



## Goddard Procedures and Guidelines

<b>DIRECTIVE NO.</b>	<u>GPG 7120.1B</u>	<b>APPROVED BY Signature:</b>	<u>Original Signed by</u>
<b>EFFECTIVE DATE:</b>	<u>February 23, 2004</u>	<b>NAME:</b>	<u>A. V. Diaz</u>
<b>EXPIRATION DATE:</b>	<u>February 23, 2009</u>	<b>TITLE:</b>	<u>Director</u>

**Responsible Office:** 400/Flight Programs and Projects Directorate

**Title:** Program and Project Management

### PREFACE

#### P.1 PURPOSE

This procedure establishes the process for management of Goddard Space Flight Center (GSFC) programs and projects.

#### P.2 APPLICABILITY

This procedure applies to all GSFC programs and projects established to Provide Aerospace Products and Capabilities (PAPAC) as defined in NPR 1000.2, the NASA Strategic Management Handbook.

#### P.3 AUTHORITY

[NPD 7120.4](#), Program/Project Management

#### P.4 REFERENCES

- a. Enterprise Strategic Plans
- b. [NP-2003-9-570-GSFC](#), Goddard FY2004 Implementation Plan
- c. [SP-6105](#), NASA Systems Engineering Handbook
- d. [NPD 1000.1](#), NASA Strategic Plan
- e. [NPD 8010.3](#), Notification of Intent to Terminate Operating Space Systems
- f. [NPD 8700.1](#), NASA Policy for Safety and Mission Success
- g. [NPD 8710.3](#), NASA Policy for Limiting Orbital Debris Generation
- h. [NPD 8730.4](#), Software Independent Verification and Validation Policy (IV&V)
- i. [NPR 1000.2](#), NASA Strategic Management Handbook
- j. [NPR 1441.1](#), NASA Records Retention Schedule
- k. [NPR 2190.1](#), NASA Export Control Program
- l. [NPR 2810.1](#), Security of Information Technology
- m. [NPR 7120.5](#), NASA Program and Project Management Processes and Requirements
- n. [NPR 8580.1](#), Implementing the National Environmental Policy Act and Executive Order 12114
- o. [NSS 1740.14](#), NASA Safety Standard: Guidelines and Assessment Procedures for Limiting Orbital Debris

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- p. [GPG 1060.2](#), Management Review and Reporting for Programs and Projects
- q. [GPG 1280.1](#), The GSFC Quality Manual
- r. [GPG 1310.2](#), Approval Process For GSFC Proposals Exceeding New Business Committee Threshold
- s. [GPG 1410.2](#), Configuration Management
- t. [GPG 2570.1](#), Radio Frequency (RF) and Equipment Licensing
- u. [GPG 2810.1](#), Security of Information Technology
- v. [GPG 3410.2](#), Employee Competence and Quality Management System Training
- w. [GPG 7120.4](#), Risk Management
- x. [GPG 8700.4](#), Integrated Independent Reviews
- y. [GPG 8700.6](#), Engineering Peer Reviews

## P.5 CANCELLATION

- a. GPG 7120.1A, Program Management
- b. GPG 7120.2, Project Management

## P.6 SAFETY

None

## P.7 TRAINING

See paragraphs 1.5 and 1.7.

## P.8 RECORDS

Record Title	Record Custodian	Retention
Program Plan	Program office. If disestablished, then directorate office.	* <a href="#">NRRS 7/5A3a</a> (Permanent. Retire to Federal Records Center when 2 years old. Transfer to National Archives and Records Administration when 20 years old.)
Project Plan	Project office. If disestablished, then program office.	* <a href="#">NRRS 7/5A3a</a>

\* *NRRS – NASA Records and Retention Schedules* ([NPR 1441.1](#))

## P.9 METRICS

Metrics are as defined in NPR 7120.5, NASA Program and Project Management Processes and Requirements.

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<http://gdms.gsfc.nasa.gov/gdms> TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

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## P.10 DEFINITIONS

- a. Announcement of Opportunity (AO) – a procurement vehicle used by NASA Headquarters Enterprise Offices to solicit and select Space and Earth Science investigations for space flight. The AO is a competitive procurement process open to all elements of the scientific community.
- b. Approval – The PAPAC subprocess used to decide on the readiness of a program/project to proceed from Formulation to Implementation.
- c. Enterprise – One of the strategic business areas through which NASA implements missions and communicates with customers.
- d. Formulation – The PAPAC subprocess used to define the products and capabilities specified in the approved program/project plan.
- e. Formulation Authorization Document – The document issued by the Enterprise Associate Administrator to authorize the formulation of a program or project.
- f. Governing Program Management Council (GPMP) – The highest level Program Management Council (PMC) that has the responsibility to regularly review a program or project.
- g. Implementation – The PAPAC subprocess used to deliver the products and capabilities specified in the approved program/project plan.
- h. PAPAC – Abbreviation for Provide Aerospace Products and Capabilities, one of the four critical crosscutting processes defined in the NASA Strategic Management Handbook.
- i. Pre-Formulation – Those activities performed prior to mission selection or assignment, including advanced concept development, generation of Enterprise roadmaps, AO development and release, proposal preparation, and technology development.
- j. Program – An activity within an Enterprise having defined goals, objectives, requirements, and funding and consisting of one or more projects.
- k. Program Management Council (PMC) – One of the hierarchy of forums, composed of senior management, that assesses program and project planning and implementation and provides oversight and direction as appropriate. These are established at the Agency, Enterprise, and Center levels.
- l. Program Commitment Agreement (PCA) – The agreement between the NASA Administrator and the cognizant Enterprise Associate Administrator (EAA) for implementation of a program. The content of a PCA is described in Appendix E of NPR 7120.5.
- m. Program Plan – The document that establishes the baseline for implementation of a program. It is prepared and maintained by the program office and signed by the cognizant EAA, Center Director and program manager. The content of a program plan is described in Appendix E of NPR 7120.5.

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- n. **Project** – An activity designated by a program and characterized as having defined goals, objectives, requirements, Life Cycle Costs, a beginning, and an end. Selected aerospace activities can be further designated as GSFC projects when recommended by a sponsoring directorate and approved by the Center Director or his/her designee.
- o. **Project Plan** – The document that establishes the baseline for the implementation of a project within a program. It is prepared and maintained by the project and signed by the project manager, program manager, and Center Director. The content of a project plan is described in Appendix E of NPR 7120.5.
- p. **Risk Management** – An organized, systematic, decision-making process that efficiently identifies, analyzes, plans, tracks, controls, communicates, and documents risk to increase the likelihood of achieving program/project goals.
- q. **Space Flight Project** – A project which results in the launch and operation in space of an instrument, spacecraft, or major spacecraft subsystem. It does not include suborbital projects such as sounding rockets, balloons, or aircraft.
- r. **System Management Office (SMO)** – The GSFC organization responsible for independent review and assessment of programs/projects during Formulation and Implementation, whose findings are reported to the GSFC PMC.
- s. **Tailoring** – The adaptation of the processes and requirements so as to be consistent with program and project characteristics, such as size, complexity, cost, risk, and priority. Tailoring decisions are documented in the PCA and program and project plans.
- t. **Termination Review** – An analysis by the GPMC for the purpose of recommending whether to continue a program or a project. Exceeding the parameters or levels specified in controlling documents may trigger the initiation of a termination review.

## PROCEDURES

### 1. RESPONSIBILITIES

#### 1.1 Center Director

The Center Director is responsible for fostering advanced concept studies, concurring in appropriate formulation authorizations, appointing program managers with the concurrence of the EAA, concurring in the appointment of space flight project managers, approving the program and project plans, and overseeing program and project Formulation, Implementation, and Evaluation.

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## **1.2 Deputy Center Director**

The Deputy Center Director is delegated the responsibility and authority by the Center Director to direct the Formulation, Implementation and Evaluation of programs and projects and is accountable to the Center Director and the EAA for the programs and projects.

## **1.3 Director of Flight Programs and Projects**

For programs and projects managed at GSFC/Greenbelt, the Director of Flight Programs and Projects is responsible for administering the Formulation subprocess, initiating the Approval subprocess, appointing project managers with concurrence of the Center Director, and administering the Implementation and Evaluation subprocesses. He/she is also responsible for defining technology requirements, infusing these technologies into new programs and projects, promoting technology transfer to the commercial sector, and developing advanced concepts for the new missions necessary to support the Enterprise programs, projects, and products.

## **1.4 Director of Suborbital and Special Orbital Projects**

For programs and projects managed at GSFC's Wallops Flight Facility, the Director of Suborbital and Special Orbital Projects is responsible for administering the Formulation subprocess, initiating the Approval subprocess, appointing project managers, and administering the Implementation and Evaluation subprocesses. He/she is also responsible for defining technology requirements, infusing these technologies into new programs and projects, promoting technology transfer to the commercial sector, and developing advanced concepts for the new missions necessary to support the Enterprise programs, projects, and products.

## **1.5 Program Manager**

The program manager is responsible for accomplishing all aspects of programs/projects in accordance with the NASA Policy for Safety and Mission Success (NPD 8700.1). The program manager is also responsible for the integration of all project objectives and requirements at the program level, preparing the Program Plan, initiating tailoring of processes and requirements throughout the program, and maintaining conformance of the program with the Goddard Quality Management System (QMS) as described in GPG 1280.1. The program manager ensures that project plans are prepared in accordance with applicable Directives.

The program manager is responsible for all aspects of program implementation including conformance to the customers' technical, cost, and schedule requirements, and the integration of these elements to best meet overall program goals. The expected cost, schedule, technical performance, and planned program implementation are defined in the Program Plan that is progressively updated to reflect the approval of new projects.

The program manager is responsible for the performance of the program staff and team. He/she is responsible for project-specific training needed by program and project personnel in order to do their

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jobs and for determination of necessary competencies in accordance with GPG 3410.2, Employee Competence and Quality Management System Training. The program manager is responsible for the performance evaluations of the staff directly assigned to the program office, as well as for providing inputs to the appropriate supervisors for the performance evaluations of personnel assigned to his/her staff in a co-located fashion.

The program manager is responsible for supporting the following Center-wide management functions:

- a. Center manpower budget process
- b. Budget generation and execution
- c. Status review process
- d. Independent technical review process
- e. Personnel management, including the Center awards and promotion processes
- f. Quality Management
- g. Safety Management
- h. Risk Management
- i. Lessons Learned

The program manager reports program status to the GSFC PMC at the Monthly Status Reviews.

## **1.6 Project Formulation Manager**

The project formulation manager (PFM) is responsible for all aspects of project Formulation and their conformance to the GSFC QMS.

The PFM is also responsible for the performance of the formulation team. He/she is responsible for the performance evaluations of the staff directly assigned to the project as well as providing inputs to appropriate supervisors for the performance evaluation of personnel that are assigned to the team in a co-located fashion.

The PFM reports status to the GSFC PMC at the Monthly Status Reviews as required by the PMC.

## **1.7 Project Manager**

The project manager is responsible for all aspects of project implementation, including conformance to the customers' technical, cost, and schedule requirements, and conformance to the GSFC QMS. The project manager prepares the Project Plan that defines the expected cost, schedule, technical performance, and planned project implementation.

The project manager is responsible for the performance of the project team. He/she is responsible for project-related training on issues such as safety and various planning and implementation procedures. The project manager is responsible for the performance evaluations of the staff directly assigned to the project as well as providing inputs to appropriate supervisors for the performance evaluation of personnel assigned to the project in a co-located fashion.

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The project manager is responsible for supporting the same Center-wide management functions as were identified for the program manager (Section 1.5)

The project manager reports project status to the GSFC PMC at the Monthly Status Reviews.

## **2. PROVIDE AEROSPACE PRODUCTS AND CAPABILITIES (PAPAC) SUBPROCESSES**

The PAPAC process consists of the following four subprocesses:

- a. Formulation
- b. Approval
- c. Implementation
- d. Evaluation

Formulation, Approval, and Implementation occur sequentially in time, while the Evaluation subprocess occurs throughout the life cycle of a program or project. Programs and projects managed by GSFC shall conform to the procedures and guidelines established in NPR 7120.5.

### **2.1 Program/Project Formulation**

The responsibility for the Formulation subprocess is assigned to the appropriate EAA, although he/she delegates to others within the Enterprise specific activities comprising the overall Formulation subprocess.

**2.1.1 Program Formulation** - Program Formulation is the subprocess that defines a program concept and the plans to meet program objectives through one or more projects, including budget, schedule, and technology goals, as specified in the respective Enterprise Strategic Plan, the NASA Strategic Plan and the GSFC Strategic Implementation Plan. Once a program budget line is approved within the NASA budget, the program manager is appointed by the Center Director and leads the definitization of the program within the Formulation subprocess. The primary input to Program Formulation is the Formulation Authorization Document (FAD) prepared by the Enterprise. The primary outputs are the Program Plan, which documents the program's approach to satisfaction of requirements, including tailoring decisions, and the PCA. Approved program plans shall be maintained under configuration control in accordance with GPG 1410.2, Configuration Management.

**2.1.2 Project Formulation** - Project Formulation is the subprocess that defines a project concept and the plans to meet mission/project objectives, including budget, schedule, and technology goals, as specified in the respective program plan. The responsibility and authority for managing the Formulation of a project at GSFC is delegated to the appropriate program office through the Center Director and Deputy Center Director. Space flight project formulation teams are led by a project formulation manager appointed by the Director of Flight Programs and Projects. Where appropriate, the Director of Suborbital and Special Orbital Projects appoints study managers for formulation of suborbital and other assigned projects. The primary inputs to project Formulation are the program plan, and, where appropriate, the FAD prepared by the Enterprise. A primary output is the project plan, which documents

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the project's approach to satisfaction of requirements, including tailoring decisions, and the Life Cycle Cost (LCC) estimate. Approved project plans shall be maintained under configuration control in accordance with GPG 1410.2.

**2.1.3 Formulation Products** – During Formulation, the formulation manager must ensure that the following activities are accomplished prior to the initiation of the Approval subprocess:

- a. Launch vehicle requirements are defined.
- b. Environmental requirements and compliance issues are addressed in accordance with the National Environmental Policy Act (NEPA) including preparation of required environmental documentation.
- c. End-of-Life issues are addressed, including any disposal planning and orbital debris assessments as required by NPD 8710.3, NASA Policy for Limiting Orbital Debris Generation, and NSS 1740.14, Guidelines and Assessment Procedures for Limiting Orbital Debris.
- d. Draft agreements with domestic and international partners are developed.
- e. Termination review criteria are established.
- f. The results of any independent assessments or Non-Advocate Reviews (NAR) are available.
- g. The criteria which must be met to satisfy mission objectives are defined.
- h. Mission requirements are established and agreed upon by the project, GSFC management, Headquarters, and the Principal Investigator (PI) or Science Working Group.
- i. A “grass-roots” cost estimate with a work breakdown structure is developed based on assumptions of schedule and workforce.
- j. Adequate cost reserves and schedule slack (nominally 25% to 30% and one month per year respectively for typical space flight projects) are built into the planning.
- k. Frequency authorizations are achieved in accordance with GPG 2570.1, Radio Frequency (RF) and Equipment Licensing. (Note: The GSFC Spectrum Manager must be consulted during the development of requests for industry proposals regarding the design, development or procurement of RF equipment.)
- l. Additional documentation is developed as required. In addition to the program and project plans, the Formulation subprocess may result in some or all the following additional products. Determination of actual need is based on tailoring decisions.
  - (1) Technology Development Plan
  - (2) Acquisition Plan
  - (3) Risk Management Plan (as required by GPG 7120.4, Risk Management)
  - (4) Descope Plan, including an implementation timeline
  - (5) Independent Review Plan (see Section 2.4)
  - (6) Education and Public Outreach Plan
  - (7) Draft Mission Operations Plan
  - (8) Draft Data Management Plan



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- (9) Draft Configuration Management Plan
- (10) Systems Engineering Management Plan
- (11) Lessons Learned during Formulation

## 2.2 Program/Project Approval

Program/Project Approval is the subprocess that assesses the readiness of a program/project to proceed from Formulation to Implementation.

For new programs, the proposed program plan is presented by the EAA to the NASA PMC and the Administrator. The Administrator has sole authority to approve new programs.

For new space flight projects, the EAA approves the transition from Formulation to Implementation. The EAA conducts a Confirmation Review (CR) in order to establish that the mission team has rigorously formulated the mission including the establishment of success criteria and acceptable risk, has an acceptable project plan that includes a commitment to people, facilities, travel and other Center resources, adequate technical margins and resource reserves, and is prepared to implement the mission in a disciplined manner and within the resource and schedule constraints identified.

A Mission Confirmation Readiness Review (MCRR) is held by the GSFC PMC as part of a three-step process for all GSFC space flight projects, including major instruments or subsystems intended for non-GSFC missions. Strategic missions that report to the Agency PMC usually have a NAR, and the results of this review are reported directly to the Agency PMC. The standard three-step approval process is as follows:

**2.2.1 Confirmation Readiness Assessment** - An Integrated Independent Review Team (IIRT) shall be chartered by the SMO and PMC to assess the adequacy of the formulation effort and the readiness of the mission to proceed into implementation. Two co-chairs lead the IIRTs for GSFC projects. One co-chair shall be from the GSFC Systems Review Office (SRO), and the other co-chair shall be from outside of GSFC. Co-chair selections are subject to the approval of the SMO Director, GPMC Chair and the EAA. The confirmation readiness assessment will typically be conducted as an integral part of the Preliminary Design Review (PDR) or other critical milestone review. Findings, recommendations and project responses from this review are presented to the GSFC PMC at the MCRR.

**2.2.2 Mission Confirmation Readiness Review (MCRR)** - The project manager, project scientist and/or PI, the SMO, and the program manager brief the GSFC PMC on the readiness of the project to proceed to Implementation. A summary of the material to be presented may be found in GPG 1060.2, Management Review and Reporting for Programs and Projects.

**2.2.3 Confirmation Review (CR)** – The Headquarters CR begins with the PI, or project scientist, and project manager summarizing the mission and implementation plans. The external co-chair of the IIRT (or the chair of the NAR, if applicable) shall then brief the findings and recommendations from the Confirmation Readiness Assessment. The IIRT co-chair includes the project responses to all recommendations that the IIRT acknowledges as formally closed. The program manager provides the

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program/project closure plan for any remaining IIRT recommendations and a confirmation recommendation from the program perspective. In conclusion, the Deputy Center Director, or designee, presents the findings and recommendations of the GSFC PMC on the confirmation readiness of the mission. Based on the Governing PMC review and recommendation, the project plan is signed by the project manager, program manager, and Center Director.

In the case of projects that report to the Agency PMC, mission-level Integrated Independent Reviews (IIRs) will be conducted by two clearly identifiable review teams that function as a single team (i.e., IIRT). Agency-level Independent Review Team (IRT) processes will be used to select a review chair and review team members from outside of GSFC. The chair should be external to NASA. This review team will be designated as the IRT. The SRO Chief will appoint the chair and members of the independent GSFC review team as described herein. This review team will be known as the Center SMO review team.

### **2.3 Program/Project Implementation**

The responsibility and authority for managing the Implementation of a program or project at GSFC is delegated to the appropriate program office through the Center Director and Deputy Center Director. Tailoring for individual programs and projects is documented in the PCA and the program and project plans.

The Implementation of a program is accomplished through its projects. The program office represents all projects throughout their life cycle to the governing PMC. The governing PMC may be at NASA Headquarters (HQ) or GSFC, as documented in the program plan.

The various phases of project Implementation as conducted at GSFC are described in Section 3.1. The interim and gateway reviews that occur during Implementation are described in Section 3.2.

During Implementation, the program/project managers must ensure that the following activities are accomplished:

- a. Products are delivered consistent with the requirements, schedule, and budget established by the approved program and project plans.
- b. The requirements flow-down is completed.
- c. The program/project complies with applicable laws and regulations such as the NEPA and International Traffic in Arms Regulations (ITAR). See NPR 8580.1, Implementing the NEPA and Executive Order 12114, and NPR 2190.1, NASA Export Control Program.
- d. The schedule is coordinated to ensure that the required facilities and skills are available when needed.

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- e. Facilities and equipment are evaluated to ensure their availability and capability, including temperature and humidity control, meet product requirements.
- f. A reentry debris analysis is conducted, and the orbital debris requirements documented in NSS 1740.14, Guidelines and Assessment Procedures for Limiting Orbital Debris, are met.
- g. The verification matrix is completed.
- h. Plans are in place for Independent Verification and Validation (IV&V) of mission critical software per NPD 8730.4.
- i. To the extent possible, end-to-end testing is conducted in the flight configuration.
- j. Acceptable mission risk is defined at the outset with buy-in at all management levels.
- k. A thorough series of peer reviews is conducted.
- l. The operations team is integrated early into the flight hardware development effort.
- m. A plan is developed for the development-to-checkout-to-operations transition, including the ground system.
- n. Information Technology (IT) security documents are prepared for line management approval and submitted to the GSFC IT Security Manager per NPR 2810.1 and GPG 2810.1, Security of Information Technology.
- o. Lessons learned are documented and made available for other programs and projects.

## 2.4 Program/Project Evaluation

The purpose of the Evaluation subprocess is to provide independent assessments of the continuing ability of the program or project to meet its technical and programmatic commitments and to provide value-added assistance to the program/project managers. The Evaluation subprocess occurs throughout the life cycle of the program or project to ensure the successful completion of the Formulation, Approval, and Implementation subprocesses. The approach should be tailored based on factors such as program and project scope, complexity, visibility, cost, safety, and acceptable risk.

For all space flight projects, the project manager, in consultation with the SRO, shall develop and maintain an Independent Review Plan for the project. The review plan shall identify the planned gateway reviews, life-cycle series of integrated independent reviews, and pre-launch readiness reviews. The primary objective of each review shall be concisely documented. The review plan shall also describe the project team's approach to engineering peer reviews. See GPG 8700.4, Integrated Independent Reviews and GPG 8700.6, Engineering Peer Reviews. The review plan shall be maintained under configuration control in accordance with GPG 1410.2, Configuration Management.

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The outcome of the Evaluation subprocess is a set of conclusions regarding the ability to meet commitments and recommendations for proceeding with, modifying, or terminating the program or project. Special reviews can be directed during Formulation or Implementation by the EAA or the Governing PMC, as required.

### 3. PROJECT LIFE CYCLE

In NPR 7120.5, the life cycle of projects is defined only in the broad terms of the Formulation, Approval, and Implementation subprocesses. GSFC projects will be managed using the traditional Pre-phase A, Phase A, Phase B, Phase C/D, and Phase E/F terminology as described in SP-6105, the NASA Systems Engineering Handbook. The mapping of the traditional Phase A/F approach into the Formulation, Approval, and Implementation terminology is shown in Figure 1.

Figure 1 also shows the relative timing of the standard reviews normally conducted during the lifetime of space flight projects. The review cycle for projects managed by the Suborbital and Special Orbital Projects Directorate will be tailored appropriately. Section 3.1 below provides brief definitions of the life cycle phases as described in SP-6105. Section 3.2 provides brief definitions of the individual flight project reviews.

#### 3.1 Life Cycle Phases

The life cycle phases are defined as follows:

**3.1.1 Pre-Phase A (Mission Feasibility)** – The purpose of this phase is to investigate a broad spectrum of ideas and alternatives for missions from which new projects can be selected. It is equivalent to “Pre-Formulation” in the NPR 7120.5 terminology. During this phase, advanced studies are conducted in order to determine mission feasibility. The culmination of Pre-Phase A is the Mission Concept Review (MCR).

**3.1.2 Phase A (Mission Definition)** - The purpose of this phase is to further examine the feasibility and desirability of a suggested new system before seeking significant funding. It is the first part of “Formulation” in the NPR 7120.5 terminology. The culmination of Phase A is usually the Mission Definition Review (MDR). Some projects may choose to combine the System Requirements Review (SRR) with the MDR at the end of Phase A. The Space Science Enterprise requires its own “Initial Confirmation Review” before a project can proceed to Phase B.

**3.1.3 Phase B (Definition)** – The purpose of this phase is to define the technical requirements in sufficient detail to establish firm schedule and cost requirements. It is the last part of “Formulation” and precedes “Approval” in the NPR 7120.5 terminology. Interim reviews conducted during Phase B are the System Requirements Review (SRR) and the System Concept Review (SCR). The culmination of Phase B is the Preliminary Design Review (PDR). The PDR is the primary data source for a Non-Advocacy Review (NAR) or Integrated Independent Review (IIR), the results of which feed into the Approval subprocess for the transition from Formulation to Implementation (or from Phase B to Phase C). Approval to proceed into Implementation is provided by the appropriate Enterprise Office at the

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Confirmation Review (CR). As was indicated in Section 2.2, GSFC conducts a Mission Confirmation Readiness Review (MCRR) prior to the CR.

**3.1.4 Phase C (Design)** – The purpose of this phase is to complete the detailed design of the system and its associated subsystems, including its operations subsystems. It is the first step in “Implementation” in the NPR 7120.5 terminology. The culmination of Phase C is the system-level Critical Design Review (CDR).

**3.1.5 Phase D (Development)** – The purpose of this phase is to build and verify the system defined in the previous phase, deploy it, and prepare for operations. It is the second part of “Implementation” in the NPR 7120.5 terminology. There are a number of interim reviews conducted during Phase D including the Mission Operations Review (MOR), the Pre-Environmental Review (PER), the Flight Operations Review (FOR), the Pre-Ship Review (PSR), and the Operations Readiness Review (ORR). The culmination of Phase D is GSFC’s Mission Readiness Review (MRR) and Kennedy Space Center’s Flight Readiness Review (FRR) and Launch Readiness Review (LRR).

**3.1.6 Phase E (Operations)** – The purpose of this phase is to produce the intended data products of the mission. It is the third part of “Implementation” in the NPR 7120.5 terminology. Once the nominal lifetime of the mission has been reached, a decision may be made by the Enterprise Office to move into Phase F, Extended Operations. The culmination of Phase E/F is the Decommissioning Review (DR) at the end of the mission. Notification of intent to terminate a mission is to be done per NPD 8010.3, Notification of Intent to Terminate Operating Space Systems.

## 3.2 Space Flight Project Life Cycle Reviews

The GSFC space flight project life cycle reviews are defined below. The specific reviews to be conducted by each project are identified in the Independent Review Plan developed in consultation with the Systems Review Office.

- a. **Mission Concept Review (MCR)** – This review affirms the mission need, and examines the proposed mission’s objectives and the concept for meeting those objectives.
- b. **Mission Definition Review (MDR)** – This review examines the functional and performance requirements defined for the system and assures that the requirements and the selected architecture/design will satisfy the mission.
- c. **System Requirements Review (SRR)** – This review confirms that the proposed requirements meet the mission objectives and that the requirements will lead to a reasonable solution.
- d. **System Concept Review (SCR)** – This review occurs near the end of the definition study phase (Phase B). Its purpose is to evaluate the design approaches, hardware/software tradeoffs, software requirements, and operational concepts.

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- e. Preliminary Design Review (PDR) – This review demonstrates that the preliminary design meets all the system requirements with acceptable risk, and establishes the basis for proceeding with detailed design.
- f. Critical Design Review (CDR) – This review ensures that the design maturity justifies the decision to initiate fabrication/manufacturing, integration, and verification of mission hardware and software.
- g. Mission Operations Review (MOR) – This review occurs before significant integration and test of the flight systems and ground systems. Its purpose is to review the status of the system components, including the ground systems and its operational interfaces with the flight systems.
- h. Pre-Environmental Review (PER) – This review establishes the readiness of the system for test and evaluates the environmental test plans.
- i. Flight Operations Review (FOR) – This review assesses the final orbital operations plans as well as the compatibility of the flight components with ground support equipment and the ground network, including summary results of the network compatibility tests.
- j. Pre-Ship Reviews (PSR) – These reviews assess the readiness of an instrument to be shipped for integration with the spacecraft and the readiness of the observatory to be shipped to the launch range.
- k. Operations Readiness Review (ORR) – This review establishes that the system is ready to transition into an operational mode through examination of available ground and flight test results, analyses, and operational demonstrations.
- l. Mission Readiness Review (MRR) – This review is conducted by the GSFC PMC to assess the readiness of GSFC-managed missions for launch and on-orbit operations, and to provide the documented basis for certifying to NASA Headquarters that each mission is ready for launch.
- m. Flight Readiness Review (FRR) – This review is held at the launch site to assess the overall readiness of the total system to support the flight objectives of the mission.
- n. Launch Readiness Review (LRR) – This review is held at the launch site and ensures that all flight and ground hardware, software, personnel, procedures, and the launch range are ready to support a safe and successful launch.
- o. Decommissioning Review (DR) – This review establishes that the state of the mission requires decommissioning/disposal, and that the plans for doing so are correct, current, and appropriate for the current environmental constraints.

### 3.3 Competitively Awarded Space Flight Projects

The life cycle of competitively awarded space flight projects is shown in Figure 2. This figure also depicts the relationship between the Center and the Enterprise Offices at NASA HQ. The division of

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responsibilities and duties within the Center through the life cycle of a competitively awarded project is shown in Table 1. The necessary steps in processing GSFC proposal submittals in response to an AO are defined in GPG 1310.2, Approval Process for GSFC Proposals Exceeding New Business Committee Threshold.

The process is initiated when the PI and his/her team of scientists and engineers prepare a proposal in response to an AO issued by the Enterprise Office. In parallel, the Enterprise Office prepares for the peer review leading to the selection of proposals by the EAA. GSFC may perform any of several roles in the development of the proposals responding to the AO, e.g., a GSFC team could lead in the development of a proposal or play a supporting role for a PI located elsewhere.

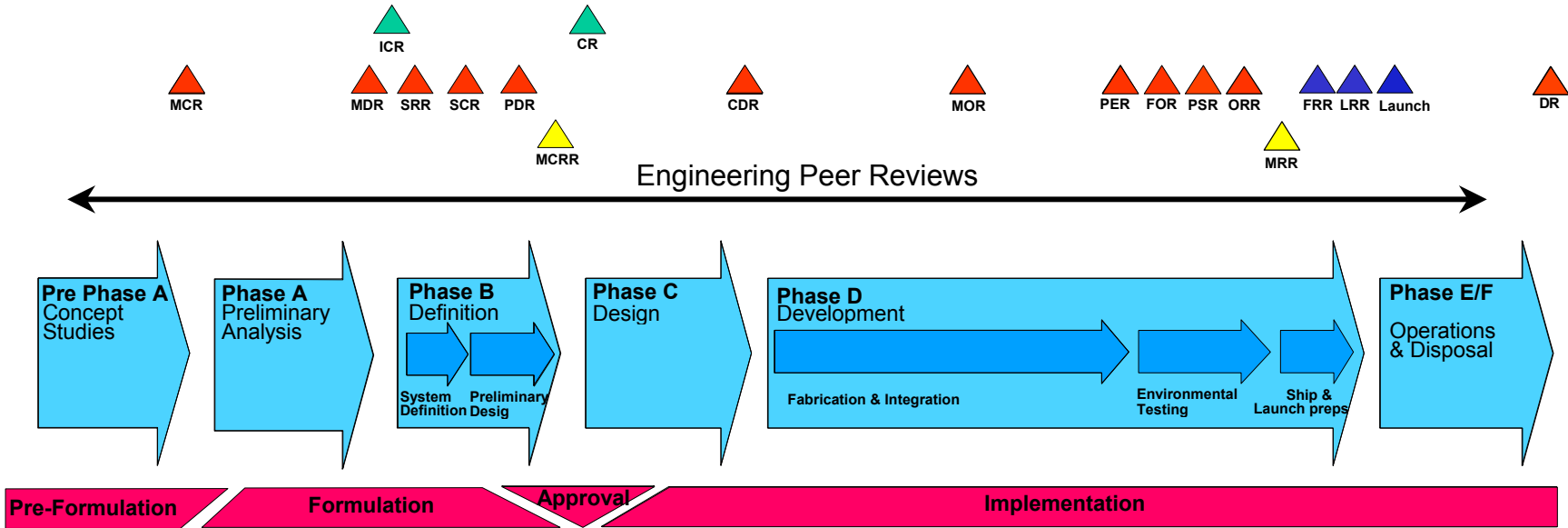
The selection process is described in the flow chart of Figure 2 and in Table 1. Normally the approval process is organized into either a 1-step or a 2-step process. These are explained in more detail in GPG 1310.2.

### **3.4 Assigned Space Flight Projects**

The life cycle of assigned space flight projects is shown in Figure 3. This figure also depicts the relationship between the Center and the Enterprise Offices at NASA HQ. The division of responsibilities and duties within the Center through the life cycle of a strategically defined project is identified in Table 2.

Assigned projects are authorized for Formulation and assigned to the Center by the HQ Enterprise Office. These programs and projects are defined in conjunction with the appropriate science community members and usually address specific strategic goals of the Enterprise as defined in the Enterprise Strategic Plan.

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CDR: Critical Design Review  
 CR: Confirmation Review  
 DR: Decommissioning Review  
 FOR: Flight Operations Review  
 FRR: Flight Readiness Review  
 ICR: Initial Confirmation Review (Code S only)  
 IIR: Integrated Independent Review  
 LRR: Launch Readiness Review  
 MCR: Mission Concept Review  
 MCRR: Mission Confirmation Readiness Review

MDR: Mission Definition Review  
 MOR: Mission Operations Review  
 MRR: Mission Readiness Review  
 ORR: Operations Readiness Review  
 PDR: Preliminary Design Review  
 PER: Pre-Environmental Review  
 PSR: Pre-Ship Review  
 SCR: System Concept Review  
 SRR: System Requirements Review

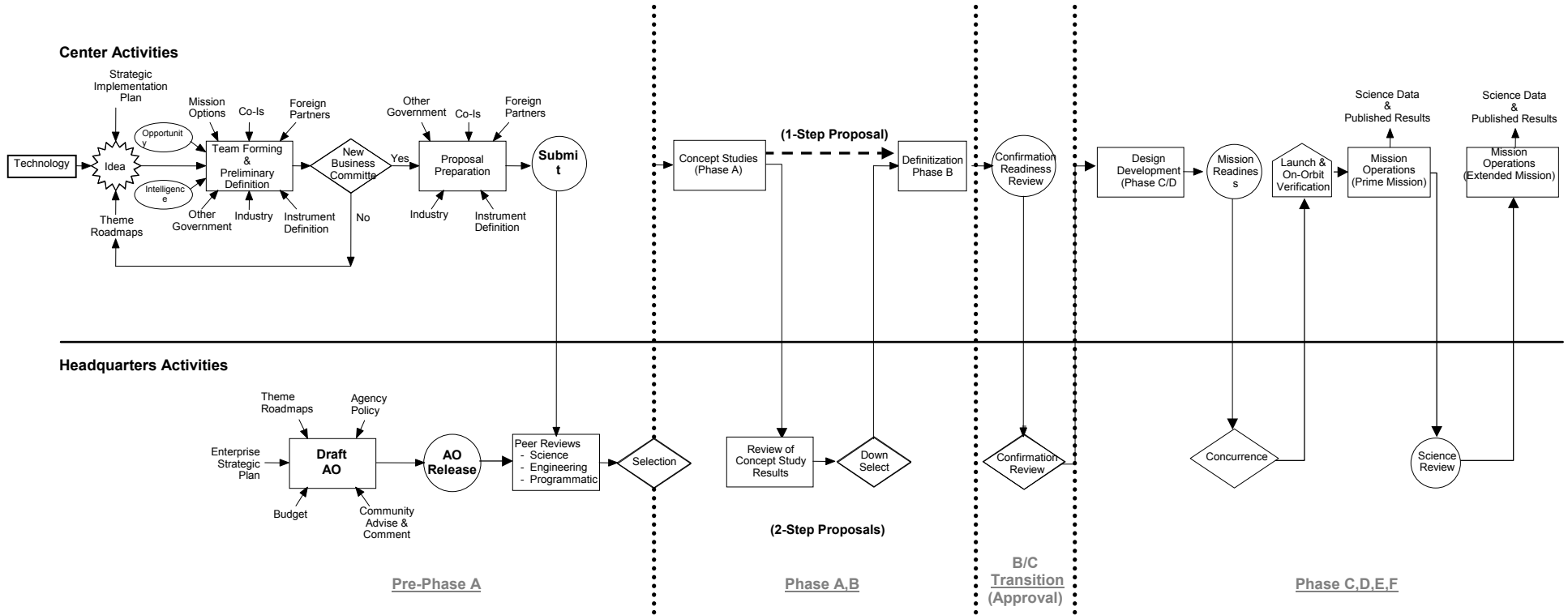
▲ HQ Reviews  
 ▲ GSFC PMC Reviews  
 ▲ IIR Reviews  
 ▲ KSC Reviews, Launch

**Figure 1 Lifecycle of GSFC Space Flight Projects**

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**Figure 2. Life Cycle for Competitively Awarded Space Flight Projects**

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**Table 1.**  
**Competitively Awarded Space Flight Projects**  
**Roles and Responsibilities**

Program Phase	HQ	Center	
		Code 100	Code 400
<b><u>Pre-Phase A</u></b> <b>(Pre-Formulation)</b>	<ul style="list-style-type: none"> <li>• Prepare and issue AO</li> <li>• Establish proposal review process</li> <li>• Review &amp; categorize proposals</li> <li>• Select Concept Studies and assign to Center</li> </ul>	<ul style="list-style-type: none"> <li>• New Opportunities Office (NOO) leads intelligence gathering</li> <li>- NOO advises Center personnel of AO and NASA Research Announcement opportunities</li> <li>- NOO leads proposal development and new business process</li> </ul>	<ul style="list-style-type: none"> <li>• Work with 500 and 600/900 in forming GSFC Proposal Teams</li> <li>• Facilitate GSFC proposals through the New Business Committee</li> <li>• Establish Partnerships</li> <li>• Support the PI in Preparation and Submission of Proposals</li> <li>• Support HQ in preparation of AO's &amp; AO evaluations as requested</li> <li>• Support proposal Blue/Red Team Reviews, acquisition strategy development, &amp; budget development</li> </ul>
<b><u>Phase A,B</u></b> <b>(Formulation)</b>	<ul style="list-style-type: none"> <li>• Oversight and assessment</li> <li>• Provide funding for Concept Studies</li> <li>• Review and evaluate Concept Study Reports</li> <li>• Down-select missions</li> </ul>	<ul style="list-style-type: none"> <li>• Accept selections &amp; assign to Code 400 for management</li> <li>• Provide top level direction</li> <li>• Conduct Monthly Status Reviews</li> </ul>	<ul style="list-style-type: none"> <li>• Appoint Project Formulation Manager with concurrence of Center Director</li> <li>• Initiate concept studies</li> <li>• Develop Program/Project Plans</li> <li>• Develop &amp; maintain program/project budget through the POP process</li> <li>• Oversee mission definition</li> <li>• Provide monthly status briefings to GSFC PMC</li> </ul>
<b><u>Phase B/C Transition</u></b> <b>(Approval)</b>	<ul style="list-style-type: none"> <li>• Conduct Confirmation Review</li> </ul>	<ul style="list-style-type: none"> <li>• Conduct Mission Confirmation Readiness Review</li> </ul>	<ul style="list-style-type: none"> <li>• Appoint Project Manager with concurrence of Center Director</li> <li>• Code 600/900 appoint Project Scientist</li> <li>• Support Independent Assessment</li> <li>• Update Program/Project Plans, as required</li> <li>• Initiate reviews leading to Confirmation</li> </ul>

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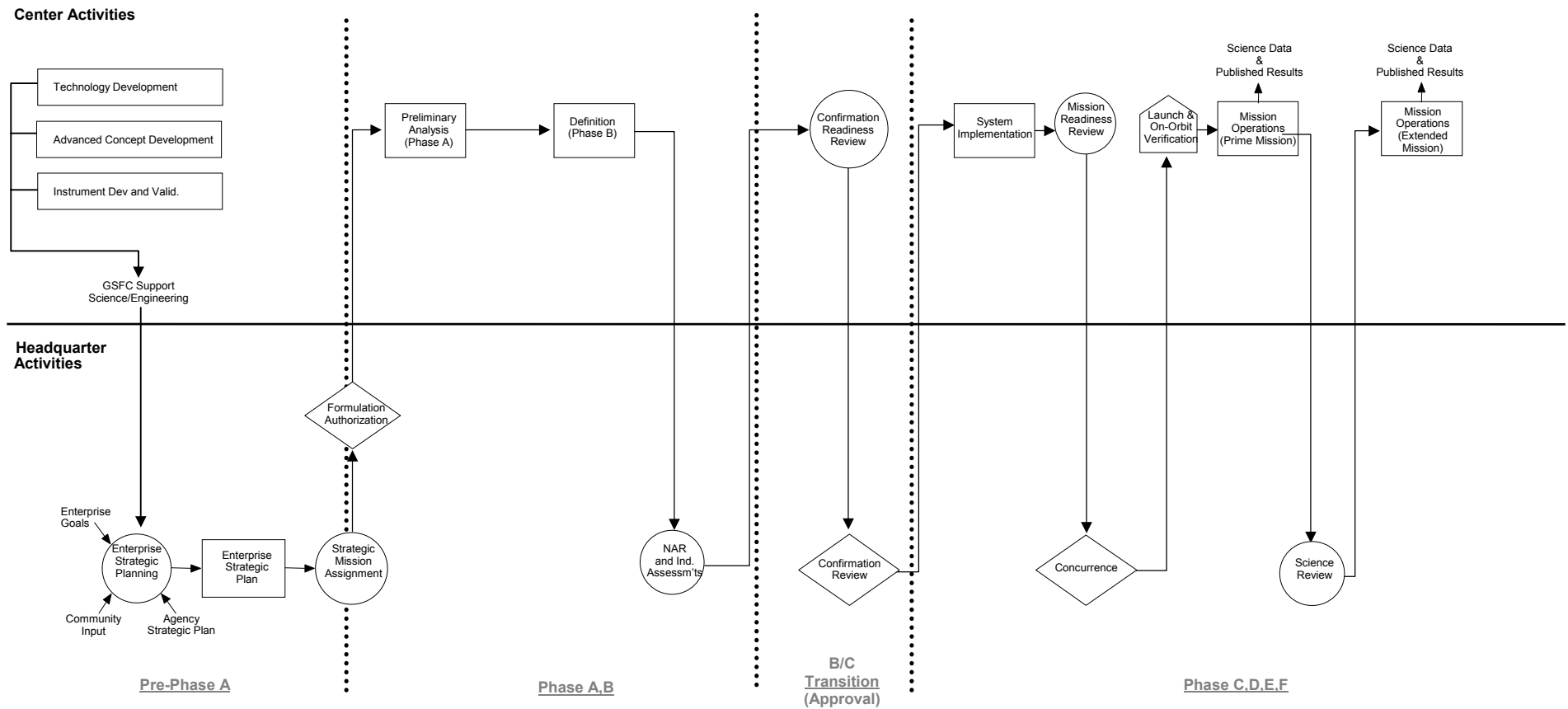
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**Table 1. (Continued)**

Program Phase	HQ	Center	
		Code 100	Code 400
<b><u>Phase C,D</u></b> <b>(Implementation)</b>	<ul style="list-style-type: none"> <li>• Oversight and assessment</li> <li>• Issue budget guidelines</li> <li>• Review and accept MRR letters</li> </ul>	<ul style="list-style-type: none"> <li>• Accept HQ Confirmation</li> <li>• Conduct Monthly Status Reviews &amp; address issues, as appropriate</li> <li>• Conduct MRR</li> <li>• Center Director signs mission readiness certification</li> </ul>	<ul style="list-style-type: none"> <li>• Establish Program/Project Office, as required</li> <li>• Initiate continuous customer involvement</li> <li>• Initiate contracts and manage design and development</li> <li>• Develop &amp; maintain program/project budget through POP process</li> <li>• Ensure QMS compliance</li> <li>• Provide Weekly Reports to HQ</li> <li>• Provide Monthly Status Reports to Goddard PMC</li> <li>• Ensure program/project Independent Verification and Validation</li> <li>• Support MRR</li> <li>• Launch mission and perform on-orbit verification</li> </ul>
<b><u>Phase E,F</u></b> <b>(Operations)</b>	<ul style="list-style-type: none"> <li>• Oversight and assessment</li> <li>• Coordinate reviews to prioritize funding for extended missions</li> </ul>	<ul style="list-style-type: none"> <li>• Conduct Monthly Status Reviews &amp; address issues, as appropriate</li> </ul>	<ul style="list-style-type: none"> <li>• Conduct/oversee mission operations</li> <li>• Provide Monthly Status Reports to Goddard PMC</li> <li>• Provide Weekly Status Reports to HQ</li> </ul>

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**Figure 3. Life Cycle for Assigned Space Flight Projects**

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**Table 2.**  
**Assigned Space Flight Projects Roles and Responsibilities**

Program Phase	HQ	Center	
		Code 100	Code 400
<b><u>Pre-Phase A</u></b> <b>(Pre-Formulation)</b>	<ul style="list-style-type: none"> <li>• Lead the strategic planning &amp; involve the science community</li> <li>• Assign Strategic Missions to Centers</li> <li>• Provide funding</li> <li>• Issue Formulation Authorization Document (FAD)</li> </ul>	<ul style="list-style-type: none"> <li>• Organize Center support of strategic planning and road map development</li> </ul>	<ul style="list-style-type: none"> <li>• Support strategic planning with Concept Studies, Technology Road Maps, instrument development</li> </ul>
<b><u>Phase A,B</u></b> <b>(Formulation)</b>	<ul style="list-style-type: none"> <li>• Oversight and assessment</li> <li>• Provide integration across HQ programs</li> <li>• Provide annual budget guidelines</li> <li>• Provide necessary funding</li> <li>• Prepare/update PCA, as required</li> </ul>	<ul style="list-style-type: none"> <li>• Accept FAD &amp; assign to Code 400 for management</li> <li>• Provide top level direction</li> <li>• Conduct Monthly Status Reviews</li> </ul>	<ul style="list-style-type: none"> <li>• Appoint Project Formulation Manager with concurrence of Center Director</li> <li>• Establish partnerships for Implementation</li> <li>• Develop acquisition strategy &amp; procurement package</li> <li>• Develop &amp; maintain program/project budget through POP process</li> <li>• Develop Program/Project Plans</li> <li>• Update Program/Project Plans, as required</li> <li>• Provide monthly status briefings to GSFC PMC</li> </ul>
<b><u>Phase B/C Transition</u></b> <b>(Approval)</b>	<ul style="list-style-type: none"> <li>• Sponsor a NAR, as required</li> <li>• Conduct Confirmation Review</li> </ul>	<ul style="list-style-type: none"> <li>• Conduct Mission Confirmation Readiness Review</li> </ul>	<ul style="list-style-type: none"> <li>• Appoint Project Manager with concurrence of Center Director</li> <li>• Code 600/900 appoint Project Scientist</li> <li>• Support the NAR or Independent Assessment</li> <li>• Initiate reviews leading to Confirmation</li> </ul>

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**Table 2. (Continued)**

Program Phase	HQ	Center	
		Code 100	Code 400
<b><u>Phase C,D</u></b> <b>(Implementation)</b>	<ul style="list-style-type: none"> <li>• Oversight and Assessment</li> <li>• Issue budget guidelines</li> <li>• Review and accept MRR letters</li> </ul>	<ul style="list-style-type: none"> <li>• Accept HQ Confirmation</li> <li>• Conduct Monthly Status Reviews &amp; address issues as appropriate</li> <li>• Conduct MRR</li> <li>• Center Director signs mission readiness certification letter</li> </ul>	<ul style="list-style-type: none"> <li>• Establish Program/Project Office as required</li> <li>• Initiate continuous customer involvement</li> <li>• Initiate contracts &amp; manage design &amp; development</li> <li>• Develop &amp; maintain program/project budget through POP process</li> <li>• Ensure QMS Compliance</li> <li>• Provide Weekly Reports to HQ</li> <li>• Provide Monthly Status Reports to Goddard PMC</li> <li>• Ensure program/project and Independent Verification and Validation</li> <li>• Support MRR</li> <li>• Launch Mission and Perform On-Orbit Verification</li> </ul>
<b><u>Phase E,F</u></b> <b>(Operations)</b>	<ul style="list-style-type: none"> <li>• Oversight and Assessment</li> <li>• Coordinate reviews to prioritize funding for extended missions</li> </ul>	<ul style="list-style-type: none"> <li>• Coordinate Monthly Status Reviews &amp; address issues as appropriate</li> </ul>	<ul style="list-style-type: none"> <li>• Conduct mission operations</li> <li>• Provide Monthly Status Reports to Goddard PMC</li> <li>• Provide Weekly Status Reports to HQ</li> </ul>

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**CHANGE HISTORY LOG**

<b>Revision</b>	<b>Effective Date</b>	<b>Description of Changes</b>
Baseline	04/26/1999	Minor changes were made to include design planning during implementation, expansion of the tailoring concept for both NASA and GSFC directives and editorial changes.
Minor Change	05/07/1999	Modify 2.4 to remove Original Proposal, Code 100 from list of Quality Records
A	08/09/99	This is an ADMINISTRATIVE REVISION only. The revision is required to bring document in line with GPG 1410.1, <b>2.7 Revising Directives</b> , that states: "When a revision is necessary, substantive or non-substantive, the entire directive must be reissued in accordance with the process for issuing new directives described in this GPG."
B	02/23/2004	Complete re-write to combine GPG 7120.1 and GPG 7120.2 and conform to new NPR 7120.5B.

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