. Experience auditing is a plus.

**Operations Research Analyst or Resource Analyst (6 months to 1 year)**

**Description:** This opportunity contributes to the soundness of budget, procurement, and resource planning at the Center. The Operations Research Analyst is assigned to the Resource Analysis Office (RAO), Code 305. He/she collects historical cost, technical and programmatic project data that are used in the development of proposed and on-going flight projects, and other major procurements at the Center. Working with the RAO team, he/she analyzes and normalizes data and captures project lessons learned as well as cost drivers for entry in RAO historical databases. He/she will learn the mathematical model development and independent assessments as well.

**Qualifications:** Desirable experience is 5 years supporting GSFC projects or programs in a professional administrative or engineering capacity. A Bachelor's degree in an appropriate field of engineering, mathematics, physical science, or business administration (or a combination of appropriate education and experience) is required.

**Special Skills:** Special skills desired include understanding of an engineering discipline, theories, concepts, and experience. Understanding of the GSFC project lifecycle is desirable.

## Appendix D: SMA Competency Areas Relevant to Rotational Assignments

Competency	Relevancy to the Rotational Assignment: High, Med, Low, None (Blank)					
	Systems Review Mgr.	CSO	Reliability Eng.	Safety Eng.	Supply Chain Mgr.	Operations Research Analyst
1. Concepts and Architecture:						
1.1. Missions Needs Statement	See Note 1	Med	High	Med	Low	-
1.2. Systems Environments		High	High	Med	Low	-
1.3. Trade Studies		Med	High	High	Low	High
1.4. System Architecture		High	High	High	Low	
2. Systems Design						
2.1. Stakeholder Expectation Definition & Mngmnt.	See Note 1	Med	Low	Med	Low	-
2.2. Technical Requirements Definition		High	High	High	Low	-
2.3. Logical Decomposition		Med	Med	Med	Low	-
2.4. Design Solution Definition		High	High	High	Low	-
3. Production, Product, Transition, & Operations						
3.1. Product Implementation	See Note 1	High	High	High	y	-
3.2. Product Integration		High	High	High	Med	-
3.3. Product Verification		High	High	High	Med	-
3.4. Product Validation		High	High	High	Med	-
3.5. Product Transition		High	High	High	Med	-
4. Technical Management						
4.1. Technical Planning	See Note 1	y	Med	Med	Med	-
4.2. Requirements Management		Med	Med	Med	High	-
4.3. Interface Management		High	Med	High	Med	-
4.4. Technical Risk Management		High	High	High	Med	-
4.5. Configuration Management		High	Low	Med	High	-
4.6. Technical Data Management		Low	Low	Low	Med	-
4.7. Technical Assessment		High	High	High	Med	High
4.8. Technical Decision Analysis		High	High	High	Med	-
5. Project Management and Control						
5.1. Acquisition Strategies and Procurement	See Note 2	High	High	Med	Med	-
5.2. Contract Management		-	-	-	High	-
5.3. System Engineering Management		Med	Med	Med	Med	-
6. NASA Internal and External Environments						
6.1. Agency Structure, Mission, Internal Goals	High	Low	Low	Low	Low	-
6.2. NASA PM/SE Procedures and Guidelines	High	High	Med	Med	Low	-
6.3. External Relationships	High	High	Low	Med	High	-
7. Human Capital Management						
7.1. Team Dynamics and Management	See Note 2	High	Low	High	Med	-
8. Professional and Leadership Development						
8.1. Mentoring and coaching	High	Med	Med	Med	Med	-
8.2. Communication	High	High	High	High	High	-
8.3. Leadership	High	High	Med	High	High	-
9. Knowledge Management						
9.1. Knowledge Capture and Transfer	Med	High	Med	Med	Low	High
10. Safety, and Mission Assurance						
10.1. Safety and Mission Assurance	See Note 2	High	High	High	Med	-
10.2. Reliability						
10.2.1. FMEA (Failure Modes & Effects Analysis)	See Note 2	Med	High		Low	-
10.2.2. PRA (Probabilistic Reliability Analysis)		Med	High		Low	-
10.2.3. Software Assurance Tools		Med	High		Low	-
10.3. Safety						
10.3.1. Systems Safety	See Note 2	High	High	High	Low	-
10.3.2. Hazardous Operations		High	High	High	Low	-
10.4. Quality Assurance Activities						
10.4.1. Workmanship Standards	See Note 2	High	Med	Low	High	-

Competency	Relevancy to the Rotational Assignment: High, Med, Low, None (Blank)					
	Systems Review Mgr.	CSO	Reliability Eng.	Safety Eng.	Supply Chain Mgr.	Operations Research Analyst
10.4.2. Material Review Board	See Note 2	High	Med	Med	Med	-
10.4.3. Reporting of Anomalies		High	Med	Med	High	-
10.4.4. Letters of Delegation		High	Med	Med	High	-
10.4.5. EEE Parts and Packaging		High	Med	Med	High	-
10.4.6. GIDEP Alerts and Advisories		High	Med	Med	High	-
10.4.7. Supplier Management		High	Med	Med	High	-
10.4.8. Metrology and Calibration		Med	Med	Med	High	-
10.4.9. Software Quality Assurance		Med	Med	Med	High	-
10.4.10. Ground System Mission Assurance		Med	Med	Med	Med	-
10.4.11. Control of Non-Conforming Product		Med	Med	Med	High	-
10.4.12. Risk Management		Med	High	High	High	-
10.4.13. Document Control		Med	Med	Med	High	-
10.4.14. Supplier Assessment and Mngmnt.		Med	Med	Med	High	-
10.4.15. Auditing		Med	Med	Med	High	-
10.4.16. Contamination Control		Med	Med	Med	High	-
10.4.17. System Reviews		Med	Med	Med	Low	-
<b>10.5. Verification Activities</b>						
10.5.1. Environmental Testing	See Note 2	High	Med	Med	High	-
10.5.2. Vibration Testing		High	Med	Med	High	-
10.5.3. Acoustic Testing		High	Med	Med	High	-
10.5.4. EMI and EMC Testing		High	Med	Med	High	-

Note 1: Must have high competency in a minimum of two of the major engineering competency areas.

Note 2: Must have high competency in a minimum of two of these major project competency areas.

Note 3: Subject Matter Experts in each Code determined the above competency levels.

**Appendix E: Technical Course Listing by Rotational Assignment Area**

Area	Training Course Title	Training Source
All	Task Order Management System (TOMS) User Training	TBD
Reliability & Maintainability Engineer	Reliability Management	Commercial
	RAM Management	
	Probabilistic Analysis	
	Reliability Testing	
	NSTC 017 Design for Availability	NASA Safety Trng Ctr
	SMA-017-01 Failure Modes and Effects Analysis (FMEA)/Critical Items List (CIL)	SATERN
	SMA-051-03 Reliability and Maintainability Overview	
SMA-080-02 Fault Tree Analysis		
System Safety Engineer	NSTC 002, System Safety Fundamentals	NASA Safety Training Center
	NSTC 006, MORT based Mishap Investigation	
	NSTC 016 Payload Safety Review Process and Requirements	
	NSTC 020, Basic System Safety Practice	
	NSTC 023 System Safety in Acquisition	
	NSTC 025, Software System Safety	
	NSTC 036 Battery Safety	
	NSTC 049, Root Cause Analysis	
	NSTC 313 Cryogenics Safety	
	NSTC 315 Safety in High Pressure Systems	
	SMA-066-01 System Safety	SATERN
SMA-001-05 Introduction to Mishap Investigations		
Systems Review Management	Independent Review Board Member Training*	TBD
	Managing Team Dynamics*	
	Leadership and Management Skills*	
Supply Chain Manager	Supply Chain Database Training	TBD
	Supplier Assessment GPR Training	
	Introduction to ISO 9001 and Introduction to AS9100*	
	Auditor 2-day Training Class	
	Lead Auditor Training	
	SOARIS System, SAS Database, and Supplier Assessment DB Training	
Operations Research Analyst	On the job training	NA
The following training applies to the CSO position		
CSO	CSO University*	Code 300
	SMA Data Base Use*	TBD
	Review of the GSFC Standard Mission Assurance Requirements* (MAR)	TBD
Contamination Control	EDT-009-04 Space Environment and Contamination Effects	SATERN
GIDEP Alerts & Problem Solving	GPR 5340.3 Preparation and Handling of Alerts and Safe Alerts	
	SMA-020-01 GIDEP Participation and The NASA Advisory	
Nonconformance Systems	SMA-022-01 Incident Reporting Information System (IRIS)	
	SMA-033-01 Material Review Board	
Parts, Materials, and Process (PMP)	EDT-002-04 EEE Parts and Packaging	SATERN
	EDT-009-03 Radiation: Testing Overview	
Quality Assurance/Engineering	GPR 1410.1 Directives Management	Office of Human Resources (ISO 9000/QMS Presentations)
	GPR 1440.7 Records Control	
	GPR 1710.1 Corrective and Preventive Action	
	GPR 4520.2 Incoming Inspection and Test	
	GPR 5100.2 Supplier Performance Evaluations	
	GPR 5100.3 Quality Assurance Letter of Delegation	
	GPR 5330.1 Product Processing, Inspection and Test	
	GPR 5340.2 Control of Nonconformance's	
	GPR 6400.1 Handling, Storage, Packaging, Marking, Preservation and Transportation	
	GPR 8730.1 Calibration and Metrology	
	GPR 9980.1 Internal Audit System	
Spacecraft QA Integration and Testing		

Area	Training Course Title	Training Source
	NSTC 049 Root Cause Analysis	NASA Safety Training Center
	NSTC 074 Range Safety Orientation	
	SEC-001-05 Independent Technical Authority Awareness	SATERN
	SMA-001-01D Acceptance/DD 250 Material Inspection and Receiving Report (MIRR)	SATERN
	SMA-003-01 As-Designed vs. As-Built	
	SMA-004-01 Audits and Reviews	
	SMA-005-01 Configuration Management	
	SMA-008-01 Contractor Performance Surveillance	
	SMA-026-01 Inspection Planning	
	SMA-027-01D Lessons Learned Information System (LLIS)	
	SMA-035-01 Metrology and Calibration	
	SMA-046-01 Preventive Action/Corrective Action	
	SMA-047-01 Process Control	
	SMA-048-01 Project Surveillance Plan	
	SMA-049-01 Qualification	
	SMA-050-01 Receiving Inspection	
	SMA-052-01 Remedies/Corrective Action Strategy	
	SMA-064-01 Stamp Control	
	SMA-065-01 Supplier's Quality Program Plan	
	SMA-067-01 Testing	
	SMA-068-01 Training and Certification	
	SMA-069-01 Vendor Surveillance	
	SMA-070-01 Workmanship Standards	
Risk Management	SMA-055-01 Risk Management Overview	SATERN
	SMA-056-01 Risk Management Plan Development	
Software Assurance	SMA-061-01 Software Assurance	SATERN
	SMA-062-01 Software System Safety	
	NASA Software Assurance Training (Overview of five Disciplines)	
	Software Quality Training Module 1 - Processes, Reporting, and Records	GSFC Software Assurance web site
	Software Quality Training Module 2 - CSO Role in Software Quality Program	

\* Enabling Training Courses

## Appendix F: NASA SMA Reference Documents

Document Number	Title	System Review Mgr	CSO	Reliability Eng	Safety Eng	Supply Chain Eng	Resource Mgr
	System Review Board Handbook (Draft)	X					
	Safety and Mission Assurance Requirements (MAR)	X	X	X	X		
302-PG-7120.2.1	Systems Safety Support to GSFC Missions and other Organizations		X		X		
303-PG-7120.2.1	Procedure for Developing and Implementing Software Quality Programs		X				
303-WI-7120.1.1	Software Quality Reporting Process		X				
303-WI-7120.1.2	Software Quality Assessment Process		X				
303-WI-7120.1.3	Software QA Engineering Peer Review Assessment		X				
303-WI-7120.2.1	Mission Assurance Requirements (MAR) Preparation		X				
305-WI-1310.1.1B							X
540-PG-8715.1.1	Mechanical Systems Division (MSD) Safety Manual		X				
580-PG-8730.3.1	Product Development Handbook		X				
AFSPCMAN 91-710	Range Safety User Requirements Manual		X		X		
CR 5320.9	Payload and Experiment Failure Mode Effects Analysis and Critical Items List Ground Rules		X	X			
EEE-INST-002	Instructions for EEE Parts Selection, Screening, Qualification, and Derating			X			
EWR 127-1	Eastern and Western Range Safety Requirements		X		X		
FAP P-302-720,	Performing a Failure Mode and Effects Analysis		X	X			
	FMEA Handbook			X			
GPR 1860.1 - .4	Radiation Protection		X				
GPR 5340.3	Preparation and Handling of Alerts, Safe Alerts and Advisories		X		X		
GPR 8700.4	Integrated Independent Review (IIR)-	X	X				
GPR 8700.5	In-House Development & Maintenance of SW Products		X				
GPR 8700.6	Engineering Peer Reviews	X	X	X	X	X	
GPR STD 1000	Rules, Design, Development, Verification		X	X	X	X	
GPR-5100.2	Supplier Performance Evaluations		X				
GPR-5100.4	Supplier Quality Audits		X			X	
GPR-5340.2	Control of Nonconformance's		X			X	
GPR-7120.1	Program and Project Management	X	X				
GPR-7120.4	Risk Management		X	X			
GPR-8700.4	Integrated Independent Reviews	X	X				
GPR-8715.1	Processing of NASA Safety Reporting System (NSRS) Incident Reports		X	X			
GSFC STD 1001	Criteria for Flight Project Reviews -- Undated Draft	X		X			
GSFC-STD 0002	Risk Management Reporting System			X			
GSFC-STD-7000	General Environmental Verification Standard	X	X	X	X		
KHB 1700.7	Kennedy Space Center Directives Space Shuttle Payload Ground Safety Handbook		X		X		
KNPR 8715.3	Kennedy Space Center Safety Practices Procedural Requirements		X		X		
MIL-HDBK-338	Electronic Reliability Design Handbook			X			
MIL-STD-1522	Standard General Requirements for Safe Design and Operation of Pressurized Missile and Space Systems		X		X		
MIL-STD-882	System Safety Program Requirements		X		X		
NASA FTA	NASA Fault Tree Handbook With Aerospace Applications			X			
NASA PRA Handbook	Probabilistic Risk Assessment Procedures Guide for NASA Managers and Practitioners			X			

Document Number	Title	System Review Mgr	CSO	Reliability Eng	Safety Eng	Supply Chain Eng	Re-source Mgr
NASA-STD-8719.11	Safety Standard for Fire Protection				X		
NASA-STD-8719.13	Software Safety Standard				X		
NASA-STD-8719.7	Facility System Safety Requirements				X		
NASA-STD-8719.8	Expendable Launch Vehicle Payload Safety Review Process Standard				X		
NASA-STD-8719.9	Standard for Lifting Devices and Equipment				X		
NASA-STD-8729.1	Planning, Developing and Managing an Effective Reliability and Maintainability Program		X	X		X	
NASA-STD-8729.1	Planning, Developing and Managing an Effective Reliability and Maintainability Program			X			
NASA-STD-8739.1	Workmanship Standard for Staking and Conformal Coating of Printed Wiring Boards and Assemblies		X			X	
NASA-STD-8739.2	Workmanship Standard for Surface Mount Technology		X			X	
NASA-STD-8739.3	Soldered Electrical Connections Standard		X			X	
NASA-STD-8739.4	Crimping, Interconnecting Cables Harnesses and Wiring		X			X	
NASA-STD-8739.5	Fiber Optic Terminations, Cable Assemblies, and Installation		X			X	
NASA-STD-8739.8	NASA Software Assurance Standard		X			X	
NAS-STD-8719.13	Software Safety Standard		X		X	X	
NPD 2820.1	NASA Software Policies		X			X	
NPD 8610.23; NPD 8610.24	Expendable Launch Vehicle Launch Services Safety Requirements				X		
NPD 8700.1	NASA Policy for Safety and Mission Assurance	X					
NPD 8700.2: NPR 8705.3	Experimental Aerospace Vehicle SMA Requirements			X			
NPD 8700.3	Safety and Mission Assurance Policy for NASA Spacecraft, Instruments and Launch Services		X	X	X	X	
NPD 8710.3	Limiting Orbital Debris Generation		X			X	
NPD 8715.1	NASA Occupational Safety and Health Programs				X		
NPD 8720.1	NASA Reliability & Maintainability Program		X	X		X	
NPD 8730.1	Metrology and Calibration		X			X	
NPD 8730.2	NASA Parts Policy		X			X	
NPR 7120.5	NASA Space Flight Program and Project Mgt. Rqmts.	X	X			X	
NPR 7123.1	NASA Systems Engineering Processes & Requirements.	X					
NPR 7150.2	NASA Software Engineering Requirements		X			X	
NPR 8000.4	Risk Management Procedural Requirements			X			
NPR 8621.1	NASA Mishap Reporting Investigating, and Record Keeping		X		X	X	
NPR 8704.4	Risk Classification for NASA Payloads			X			
NPR 8705.5	Probabilistic Risk Assessment			X			
NPR 8705.6	SMA Audits, Reviews, and Assessments	X					
NPR 8715.3	NASA Safety Manual				X		
NPR 8715.4; NPD 8710.5	NASA Safety Policy for Pressure Vessels and Pressurized Systems				X		
NPR 8715.XX	Range Safety Program				X		
NPR 8735.1	GIDEP Notifications and NASA Advisories		X			X	
NSS 1740.12	NASA Safety Standard (NSS) for Explosives, Propellants, and Pyrotechnics		X		X	X	
NSS 1740.14	NASA Safety Standard, Guidelines & Assessment Procedures for Limiting Orbital Debris		X		X	X	
RADC-TR--85-229	Reliability Prediction for Spacecraft		X			X	

## Key Elements of a Successful Rotational Program

