NASA Procedural Requirements

NPR 7120.5E
Effective Date: August 14, 2012
Expiration Date: August 14, 2019

COMPLIANCE IS MANDATORY

NASA Space Flight Program and Project Management Requirements w/Changes 1-16

Responsible Office: Office of the Chief Engineer

NASA Standing Review Board Handbook

NASA Space Flight Program and Project Management Handbook

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Change History

NPR 7120.5E, NASA Space Flight Program and Project Management Requirements w/Change 1-16			
Change Number	Date	Location	Change Description
1	9/26/2012	Compliance Matrix	Administrative changes to include information about baseline document deadlines for the I-6 and I-7 tables in the Compliance Matrix.
2	9/26/2012	Compliance Matrix	Addition of the Communications and Education Plans to Table I-5 (project) in the Compliance Matrix to correctly reflect Table I-5 requirements.
3	9/26/2012	Compliance Matrix	Addition of the MDAA as an applicable party for the Orbital Debris and End of Mission plans.
4	9/26/2012	Appendices G and H	The removal of the sentences on the applicability of NPR 2830.1, NASA Enterprise Architecture Procedures in the Program and Project Plan templates.
5	9/26/2012	Appendix F	Administrative correction of an incorrect reference to "Program Plan" rather than "Formulation Agreement" in Appendix F (the Project Formulation Agreement template)
6	9/26/2012	Appendix G	Administrative correction of an incorrect reference to "Project Plan" rather than "Program Plan" in Appendix G (the Program Plan template).
7	9/26/2012	Figure 2-4	Corrected corrupted version of graphic.

8	9/26/2012	Preface	Administrative change made to add NPR 7120.5D to paragraph P.6 Cancellation.
9	11/19/2012	Appendices G and H	Modified language to the Threat Summary and project Protection Plan sections of the Program and Project Plans to indicate that the Threat Summary contains Top Secret information and the Protection Plan has Secret information.
10	1/29/2013	Appendix C	Corrected reference in Introduction from 3.5.2.2 to 3.5.4.
11	8/14/2014	Figure 2-3, Tightly Coupled Programs Life Cycle Chart	Added footnote for CERR. Renumbered other footnotes. Corrected titles for SDR and SRR reviews.
11	8/14/2014	2.1.1.b.	"Space flight projects are" added to definition of "project" to indicate the difference between the definition of "project" in NPR 7120.5E and the new definition of "project" in NPD 1000.0 is specific to space flight.
11	8/14/2014	2.2.5	Add reference to "NASA Space Flight Program and Project Management Handbook."
11	8/14/2014	2.2.5.2	Add "s" to "LCR" (typo).
11	8/14/2014	2.3.1	Remove extra space.
11	8/14/2014	3.2.1.d	Change "Center Directors are responsible and accountable for both Institutional Authority responsibilities and the proper planning and execution of programs and projects assigned to the Center" to "Center Directors are

			responsible and accountable for all activities assigned to their Center. They are responsible for the institutional activities and for ensuring the proper planning for and assuring the proper execution of programs and projects assigned to the Center." (clarification)
11	8/14/2014	3.3.4	Added sentence at end of paragraph: "TAs are expected to keep their discipline chain of authority informed of issues as they arise, including direct communication between the Center's engineering director, SMA director (or equivalent), and chief medical officer with their counterparts at NASA Headquarters." (clarification)
11	8/14/2014	3.3.6.2.a	Remove parentheses and change "may delegate" to "delegates." (clarify expectation)
11	8/14/2014	3.3.8	Add to the Safety and Mission Assurance TA responsibilities: "The following individuals are responsible for implementing SMA Ta at the Center:"
11	8/14/2014	3.3.8.1	Add "The Chief, SMA" for parallelism.
11	8/5/2013	3.3.8.2	Delete old paragraph about Center Director responsibilities and add this paragraph: "Center Director—The Center Director (or the Center safety and mission assurance director or designee) is the Center SMA TA responsible for Center safety and mission assurance processes, specifications, rules, best practices, etc., necessary to fulfill mission performance requirements for programs, projects, and/or major systems implemented by the Center. The Center Director (or designee) also monitors, collects, and assesses institutional, program, and project SMA financial metrics and performance results. The

			Center Director delegates Center SMA TA implementation responsibility to an individual in the Center's safety and mission assurance leadership. The Center SMA TA supports the lower level SMA TAs in processing changes to and waivers or deviations from requirements that are the responsibility of the SMA TA. This includes all applicable Agency and Center SMA directives, requirements, procedures, and standards. The Center Director appoints, with the approval of the NASA Chief, SMA, individuals for the position of Center SMA director (or equivalent). The Center SMA director, in consultation with the NASA Chief, SMA, appoints program- and project-level chief safety and mission assurance officers (CSOs) to exercise the TA role within programs and projects."
11	8/14/2014	Appendix A	Add definition: "Assure. To promise or say with confidence. It is more about saying than doing. (An example is: I assure you that you'll be warm enough.)
11	8/14/2014	Appendix A	Add definition: "Ensure. To do or have what is necessary for success. (An example is: I ensure that you'll be warm enough.)
11	8/14/2014	Appendix A	Add "Tribal government" to "Environmental Management" definition. (consistency with Environmental Management Plan description)
11	8/14/2014	Appendix A	Add definition: "Knowledge Management. A collection of policies, processes, and practices relating to the use of intellectual and knowledge-based assets in an organization."

11	8/14/2014	Appendix A	Add definition: "Lessons Learned. Captured knowledge or understanding gained through experience which, if shared, would benefit the work of others. Unlike a best practice, lessons learned describes a specific event that occurred and provides recommendations for obtaining a repeat of success or for avoiding reoccurrence of an adverse work practice or experience."
11	8/14/2014	Appendix A	Change last sentence in definition of "program" to agree with updated language defining "program" in Chapter 2 from "A program defines a strategic direction that the Agency has identified as critical" to "A program implements a strategic direction that the Agency has identified as needed to accomplish Agency goals and objectives."
11	8/14/2014	Appendix A	Correct typo in definition of "Request for Action/Review Item Discrepancy" from "product of documentation" to "product or documentation."
11	8/5/2013	Appendix B	Deleted acronym (SMA) from definition of CSO.
11	8/14/2014	Appendix C-Compliance Matrix; tables I-1, I-3, I-5, I-7; and Appendix J-References.	Update "Lessons Learned Plan" to "Knowledge Management Plan" and "NPR 7120.6" to "NPD 7120.6."
11	8/14/2014	Appendix F.3.14.0	Correct grammar in Leading Indicators section from "progress and management...is achieved" to "progress and management...are achieved."

11	8/14/2014	Appendix G.3	Add "knowledge management" to the Program Plan template Implementation Approach, Section 1.6.
11	8/14/2014	Appendix G.3	Lowercase "Coordinator" (style) in Section 3.12.
11	8/14/2014	Appendix G.3	Correct typo from "further" to "further" in Section 3.14.
11	8/14/2014	Appendix G.3	Update "Lessons Learned Plan" to "Knowledge Management Plan" in Section 3.21.
11	8/14/2014	Appendix H.3	Add "knowledge management" to the Project Plan template in Section 1.4.
11	8/14/2014	Appendix H.3	Add "laws" to the first bullet for consistency and add second bullet to the Environmental Management Plan in the Project Plan template to update it to include the Environmental Checklist, which triages what environmental documentation will be needed: Plan the level of National Environmental Policy Act (NEPA) documentation required to satisfy NEPA requirements prior to KDP C and project Implementation; e.g., the Environmental Checklist and Record of Environmental Consideration (REC), Environmental Assessment (EA), and Environmental Impact Statement (EIS). The project's plans are based on the program's NEPA strategy at all affected Centers, which is developed in consultation with the NASA Headquarters NEPA coordinator to ensure the most effective, least resource-intensive strategy to meet NEPA requirements across the program and its constituent projects.

11	8/14/2014	Appendix H.3	Update "Lessons Learned Plan" to "Knowledge Management Plan" in Project Plan template Section 3.20.
11	8/14/2014	Table I-1	Correct "KDP 2" to "KDP II."
11	8/14/2014	Table I-2	Correct "FRR" to "MRR/FRR"
11	8/14/2014	Table I-2	Shift the expected update of work plans to SIR and MRR/FRR from CDR and ORR, respectively.
11	8/14/2014	Table I-4 and I-6	Change CADRe line 5.i. to change "Preliminary" to "Baseline" and "Baseline" to "Update," since there is no preliminary CADRe; add "Update" at SIR; and add footnote clarifying that MRR/FRR CADRe is for launch.
12	10/9/2014	Appendix A	Update definition of "project" in glossary to match text.
12	10/9/2014	Appendix H	Update NPD title referred to in Project Plan template.
12	10/9/2014	Appendix J	Added new NPD 8081.1, NASA Chemical Rocket Propulsion Testing to References appendix.
12	10/9/2014	Table 2-1, 2.2.5 and 2.2.8	Add references to AA letter with guidance on tailoring 7120.5 requirements for small Category 3, Class D projects. A link at front of NPR.
13	6/5/15	Appendices C, G, and H	Corrections due to cancellation of NPD 7500.2 and revision of NPR 7500.2, Technology Transfer Requirements, plus a typo.
14	11/17/15	Appendix F	Added rocket propulsion testing analysis.

14	11/17/15	Appendices H, section 3.16 and J - References	Change "NASA-STD-0005, NASA Configuration Management (CM) Standard" to "SAE EIA 649B Standard for Configuration Management."
15	12/9/2016	Table 2-2, 3.2.1c, d, and g	Update Convening Authorities and roles of MDAA, Centers, and OCFO. Delete Office of Evaluation.
15	12/9/2016	2.2.4	Clarify statement about completion of life-cycle reviews.
15	12/9/2016	2.2.8.1, Appendices A and B	Change format of deliverables from CPR and IMS to IPMR.
15	12/9/2016	2.4.1	Correct reference to Decision Memorandum templates.
15	12/9/2016	3.7.1, Appendix J	Correct reference to applicable law.
15	12/9/2016	Appendices F, G, and H	Change reference to NPR containing TRL definitions. (Definitions moved from NPR 7120.8 to NPR 7123.1.)
15	12/9/2016	Appendices C and G, Tables 1-1, 1-3, 1-7; Appendix J	Delete PDLM Plan due to expiration of NPR 7120.9.
15	12/9/2016	Appendix C, Table 1-3	Correct error to add HRCP to Tightly Coupled Programs.
15	12/9/2016	Appendix C, Tables 1-4, 1-6	Change the name of NF 1739 to reflect change in NPR 9250.1. Correct delivery schedule.

15	12/9/2016	2.2.2; 3.2.1 e, f; Appendices F, G, H, J	Add references to NASA Project Planning and Control Handbook
15	12/9/2016	Appendix F	Editorial corrections; Add product statement.
16	08/13/2018	Appendix C	Organization correction plus MDAA approval for single-project programs for Table I-6.

Preface

P.1 Purpose

This document establishes the requirements by which NASA formulates and implements space flight programs and projects, consistent with the governance model contained in NASA Policy Directive (NPD) 1000.0, NASA Governance and Strategic Management Handbook.

P.2 Applicability

a. This NASA Procedural Requirements (NPR) is applicable to NASA Headquarters and NASA Centers, including Component Facilities and Technical and Service Support Centers. This language applies to the Jet Propulsion Laboratory, a Federally Funded Research and Development Center, other contractors, grant recipients, or parties to agreements only to the extent specified or referenced in the appropriate contracts, grants, or agreements.

b. This NPR applies to all NASA space flight programs and projects (including spacecraft, launch vehicles, instruments developed for space flight programs and projects, research and technology developments funded by and to be incorporated into space flight programs and projects, critical technical facilities specifically developed or significantly modified for space flight systems, highly specialized Information Technology (IT) acquired as a part of space flight programs and projects (non-highly specialized IT is subject to NPR 7120.7), and ground systems that are in direct support of space flight operations). This NPR also applies to reimbursable space flight programs and projects performed for non-NASA sponsors and to NASA contributions to space flight programs and projects performed with international and interagency partners.

c. For existing programs and projects, the requirements of this NPR apply to their current and future phases as determined by the responsible Mission Directorate, approved by the NASA Chief Engineer (or as delegated), and concurred with by the Decision Authority.

d. This NPR can be applied to other NASA investments at the discretion of the responsible manager or the NASA Associate Administrator.

e. In this directive, all mandatory actions (i.e., requirements) are denoted by statements containing the term "shall." The terms "may" or "can" denote discretionary privilege or permission, "should" denotes a good practice and is recommended but not required, "will" denotes expected outcome, and "are/is" denotes descriptive material.

f. In this directive, all document citations are assumed to be the latest version unless otherwise noted.

P.3 Authority

a. The National Aeronautics and Space Act, as amended, 51 U.S.C. § 20113(a).

b. NPD 1000.0, NASA Governance and Strategic Management Handbook.

c. NPD 1000.3, The NASA Organization.

d. NPD 1000.5, Policy for NASA Acquisition.

e. NPD 7120.4, NASA Engineering and Program/Project Management Policy.

P.4 Applicable Documents And Forms

a. Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities, OMB Circular No. A-119.

b. NPD 1001.0, NASA Strategic Plan.

c. NPD 1200.1, NASA Internal Control.

d. NPD 1210.2, NASA Surveys, Audits, and Reviews Policy.

e. NPR 7120.10, Technical Standards for NASA Programs and Projects.

f. NPR 7123.1, NASA Systems Engineering Processes and Requirements.

g. NPR 8705.4, Risk Classification for NASA Payloads.

h. NPR 8715.3, NASA General Safety Program Requirements.

i. NPR 8900.1, Health and Medical Requirements for Human Space Exploration.

j. NASA-STD-8709.20, Management of Safety and Mission Assurance Technical Authority (SMA TA) Requirements.

k. ANSI/EIA-748, Standard for Earned Value Management Systems.

P.5 Measurement/Verification

a. Compliance with this document is verified by submission to responsible NASA officials of the gate products identified in this document at Key Decision Points (KDPs), by submission of milestone products and control plans due at life-cycle reviews, and by internal and external controls. Internal controls are consistent with processes defined in NPD 1200.1, NASA Internal Control. Internal controls include surveys, audits, and reviews conducted in accordance with NPD 1210.2, NASA Surveys, Audits, and Reviews Policy. External controls may include external surveys, audits, and reporting requirements.

b. Compliance is also documented by appending a completed Compliance Matrix for this NPR (see Appendix C) to the Formulation Agreement for projects in Formulation and/or the Program Plan or Project Plan (see appendices G or H) for programs or projects entering or in Implementation. A copy of the Compliance Matrix is forwarded to the Office of the Chief Engineer.

P.6 Cancellation

a. NPR 7120.5D, NASA Space Flight Program and Project Management Requirements, dated March 6, 2007.

b. NID 7120-97, NASA Interim Directive (NID): NASA Space Flight Program and Project Management Requirement, dated, September 28, 2011.

/S/
Mike Ryschkewitsch
NASA Chief Engineer

Chapter 1. Introduction

1.1 Key Policy Changes in this NPR

1.1.1 This NASA Procedural Requirements (NPR) has been substantially restructured to streamline the requirements for space flight programs and projects and place complementary guidance and contextual information into a companion handbook. The NASA Space Flight Program and Project Management Handbook describes how programs and projects are managed in NASA and contains explanatory material to help understand the requirements of this NPR. The Handbook can be found on the "Other Policy Documents" menu in the NASA On-Line Directives Information System (NODIS) under the tab for Office of the Chief Engineer. The requirements of this NPR may be tailored in accordance with Section 3.5.

1.1.2 NASA Centers, Mission Directorates, and other organizations that have programs or projects shall develop appropriate documentation to implement the requirements of this document.

1.1.3 For existing programs and projects, this NPR's requirements apply to their current and future phases as determined by the responsible Mission Directorate, approved by the NASA Chief Engineer (or as delegated), and concurred with by the Decision Authority. The Mission Directorate shall submit their plan for phased tailoring of the requirements of this NPR within 60 days of the NPR's effective date.

1.2 Background

1.2.1 NASA space flight programs and projects develop and operate a wide variety of spacecraft, launch vehicles, in-space facilities, communications networks, instruments, and supporting ground systems. [1] This document establishes a standard of uniformity for the process by which NASA formulates and implements space flight programs and projects.

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[1] NASA space flight programs and projects often need to mature technologies to meet mission goals. These enabling and/or enhancing technologies are also covered by this NPR.

1.2.2 NASA approaches the formulation and implementation of programs and projects through a governance model that balances different perspectives from different elements of the organization. The cornerstone of program and project governance is the organizational separation of the Mission Directorates and their respective programs and projects (Programmatic Authorities) from the Headquarters Mission Support Offices, the Center organizations that are aligned with these Mission Support Offices, and the Center Directors (Institutional Authorities). (See NASA Policy Directives (NPD) 1000.0, NASA Governance and Strategic Management Handbook and the NASA Space Flight Program and Project Management Handbook.)

1.2.3 This NPR distinguishes between "programmatic requirements" and "institutional requirements." Both categories of requirements ultimately need to be satisfied in program and project Formulation and Implementation.

1.2.3.1 Programmatic requirements are the responsibility of the Programmatic Authorities. Programmatic requirements focus on the products to be developed and delivered and specifically relate to the goals and objectives of a particular NASA program or project. These programmatic requirements flow down from the Agency's strategic planning process. Table 1-1 shows this flow

down from Agency strategic planning through Agency, directorate, program, and project requirement levels to the systems that will be implemented to achieve the Agency goals.

Table 1-1 Programmatic Requirements Hierarchy

Requirements Level	Content	Governing Document	Approver	Originator
Strategic Goals	Agency strategic direction	NPD 1000.0, NASA Governance and Strategic Management Handbook; NPD 1001.0, NASA Strategic Plan; and Strategic Planning Guidance	NASA Admin-istrator	Support Organiza-tions
Agency Requirements	Structure, relationships, and principles governing design and evolution of cross-Agency Mission Directorate systems linked in accomplishing Agency strategic goals and outcomes	Architectural Control Document (ACD)	NASA Admin-istrator	Host MDAA with Inputs from Other Affected MDAAs
Mission Directorate Requirements	High-level requirements levied on a program to carry out strategic and architectural direction, including programmatic direction for initiating specific projects	Program Commitment Agreement (PCA)	NASA AA	MDAA
Program Requirements	Detailed requirements levied on a program to implement the PCA and high-level programmatic requirements allocated from the program to its projects	Program Plan	MDAA	Program Manager
Project Requirements	Detailed requirements levied on a project to implement the Program Plan and flow down programmatic requirements allocated from the program to the project	Project Plan	Program Manager	Project Manager
System Requirements	Detailed requirements allocated from the project to the next lower level of the project	System Requirements Documentation	Project Manager	Responsible System Lead

MDAA = Mission Directorate Associate Administrator; NASA AA = NASA Associate Administrator

1.2.3.2 Institutional requirements are the responsibility of the Institutional Authorities. (See Section 3.3 for details on Technical Authority.) They focus on how NASA does business and are independent of any particular program or project. These requirements are issued by NASA Headquarters (including the Office of the Administrator and Mission Support Offices) and by Center organizations. Institutional requirements may respond to Federal statute, regulation, treaty, or Executive Order. They are normally documented in NPDs, NPRs, NASA Standards, Center Policy Directives (CPDs), Center Procedural Requirements (CPRs), and Mission Directorate requirements.

1.2.4 This NPR is focused on improving program and project performance against internal and external commitments. Figure 1-1 shows the flow down from NPD 1000.0, NASA Governance and Strategic Management Handbook through Program and Project Plans. The figure identifies the five types of institutional requirements that flow down to these plans: engineering, program/project management, safety and mission assurance, health and medical, and Mission Support Office (MSO) functional requirements. These terms are defined in Appendix A.

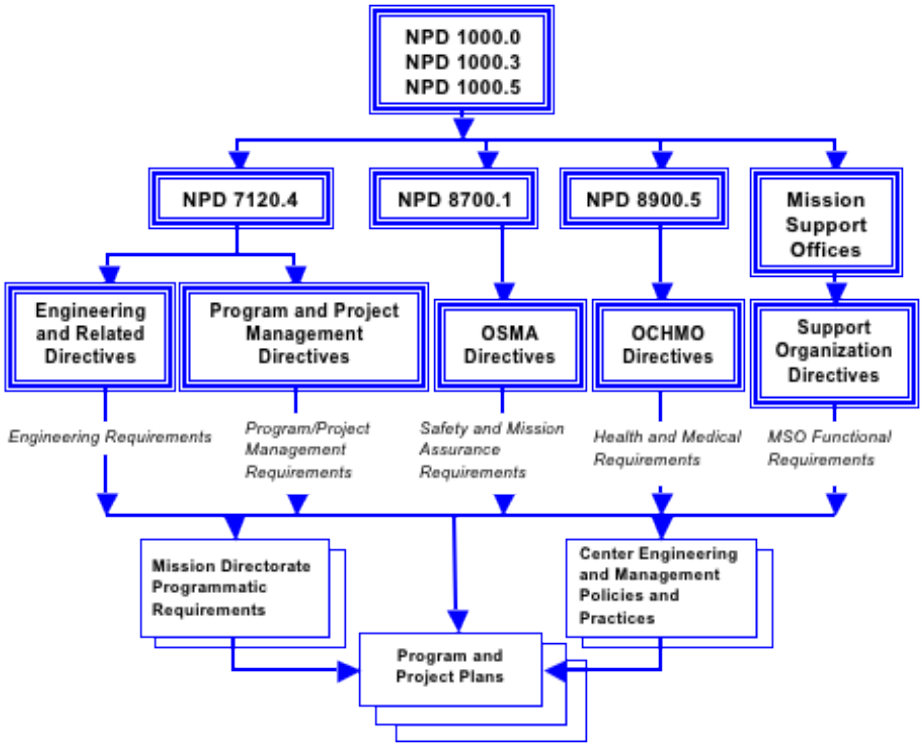

Figure 1-1 Institutional Requirements Flow Down

1.3 Overview of Management Process

1.3.1 Although this document emphasizes program and project management based on life cycles, Key Decision Points (KDPs), and evolving products during each life-cycle phase, these are embedded in NASA's four-part process for managing programs and projects, which consists of:

a. Formulation—identifying how the program or project supports the Agency's strategic goals; assessing feasibility, technology, concepts, and performance of trade studies; risk assessment and possible risk mitigations based on risk-informed decision making (RIDM) and continuous risk management (CRM) processes; team building; development of operations concepts and acquisition

strategies; establishing high-level requirements, requirements flow down, and success criteria; assessing the relevant industrial base/supply chain to ensure program or project success; preparing plans, cost estimates, budget submissions, and schedules essential to the success of a program or project; and establishing control systems to ensure performance of those plans and alignment with current Agency strategies.

b. Approval (for Implementation)—acknowledgment by the Decision Authority (see Appendix A for definition of "Decision Authority") that the program/project has met Formulation requirements and is ready to proceed to Implementation. By approving a program/project, the Decision Authority commits to the time-phased cost plan based on technical scope and schedule necessary to continue into Implementation.

c. Implementation—execution of approved plans for the development and operation of the program/project, and use of control systems to ensure performance to approved plans and requirements and continued alignment with the Agency's strategic goals.

d. Evaluation—continual self- and independent assessment of the performance of a program or project and incorporation of the assessment findings to ensure adequacy of planning and execution according to approved plans and requirements.

1.4 Acquisition

1.4.1 NASA's program and project support of its overall mission is long term in nature, but the environments in which these programs and projects are conducted are dynamic. In recognition of this, NPD 1000.0, NASA Governance and Strategic Management Handbook and NPD 1000.5, Policy for NASA Acquisition have put in place a framework for ensuring that NASA's strategic vision, programs and projects, and resources remain properly aligned. The acquisition process and annual strategic resource planning form a continuous process to oversee this alignment. At the program and project level, the Acquisition Strategy Meeting (ASM) and the Procurement Strategy Meeting (PSM) support the Agency's acquisition process, which includes strategic planning, as well as procurement. The PSM is in NASA FAR Supplement (NFS) 1807.170. The PSM guide is at http://prod.nais.nasa.gov/portals/pl/documents/PSMs_091611.html.

1.5 Document Structure

1.5.1 Chapter 2 defines the different types of programs and projects, their documents, and how they mature through their different life cycles. It also describes how to establish baselines and approval processes. Chapter 3 describes roles and responsibilities relevant to program and project managers, the governance structure, Technical Authority, the dissenting opinion process, and how to tailor requirements. Appendix C contains the Compliance Matrix. Templates for required program and project documents are contained in appendices D through H. Appendix I encompasses the tables of program and project products by phase. Appendix J provides a list of references.

Chapter 2. NASA Life Cycles for Space Flight Programs and Projects

2.1 Programs and Projects

2.1.1 Space flight programs and projects flow from the implementation of national priorities, defined in the Agency's Strategic Plan, through the Agency's Mission Directorates, as part of the Agency's general work breakdown hierarchy shown in Figure 2-1.

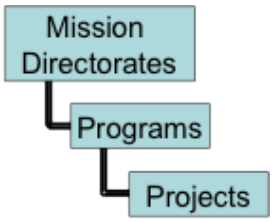

Figure 2-1 Programmatic Authority Organizational Hierarchy

This hierarchical relationship of programs to projects shows that programs and projects are different and their management involves different activities and focus. The following definitions are used to distinguish the two:

a. Program - a strategic investment by a Mission Directorate or Mission Support Office that has a defined architecture and/or technical approach, requirements, funding level, and a management structure that initiates and directs one or more projects. A program implements a strategic direction that the Agency has identified as needed to accomplish Agency goals and objectives.

b. Project - space flight projects are a specific investment identified in a Program Plan having defined requirements, a life-cycle cost, a beginning, and an end. A project also has a management structure and may have interfaces to other projects, agencies, and international partners. A project yields new or revised products that directly address NASA's strategic goals.

Regardless of the structure of a program or project meeting the criteria of Section P.2, this NPR shall apply to the full scope of the program or project and all the activities under it. Specific NPR 7120.5 requirements are flowed down to these activities to the extent necessary for the program or project to ensure compliance and mission success. See Section 3.5.6.1 for the process of obtaining any required deviations or waivers.

2.1.2 NASA Programs

2.1.2.1 NASA space flight programs are initiated and implemented to accomplish scientific or exploration goals that generally require a collection of mutually supporting projects. Programs integrate and manage these projects over time and provide ongoing enabling systems, activities, methods, technology developments, and feedback to projects and stakeholders. Programs are generally created by a Mission Directorate with a long-term time horizon in mind, though as the Agency's strategic direction or circumstances change, a Mission Directorate occasionally needs to replan its programs or combine related programs to increase effectiveness. Programs are generally executed at NASA Centers under the direction of the Mission Directorate and are assigned to

Centers based on decisions made by Agency senior management consistent with the results of the Agency's strategic acquisition planning process. Because the scientific and exploration goals of programs vary significantly, different program implementation strategies are required, ranging from very simple to very complex. To accommodate these differences, NASA identifies four basic types of programs (defined in Appendix A) that may be employed: single-project programs, uncoupled programs, loosely coupled programs, and tightly coupled programs.

2.1.3 Single-Project Programs

2.1.3.1 Single-project programs are programs that implement their program objectives and requirements through one of two management approaches: (1) separate program and project structures or (2) a combined structure. The requirements for both programs and projects apply to single-project programs as described in the NPR.

2.1.4 NASA Projects

2.1.4.1 As with programs, projects vary in scope and complexity and thus require varying levels of management requirements and Agency attention and oversight. Consequently, project categorization defines Agency expectations of project managers by determining both the oversight council and the specific approval requirements. Projects are Category 1, 2, or 3 and shall be assigned to a category based initially on: (1) the project life-cycle cost (LCC) estimate, the inclusion of significant radioactive material [2] , and whether or not the system being developed is for human space flight; and (2) the priority level, which is related to the importance of the activity to NASA, the extent of international participation (or joint effort with other government agencies), the degree of uncertainty surrounding the application of new or untested technologies, and spacecraft/payload development risk classification. (See NPR 8705.4, Risk Classification for NASA Payloads.) Guidelines for determining project categorization are shown in Table 2-1, but categorization may be changed based on recommendations by the Mission Directorate Associate Administrator (MDAA) that consider additional risk factors facing the project. The NASA Associate Administrator (AA) approves the final project categorization. The Office of the Chief Engineer (OCE) is responsible for the official listing of NASA programs and projects. [3] For purposes of project categorization, the project life-cycle cost estimate includes phases A through F and all Work Breakdown Structure (WBS) Level 2 elements and is measured in real-year (nominal) dollars.

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[2] Nuclear safety launch approval is required by the Administrator or Executive Office of the President when significant radioactive materials are included on board the spacecraft and/or launch vehicle. (Levels are defined in NPR 8715.3, NASA General Safety Program Requirements.)

[3] This data is maintained by the Office of Chief Financial Officer in a database called the Meta-Data Manager (MdM). This database is the basis for the Agency's work breakdown and forms the structure for program and project status reporting across all Mission Directorates and Mission Support Offices.

Table 2-1 Project Categorization Guidelines

Priority Level	LCC < $250M	$250M < LCC < $1B	LCC > $1B, significant radioactive material, or human space flight

High	Category 2	Category 2	Category 1
Medium	Category 3	Category 2	Category 1
Low	Category 3	Category 2	Category 1

Note: Small Category 3, Class D projects with a life-cycle cost of under $150 million should refer to guidance on tailoring NPR 7120.5 requirements from the NASA AA, which can be found on the OCE tab in NODIS under "Other Policy Documents" at http/nodis3.gsfc.nasa.gov/OCE_docs/OCE_25.pdf.

2.1.4.2 When projects are initiated, they are assigned to a NASA Center or implementing organization by the MDAA consistent with direction and guidance from the strategic planning process. They are either assigned directly to a Center by the Mission Directorate or are selected through a competitive process such as an Announcement of Opportunity (AO). [4] For Category 1 projects, the assignment shall be with the concurrence of the NASA AA.

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[4] As part of the process of assigning projects to NASA Centers, the affected program manager may recommend project assignments to the MDAA.

2.1.5 Program and Project Manager Certification

2.1.5.1 Programs and projects with a life-cycle cost greater than $250 million will be managed by program and project managers who have been certified in compliance with Office of Management and Budget (OMB)'s promulgated Federal acquisition program/project management certification requirements. This certification is required within one year of appointment. Further information on how NASA is implementing program and project manager certification can be found in the NASA Space Flight Program and Project Management Handbook.

2.2 Program and Project Life Cycles

2.2.1 Programs and projects shall follow their appropriate life cycle, which includes life-cycle phases; life-cycle gates and major events, including KDPs; major life-cycle reviews (LCRs); principal documents that govern the conduct of each phase; and the process of recycling through Formulation when program changes warrant such action. Uncoupled and loosely coupled programs follow the life cycle depicted in Figure 2-2. Tightly coupled programs follow the life cycle shown in Figure 2-3. Single-project programs follow the life cycle shown in Figure 2-4. Projects follow the life cycle shown in Figure 2-5.

2.2.2 Each program and project performs the work required for each phase, which is described in the NASA Space Flight Program and Project Management Handbook; the NASA Project Planning and Control Handbook, which covers the functions and activities of the planning and control community; and NPR 7123.1. This work shall be organized by a product-based WBS developed in accordance with the Program and Project Plan templates (appendices G and H). When an alternate approach provides for better program/project implementation, the program/project manager should tailor the requirement as noted in the Compliance Matrix. (See Appendix C.)

2.2.3 The documents shown on the life-cycle figures and described below shall be prepared in accordance with the templates in appendices D, E, F, G, and H.

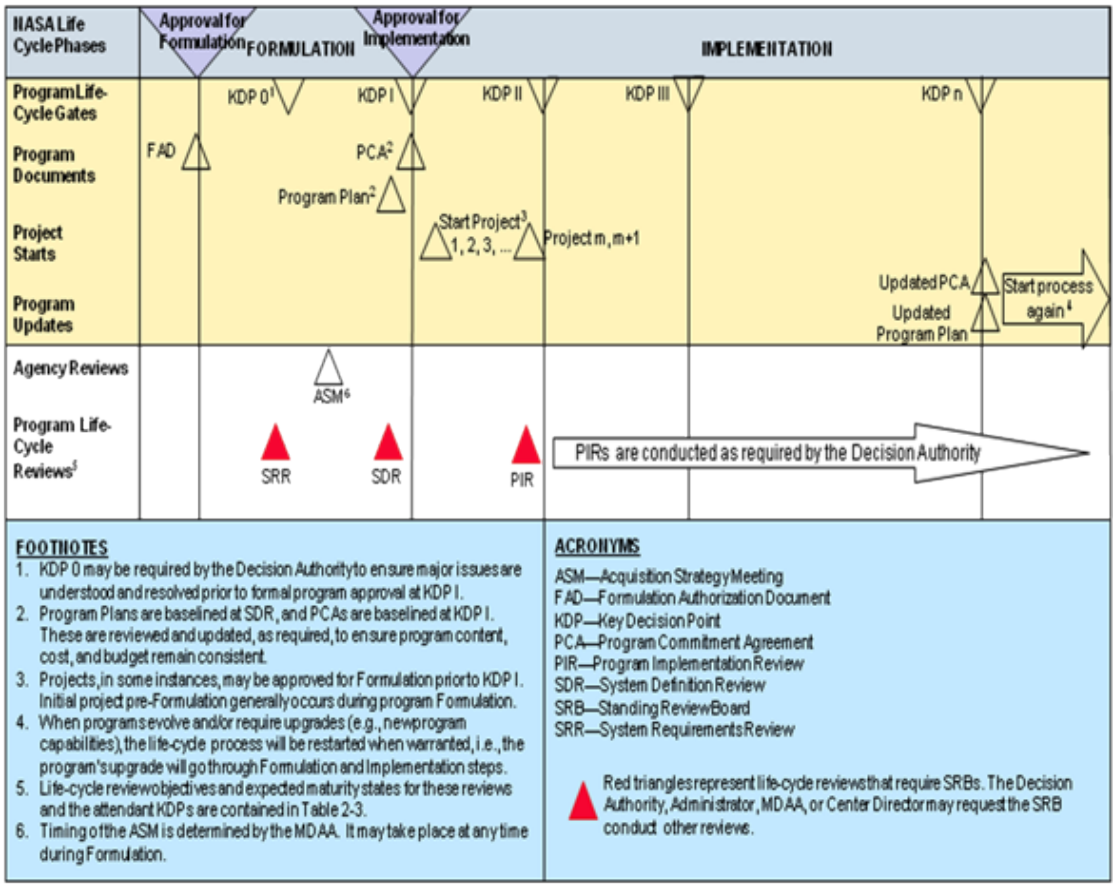


Figure 2-2 NASA Uncoupled and Loosely Coupled Program Life Cycle

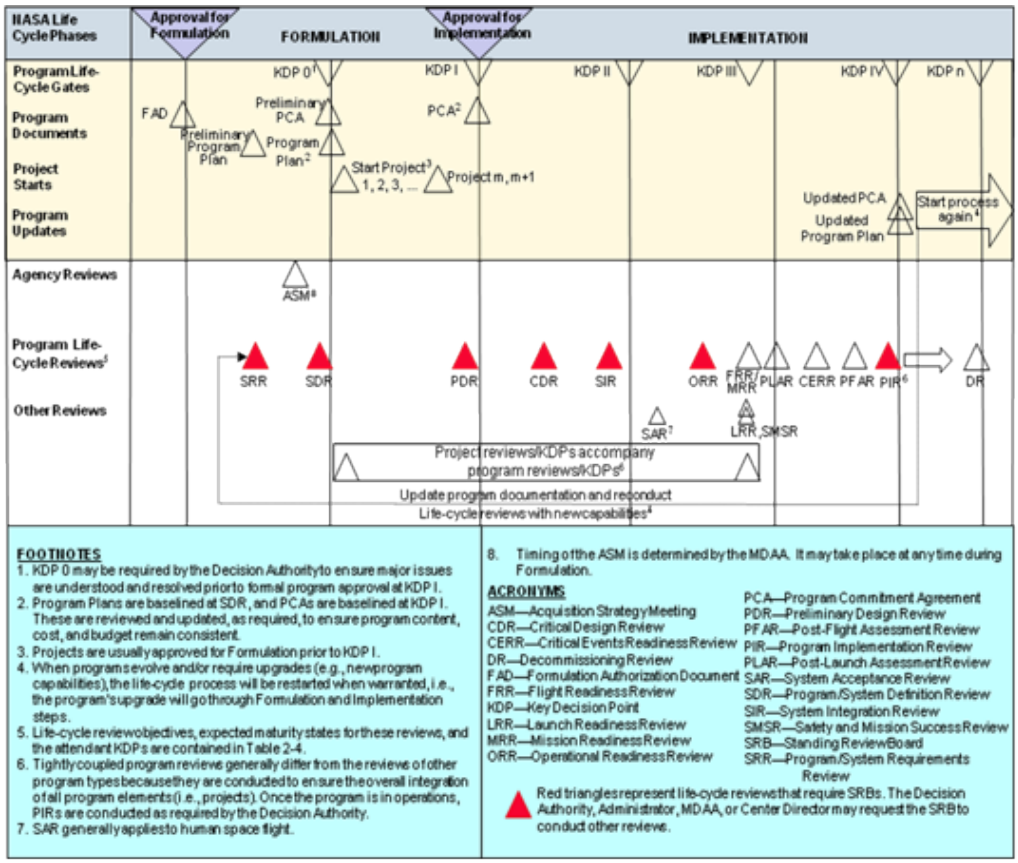
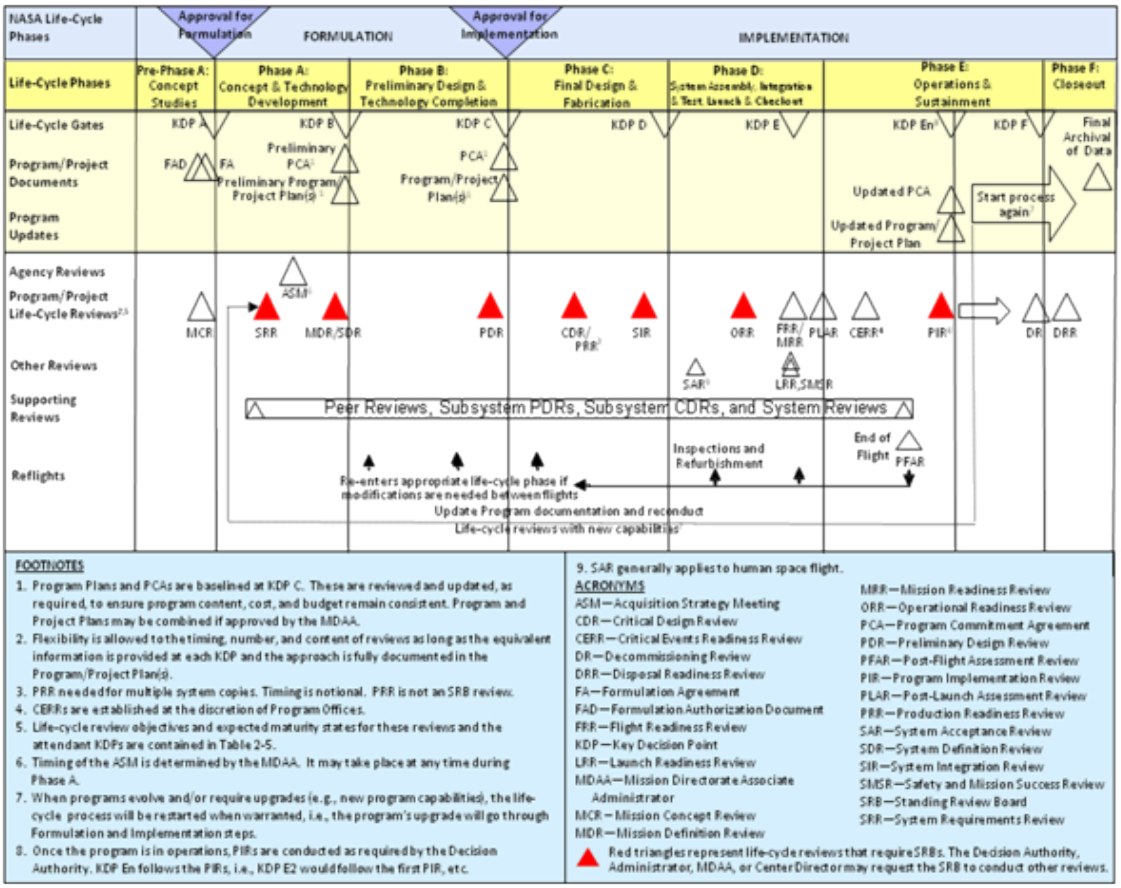


Figure 2-3 NASA Tightly Coupled Program Life Cycle



FOOTNOTES

1. Program Plans and PCAs are baselined at KDP C. These are reviewed and updated, as required, to ensure program content, cost, and budget remain consistent. Program and Project Plans may be combined if approved by the MDAA.
2. Flexibility is allowed to the timing, number, and content of reviews as long as the equivalent information is provided at each KDP and the approach is fully documented in the Program/Project Plan(s).
3. PRR needed for multiple system copies. Timing is notional. PRR is not an SRB review.
4. CERRs are established at the discretion of Program Offices.
5. Life-cycle review objectives and expected maturity states for these reviews and the attendant KDPs are contained in Table 2-5.
6. Timing of the ASM is determined by the MDAA. It may take place at any time during Phase A.
7. When programs evolve and/or require upgrades (e.g., new program capabilities), the life-cycle process will be restarted when warranted, i.e., the program's upgrade will go through Formulation and Implementation steps.
8. Once the program is in operations, PIRs are conducted as required by the Decision Authority. KDP En follows the PIRs, i.e., KDP E2 would follow the first PIR, etc.
9. SAR generally applies to human space flight.

ACRONYMS

ASM—Acquisition Strategy Meeting
CDR—Critical Design Review
CERR—Critical Events Readiness Review
DR—Decommissioning Review
DRR—Disposal Readiness Review
FA—Formulation Agreement
FAD—Formulation Authorization Document
FRR—Flight Readiness Review
KDP—Key Decision Point
LRR—Launch Readiness Review
MDAA—Mission Directorate Associate Administrator
MCR—Mission Concept Review
MDR—Mission Definition Review
MRR—Mission Readiness Review
ORR—Operational Readiness Review
PCA—Program Commitment Agreement
PDR—Preliminary Design Review
PFAR—Post-Flight Assessment Review
PIR—Program Implementation Review
PLAR—Post-Launch Assessment Review
PRR—Production Readiness Review
SAR—System Acceptance Review
SDR—System Definition Review
SIR—System Integration Review
SMSR—Safety and Mission Success Review
SRB—Standing Review Board
SRR—System Requirements Review

▲ Red triangles represent life-cycle reviews that require SRBs. The Decision Authority, Administrator, MDAA, or Center Director may request the SRB to conduct other reviews.

Figure 2-4 NASA Single-Project Program Life Cycle

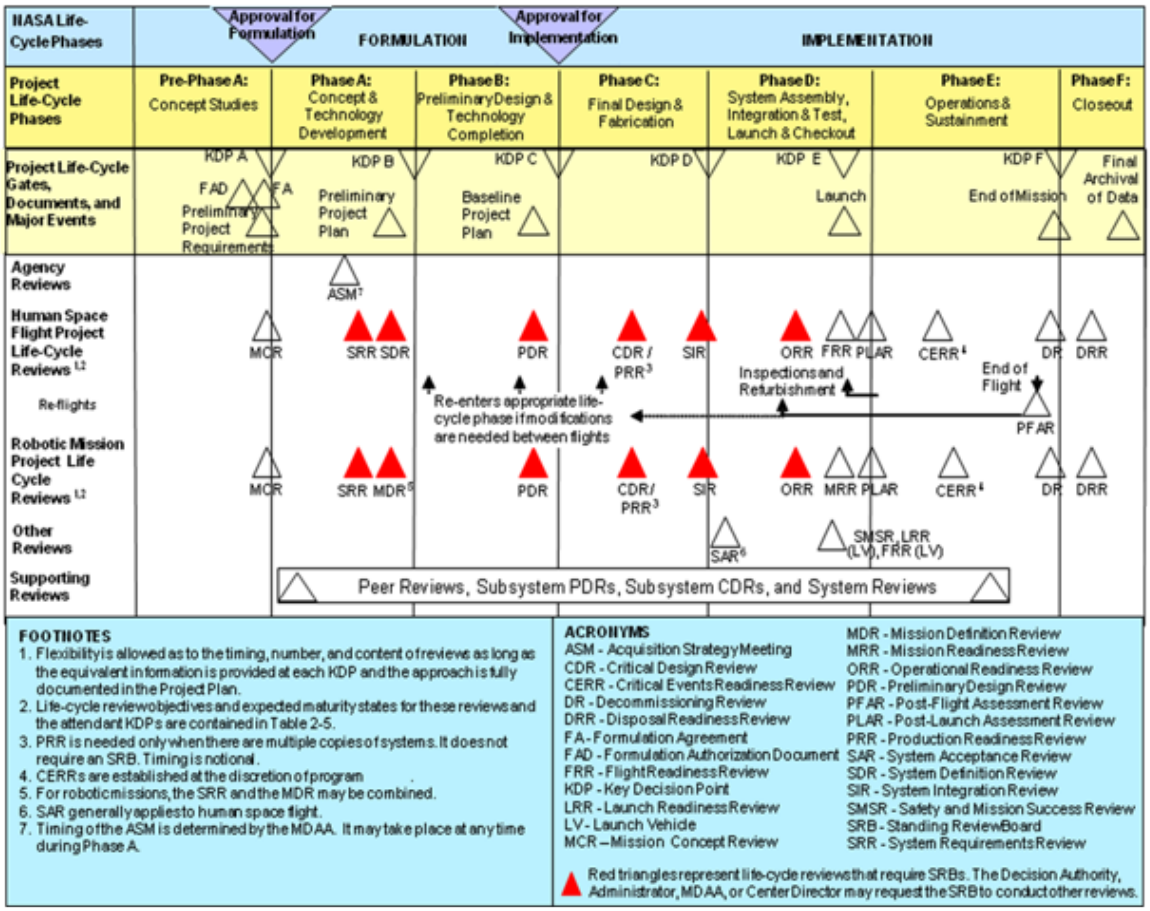


Figure 2-5 NASA Project Life Cycle

2.2.3.1 The program Formulation Authorization Document (FAD) (see Appendix E) is prepared by the Mission Directorate and authorizes a program manager to initiate the planning of a new program and to perform the analysis of alternatives required to formulate a sound Program Plan that contains project elements, requirements, schedules, and time-phased cost plans.

2.2.3.2 The PCA (see Appendix D) is an agreement between the MDAA and the NASA AA (the Decision Authority) that authorizes program transition from Formulation to Implementation. The PCA is prepared by the Mission Directorate and documents Agency requirements that flow down to the program, Mission Directorate requirements, program objectives, management and technical approach and associated architecture, technical performance, schedule, time-phased cost plans, safety and risk factors, internal and external agreements, life-cycle reviews, and all attendant top-level program requirements.

2.2.3.3 The Program Plan (see Appendix G) is an agreement between the MDAA (who has final approval authority for the plan), the participating Center Director(s), and the program manager. It documents at a high level the program's objectives and requirements, scope, implementation approach, interfaces with other programs, environment within which the program operates, funding by time-phased cost plans consistent with the approved PCA, and commitments of the program. The Program Plan is prepared by the program.

2.2.3.4 The project FAD (see Appendix E) is prepared by the Mission Directorate. It authorizes a project manager to initiate the planning of a new project and to perform the analysis of alternatives required to formulate a sound Formulation Agreement and subsequent Project Plan and contains requirements, schedules, and project funding requirements.

2.2.3.5 The Formulation Agreement (see Appendix F) is prepared by the project in response to the FAD to establish the technical and acquisition work that needs to be conducted during Formulation and defines the schedule and funding requirements during Phase A and Phase B for that work.

2.2.3.6 The Project Plan (see Appendix H) is an agreement among the MDAA; the program manager; participating Center Director(s); the project manager; and for AO-selected missions, the principal investigator. [5] The Project Plan is prepared by the project manager with the support of the project team and defines at a high level the project's objectives, technical and management approach, environment within which the project operates, and commitments of the project to the program.

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[5] A principal investigator is a person who conceives an investigation and is responsible for carrying it out and reporting its results. In some cases, principal investigators from industry and academia act as project managers for smaller development efforts with NASA personnel providing oversight.

2.2.4 Each program and project shall perform the LCRs identified in its respective figure in accordance with NPR 7123.1, applicable Center practices, and the requirements of this document. These reviews provide a periodic assessment of the program's or project's technical and programmatic status and health at key points in the life cycle using six criteria: alignment with and contribution to Agency strategic goals, adequacy of management approach, adequacy of technical approach, adequacy of the integrated cost and schedule estimates and funding strategy, adequacy and availability of resources other than budget, and adequacy of the risk management approach. (See NPR 8000.4 Agency Risk Management Procedural Requirements and NASA/SP-2011-3422 NASA Risk Management Handbook for further requirements and guidance on risk management and the NASA Space Flight Program and Project Management Handbook for further guidance on addressing the expected maturity for each of these criteria). Life-cycle reviews that occur at the end of each life-cycle phase are complete when the governing Program Management Council (PMC) and Decision Authority complete their assessment and sign the Decision Memorandum (see paragraph 2.4.1).

2.2.5 The program or project and an independent Standing Review Board (SRB) shall conduct the SRR, SDR/MDR, PDR, CDR, SIR, ORR, and PIR LCRs in figures 2-2, 2-3, 2-4, and 2-5. The Decision Authority may request the SRB to conduct other reviews identified on the figures or special reviews identified in paragraph 2.2.9. LCRs that do not require an SRB will be convened by the Center Director (or designee) of the Center responsible for the program or project management. The program or project manager determines whether one- or two-step reviews will be conducted. (See the NASA Standing Review Board Handbook and the NASA Space Flight Program and Project Management Handbook for further guidance on the review processes conducted by the SRB.) Small Category 3, Class D projects with a life-cycle cost of under $150 million should refer to guidance on using an independent review team to perform independent assessments of the project in place of an SRB. Guidance can be found on the OCE tab in NODIS under Other Policy Documents at http/nodis3.gsfc.nasa.gov/OCE_docs/OCE_25.pdf.)

2.2.5.1 NASA accords special importance to the policies and procedures established to ensure the integrity of the SRB's independent review process and to comply with Federal law. The Conflict of Interest (COI) procedures detailed in the NASA Standing Review Board Handbook shall be strictly adhered to.

2.2.5.2 The portion of the LCRs conducted by the SRB shall be convened by the Convening Authorities in accordance with Table 2-2. The scope and requirements for this review will be documented in a Terms of Reference (ToR), for which there is a template in the NASA Standing Review Board Handbook.

Table 2-2 Convening Authorities for Standing Review Board

	Decision Authority		Technical Authority		Chief Financial Officer**
	NASA AA	MDAA	NASA CE*	Center Director(s)	
Programs	Approve	Approve	Concur	Approve	Concur
Category 1 Projects	Approve	Approve	Concur	Approve	Concur
Category 2 Projects		Approve	Concur	Approve	Concur
Category 3 Projects		Approve		Approve	

NASA CE = NASA Chief Engineer

*Concurrence is obtained via coordination with designated MD Chief Engineer
** Concurrence is obtained via coordination with designated MD-embedded OCFO point of contact

NOTE: LCR entrance and success criteria in NPR 7123.1 and the life-cycle phase and KDP information in the NASA Space Flight Program and Project Management Handbook provide specifics for addressing the six criteria required to demonstrate the program or project has met expected maturity state.

2.2.5.3 The program or project manager, the SRB chair, and the Center Director (or designated Engineering Technical Authority representative) shall mutually assess the program's or project's expected readiness for the LCR and report any disagreements to the Decision Authority for final decision. The assessment occurs approximately 30 to 90 calendar days prior to the LCR.

2.2.6 In preparation for these LCRs, the program or project shall generate the appropriate documentation per the Appendix I tables of this document, NPR 7123.1, and Center practices, as necessary, to demonstrate that the program's or project's definition and associated plans are sufficiently mature to execute the follow-on phase(s) with acceptable technical, safety, and programmatic risk.

2.2.6.1 For a single-project program that is implemented through separate program and project structures, the MDAA and single-project program manager will determine which of the documents in the tables are produced by the program and which are produced by the project. In both management approaches, the Program and Project Plans may be combined if approved by the MDAA.

2.2.7 Each program and project proceeds through the KDPs identified in its respective life-cycle figure. A KDP is the event where the Decision Authority determines the readiness of a program or project to progress to the next phase of the life cycle and establishes the content, cost, and schedule commitments for the ensuing phase(s). Transition to the following phase occurs immediately following KDP approval except for the transition from Phase D to E, where transition occurs following on-orbit checkout. KDPs associated with uncoupled, loosely coupled, and tightly coupled programs are designated with Roman numerals and zero. The first KDP is KDP 0; the second is KDP I, etc. KDPs for projects and single-project programs are designated with letters, i.e., KDP A, KDP B, etc.

2.2.7.1 For missions selected as a result of an AO, KDP A is the selection of a Step 1 proposal for

concept development. In a one-step AO process, projects enter Phase A after selection (KDP A) and the process becomes conventional. In a two-step AO process, projects are down-selected following evaluation of concept study reports and the down-selection serves as KDP B. Following this selection, the process becomes conventional with the exception that products normally required at KDP B that require Mission Directorate input or approval will be finished as early in Phase B as feasible.

2.2.8 Projects in phases C and D (and programs at the discretion of the MDAA) with a life-cycle cost estimated to be greater than $20 million and Phase E project modifications, enhancements, or upgrades with an estimated development cost greater than $20 million shall perform earned value management (EVM) with an EVM system that complies with the guidelines in ANSI/EIA-748, Standard for Earned Value Management Systems. Small Category 3, Class D projects with a life-cycle cost of under $150 million should refer to guidance on implementing the EVM requirements from the NASA AA, which can be found on the OCE tab in NODIS under Other Policy Documents http/nodis3.gsfc.nasa.gov/OCE_docs/OCE_25.pdf. Use of NASA's EVM capability and processes will ensure compliance with the ANSI standard. This capability allows tailoring to match the individual needs of the program or project, while still meeting the ANSI-748 guidelines. NASA's EVM capability can be found on the Program and Project Management Community of Practice at https://nen.nasa.gov/web/pm/evm.

2.2.8.1 EVM system requirements shall be applied to appropriate suppliers, in accordance with the NASA Federal Acquisition Regulation (FAR) Supplement, and to in-house work elements. For contracts that require EVM, an Integrated Program Management Report (IPMR) and a WBS are required deliverables with the appropriate data requirements descriptions (DRDs) included in the contract and/or agreement.

2.2.8.2 For projects requiring EVM, Mission Directorates shall conduct a pre-approval integrated baseline review as part of their preparations for KDP C to ensure that the project's work is properly linked with its cost, schedule, and risk and that the management processes are in place to conduct project-level EVM.

2.2.9 The Office of the Administrator, MDAA, or the Center Director (or designee) may also convene special reviews as they determine the need. In these cases, the MDAA or the Technical Authority forms a special review team composed of relevant members of the SRB and additional outside expert members as needed. The process followed for these reviews is the same as for other reviews. The special review team is dissolved following resolution of the issue(s) that triggered its formation.

2.2.10 Each program and project shall complete and maintain a Compliance Matrix (see Appendix C) for this NPR and attach it to the Formulation Agreement for projects in Formulation and/or the Program or Project Plan. The program or project will use the Compliance Matrix to demonstrate how it is complying with the requirements of this document and verify the compliance of other responsible parties.

2.3 Program and Project Oversight and Approval

2.3.1 Each program and project shall have a Decision Authority, the Agency's responsible individual who determines whether and how the program or project proceeds through the life cycle and the key program or project cost, schedule, and content parameters that govern the remaining life-cycle activities. For programs and Category 1 projects, the Decision Authority is the NASA AA. The NASA AA may delegate this authority to the MDAA for Category 1 projects. For Category 2 and 3 projects, the Decision Authority is the MDAA. The MDAA may delegate some of their

Programmatic Authority to appropriate Mission Directorate staff or to Center Directors. Decision authority may be delegated to a Center Director for determining whether Category 2 and 3 projects may proceed through KDPs into the next phase of the life cycle. However, the MDAA will retain authority for all program-level requirements, funding limits, launch dates, and any external commitments. All delegations are documented and approved in the applicable authority document (PCA or Program Plan) depending on which Decision Authority is delegating.

2.3.1.1 The NASA AA shall approve all Agency Baseline Commitments (ABCs) for programs requiring an ABC and projects with a life-cycle cost greater than $250 million. The NASA Administrator's agreement is required for the ABCs for all programs and projects with a life-cycle cost greater than $1 billion and all Category 1 projects. (See paragraph 2.4.1.5 for more information on ABCs.)

2.3.2 To ensure the appropriate level of management oversight, NASA has established two levels of PMCs-the Agency PMC (APMC) and Mission Directorate PMCs (MDPMCs). The PMCs have the responsibility for periodically evaluating the technical, safety, and programmatic performance (including cost, schedule, risk, and risk mitigation) and content of a program or project under their purview. These evaluations focus on whether the program or project is meeting its commitments to the Agency. Each program and project shall have a governing PMC. For all programs and Category 1 projects, the governing PMC is the APMC; for Category 2 and 3 projects, the governing PMC is the MDPMC. The PMC function may be delegated by the Decision Authority to the Center Management Council (CMC) in the event the Decision Authority is delegated to the Center.

2.3.3 The Center Director (or designee) shall oversee programs and projects usually through the CMC, which monitors and evaluates all program and project work (regardless of category) executed at that Center. The CMC evaluation focuses on whether Center engineering, Safety and Mission Assurance (SMA), health and medical, and management best practices (e.g., program and project management, resource management, procurement, institutional best practices) are being followed by the program or project under review and whether Center resources support program/project requirements. The CMC also assesses program and project risk and evaluates the status and progress of activities to identify and report trends and provide guidance to the Agency and affected programs and projects. The CMC provides its findings and recommendations to program or project managers and to the appropriate PMCs regarding the performance and technical and management viability of the program or project prior to KDPs.

2.3.3.1 For programs and projects that are conducted by multiple Centers, an Integrated Center Management Council (ICMC) should be used where the Center Director (or designee) of each Center with substantial contributions is a member of the ICMC. The ICMC is chaired by the Center Director (or representative) responsible for the program/project management.

2.3.4 Following each LCR, the independent SRB and the program or project shall brief the applicable management councils on the results of the LCR to support the councils' assessments. The final LCR in a given life-cycle phase provides essential information for the KDP, which marks the end of that life-cycle phase except for transition from Phase D to E, where transition occurs following on-orbit checkout and initial operations. To support the Decision Authority's determination of the readiness of a program or project to progress to the next phase of the life cycle, the program manager (for projects in their program), the Center Director, the MDAA (for programs and Category 1 projects), and the governing PMC provide their assessments and recommendations with supporting data, as necessary. Tables 2-3 through 2-6 define for each LCR and each KDP the LCR objectives and the expected maturity state at the subsequent KDP. (The NASA Space Flight Program and Project Management Handbook provides further details.)

Table 2-3 Expected Maturity State Through the Life Cycle of Uncoupled and Loosely Coupled Programs

KDP Review	Associated Life-cycle Review	LCR Objectives	Overall Expected Maturity State at KDP
KDP 0	SRR	To evaluate whether the program functional and performance requirements are properly formulated and correlated with the Agency and Mission Directorate strategic objectives and assess the credibility of the program's estimated budget and schedule.	Program addresses critical NASA needs and can likely be achieved as conceived.
KDP Review	**Associated Life-cycle Review**	**LCR Objectives**	**Overall Expected Maturity State at KDP**
KDP I	SDR	To evaluate the proposed program requirements/ architecture and allocation of requirements to initial projects, assess the adequacy of project pre-Formulation efforts, and determine whether the maturity of the program's definition and associated plans are sufficient to begin implementation.	Program is in place and stable, addresses critical NASA needs, has adequately completed Formulation activities, has an acceptable plan for Implementation that leads to mission success, has proposed projects that are feasible within available resources, and has risks that are commensurate with the Agency's expectations.
KDP II to KDP n	PIR	To evaluate the program's continuing relevance to the Agency's Strategic Plan, assess performance with respect to expectations, and determine the program's ability to execute the implementation plan with acceptable risk within cost and schedule constraints.	Program still meets Agency needs and is continuing to meet Agency commitments, as planned.
NOTE: LCR entrance and success criteria in NPR 7123.1 and the life-cycle phase and KDP information in the NASA Space Flight Program and Project Management Handbook provide specifics for addressing the six criteria required to demonstrate the program or project has met expected maturity state.			

Table 2-4 Expected Maturity State Through the Life Cycle of Tightly Coupled Programs

KDP Review	Associated Life-cycle Review	LCR Objectives	Overall Expected Maturity State at KDP
KDP 0	SRR	To evaluate whether the functional and performance requirements defined for the system are responsive to the Mission Directorate requirements on the program and its projects and represent achievable capabilities.	Program addresses critical NASA needs, and projects are feasible within available resources.

	SDR	To evaluate the credibility and responsiveness of the proposed program requirements/architecture to the Mission Directorate requirements and constraints, including available resources, and allocation of requirements to projects. To determine whether the maturity of the program's mission/system definition and associated plans are sufficient to begin preliminary design.	
KDP I	PDR	To evaluate the completeness/consistency of the program's preliminary design, including its projects, in meeting all requirements with appropriate margins, acceptable risk, and within cost and schedule constraints, and to determine the program's readiness to proceed with the detailed design phase of the program.	Program is in place and stable, addresses critical NASA needs, has adequately completed Formulation activities, and has an acceptable plan for Implementation that leads to mission success. Proposed projects are feasible within available resources, and the program's risks are commensurate with the Agency's tolerances.
KDP II	CDR	To evaluate the integrity of the program integrated design, including its projects and ground systems. To meet mission requirements with appropriate margins and acceptable risk within cost and schedule constraints. To determine if the integrated design is appropriately mature to continue with the final design and fabrication phase.	Program is still on plan. The risk is commensurate with the projects' payload classifications. The program is ready for Assembly, Integration, and Test (AI&T) with acceptable risk within its ABC.
	SIR	To evaluate the readiness of the program, including its projects and supporting infrastructure, to begin system AI&T with acceptable risk and within cost and schedule constraints.	
KDP III	ORR	To evaluate the readiness of the program, including its projects, ground systems, personnel, procedures, and user documentation. To operate the flight system and associated ground systems in compliance with program requirements and constraints during the operations phase.	Program is ready for launch and early operations with acceptable risk within Agency commitments.
	FRR or MRR	To evaluate the readiness of the program and its projects, ground systems, personnel, and procedures for a safe and successful launch and flight/mission.	

Non-KDP Mission Operations Reviews	PLAR	To evaluate the in-flight performance of the program and its projects. To determine the program's readiness to begin the operations phase of the life cycle and transfer responsibility to the operations organization.	PLAR Expected State: Project is ready to conduct mission operations with acceptable risk within Agency Commitments.
	CERR	To evaluate the readiness of the program and its projects to execute a critical event during the flight operations phase of the life cycle.	Mission CERR Expected State: Project is ready to conduct critical mission activity with acceptable risk.
	PFAR	To evaluate how well mission objectives were met during a human space flight mission. To evaluate the status of the flight and ground systems, including the identification of any anomalies and their resolution.	PFAR Expected State: All anomalies that occurred in flight are identified, and actions necessary to mitigate or resolve these anomalies are in place.
KDP IV to KDP n-1	PIR	To evaluate the program's continuing relevance to the Agency's Strategic Plan, assess performance with respect to expectations, and determine the program's ability to execute the implementation plan with acceptable risk within cost and schedule constraints.	Program still meets Agency needs and is continuing to meet Agency commitments as planned.
KDP n	DR	To evaluate the readiness of the program and its projects to conduct closeout activities, including final delivery of all remaining program/project deliverables and safe decommissioning/disposal of space flight systems and other program/project assets.	Program decommissioning is consistent with program objectives and is ready for final analysis and archival of mission and science data and safe disposal of its assets.
NOTE: LCR entrance and success criteria in NPR 7123.1 and the life-cycle phase and KDP information in the NASA Space Flight Program and Project Management Handbook provide specifics for addressing the six criteria required to demonstrate the program or project has met expected maturity state.			

Table 2-5 Expected Maturity State Through the Life Cycle of Projects and Single-Project Programs

KDP Review	Associated Life-cycle Review	LCR Objectives	Overall Expected Maturity State at KDP
KDP A	MCR	To evaluate the feasibility of the proposed mission concept(s) and its fulfillment of the program's needs and objectives. To determine whether the maturity of the concept and associated planning are sufficient to begin Phase A.	Project addresses critical NASA need. Proposed mission concept(s) is feasible. Associated planning is sufficiently mature to begin Phase A, and the mission can likely be achieved as conceived.

KDP B	SRR	To evaluate whether the functional and performance requirements defined for the system are responsive to the program's requirements on the project and represent achievable capabilities.	Proposed mission/system architecture is credible and responsive to program requirements and constraints, including resources. The maturity of the project's mission/system definition and associated plans is sufficient to begin Phase B, and the mission can likely be achieved within available resources with acceptable risk.
	MDR or SDR	To evaluate the credibility and responsiveness of the proposed mission/system architecture to the program requirements and constraints, including available resources. To determine whether the maturity of the project's mission/system definition and associated plans are sufficient to begin Phase B.	
KDP C	PDR	To evaluate the completeness/consistency of the planning, technical, cost, and schedule baselines developed during Formulation. To assess compliance of the preliminary design with applicable requirements and to determine if the project is sufficiently mature to begin Phase C.	Project's planning, technical, cost, and schedule baselines developed during Formulation are complete and consistent. The preliminary design complies with its requirements. The project is sufficiently mature to begin Phase C, and the cost and schedule are adequate to enable mission success with acceptable risk.
KDP D	CDR	To evaluate the integrity of the project design and its ability to meet mission requirements with appropriate margins and acceptable risk within defined project constraints, including available resources. To determine if the design is appropriately mature to continue with the final design and fabrication phase.	Project is still on plan. The risk is commensurate with the project's payload classification, and the project is ready for AI&T with acceptable risk within its ABC.
	PRR	To evaluate the readiness of system developer(s) to produce the required number of systems within defined project constraints for projects developing multiple similar flight or ground support systems. To evaluate the degree to which the production plans meet the system's operational support requirements.	
	SIR	To evaluate the readiness of the project and associated supporting infrastructure to begin system AI&T, evaluate whether the remaining project development can be completed within available resources, and determine if the project is sufficiently mature to begin Phase D.	

KDP E	ORR	To evaluate the readiness of the project to operate the flight system and associated ground system(s) in compliance with defined project requirements and constraints during the operations/sustainment phase of the project life cycle.	Project and all supporting systems are ready for safe, successful launch and early operations with acceptable risk within ABC.
	MRR or FRR	To evaluate the readiness of the project and all project and supporting systems for a safe and successful launch and flight/mission.	
KDP En (applies only to Single-Project Programs)	PIR	To evaluate the program's continuing relevance to the Agency's Strategic Plan, assess performance with respect to expectations, and determine the program's ability to execute the implementation plan with acceptable risk within cost and schedule constraints.	Program still meets Agency needs and is continuing to meet Agency commitments, as planned.
Non-KDP Reviews	PLAR	To evaluate in-flight performance of the flight system early in the mission and determine whether the project is sufficiently prepared to begin Phase E.	PLAR Expected State: Project is ready to conduct mission operations with acceptable risk within ABC.
	CERR	To evaluate the readiness of the project and the flight system for execution of a critical event during the flight operations phase of the life cycle.	Mission CERR Expected State: Project is ready to conduct critical mission activity with acceptable risk.
	PFAR	To evaluate how well mission objectives were met during a human space flight mission and to evaluate the status of the returned vehicle.	PFAR Expected State: All anomalies that occurred in flight are identified. Actions necessary to mitigate or resolve these anomalies are in place.
KDP F	DR	To evaluate the readiness of the project to conduct closeout activities including final delivery of all remaining project deliverables and safe decommissioning of space flight systems and other project assets. To determine if the project is appropriately prepared to begin Phase F.	Project decommissioning is consistent with program objectives and project is ready for safe decommissioning of its assets and closeout of activities, including final delivery of all remaining project deliverables and disposal of its assets.
Non-KDP Disposal Readiness Review	DRR	To evaluate the readiness of the project and the flight system for execution of the spacecraft disposal event.	Mission DRR Expected State: Project ready to conduct disposal activity with acceptable risk.
NOTE: LCR entrance and success criteria in NPR 7123.1 and the life-cycle phase and KDP information in the NASA Space Flight Program and Project Management Handbook provide specifics for addressing the six criteria required to demonstrate the program or project has met expected maturity state.			

Table 2-6 Objectives for Other Reviews

Review Name	Review Objective
System Acceptance Review (SAR)	To evaluate whether a specific end item is sufficiently mature to be shipped from the supplier to its designated operational facility or launch site.
Safety and Mission Success Review (SMSR)	To prepare Agency safety and engineering management to participate in program final readiness reviews preceding flights or launches, including experimental/test launch vehicles or other reviews as determined by the Chief, Safety and Mission Assurance. The SMSR provides the knowledge, visibility, and understanding necessary for senior safety and engineering management to either concur or nonconcur in program decisions to proceed with a launch or significant flight activity.
Launch Readiness Review (LRR)	To evaluate a program/project and its ground, hardware, and software systems for readiness for launch.

2.4 Approving and Maintaining Program and Project Plans, Baselines, and Commitments

2.4.1 After reviewing the supporting material and completing discussions with concerned parties, the Decision Authority determines whether and how the program or project proceeds into the next phase and approves any additional actions. These decisions shall be summarized and recorded in the Decision Memorandum signed at the conclusion of the governing PMC by all parties with supporting responsibilities, accepting their respective roles. Once signed, the Decision Memorandum is appended to the project Formulation Agreement, Program Plan, or Project Plan, as appropriate. Decision Memorandum templates may be found at NASA's OCFO community of practice site (https://max.omb. gov/community/pages/viewpage.action?pageId=646907686), which can be reached via the NASA Engineering Network (NEN) Project Planning and Control (PP&C) community of practice site).

2.4.1.1 The Decision Memorandum shall describe the constraints and parameters within which the Agency, the program manager, and the project manager will operate; the extent to which changes in plans may be made without additional approval; any additional actions that came out of the KDP; and the supporting data (e.g., the cost and schedule data sheet) that provide further details. The NASA Space Flight Program and Project Management Handbook provides an example of the Decision Memorandum to illustrate the level and types of information that are documented.

2.4.1.2 The Management Agreement contained within the Decision Memorandum defines the parameters and authorities over which the program or project manager has management control. A program or project manager has the authority to manage within the Management Agreement and is accountable for compliance with the terms of the agreement. The Management Agreement, which is documented at every KDP, may be changed between KDPs as the program or project matures and in response to internal and external events. The Management Agreement should be viewed as a contract between the Agency and the program or project manager. A divergence from the Management Agreement that any party identifies as significant shall be accompanied by an amendment to the Decision Memorandum.

2.4.1.3 During Formulation, the Decision Memorandum shall establish a target life-cycle cost range (and schedule range, if applicable) as well as the Management Agreement addressing the schedule and resources required to complete Formulation.

2.4.1.4 The Decision Memorandum also documents any additional resources beyond those explicitly estimated or requested by the program/project (e.g., additional schedule margin) when the Decision Authority determines that this is appropriate. This includes Unallocated Future Expenses (UFE),

which are costs that are expected to be incurred but cannot yet be allocated to a specific WBS subelement of a program's or project's plan. Management control of some UFE may be retained above the level of the project (i.e., Agency, Mission Directorate, or program). (See Figure 2-6, Example of Agreements and Commitments in Terms of Cost for Projects.)

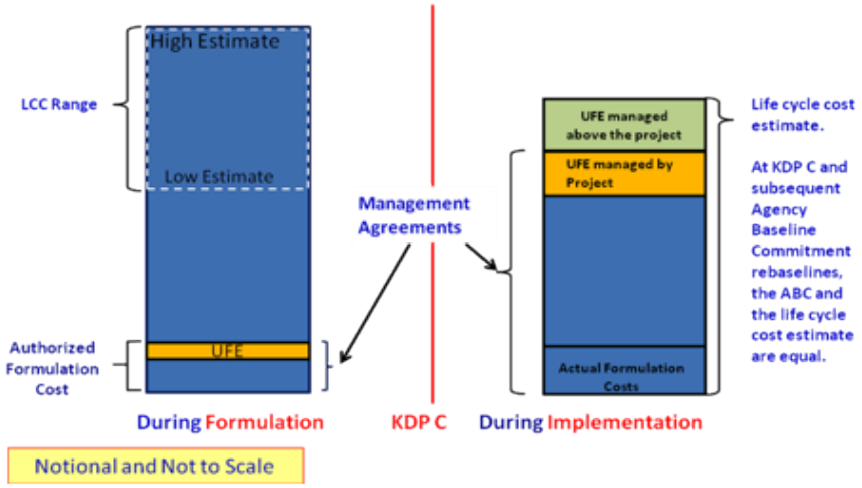

Figure 2-6 Example of Agreements and Commitments in Terms of Cost for Projects

2.4.1.5 All projects and single-project programs shall document the Agency's life-cycle cost estimate and other parameters in the Decision Memorandum for Implementation (KDP C), and this becomes the ABC. The ABC is the baseline against which the Agency's performance is measured during the Implementation Phase. The ABC for projects with a life-cycle cost of $250 million or more forms the basis for the Agency's external commitment to OMB and Congress.

2.4.1.6 Tightly coupled programs shall document their life-cycle cost estimate, in accordance with the life-cycle scope defined in the FAD or PCA, and other parameters in their Decision Memorandum and ABC at KDP I.

2.4.1.7 Programs or projects shall be rebaselined when: (1) the estimated development cost [6] exceeds the ABC development cost by 30 percent or more (for projects over $250 million, also that Congress has reauthorized the project); (2) the NASA AA judges that events external to the Agency make a rebaseline appropriate; or (3) the NASA AA judges that the program or project scope defined in the ABC has been changed or the tightly coupled program or project has been interrupted. ABCs for projects are not rebaselined to reflect cost or schedule growth that does not meet one or more of these criteria. When an ABC is rebaselined, the Decision Authority directs that a review of the new baseline be conducted by the SRB or as determined by the Decision Authority.

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[6]"Development cost" includes all project costs from authorization to proceed to Implementation (Phase C) through operational readiness at the end of Phase D.

2.4.2 All programs and projects develop cost estimates and planned schedules for the work to be performed in the current and following life-cycle phases (see Appendix I tables). As part of developing these estimates, the program or project shall document the basis of estimate (BOE) in retrievable program or project records.

2.4.3 Tightly coupled and single-project programs (regardless of life-cycle cost) and projects with an estimated life-cycle cost greater than $250 million shall develop probabilistic analyses of cost and schedule estimates to obtain a quantitative measure of the likelihood that the estimate will be met in

accordance with the following requirements.

2.4.3.1 Tightly coupled and single-project programs (regardless of life-cycle cost) and projects with an estimated life-cycle cost greater than $250 million shall provide a range of cost and a range for schedule at KDP 0/KDP B, each range (with confidence levels identified for the low and high values of the range) established by a probabilistic analysis and based on identified resources and associated uncertainties by fiscal year. Separate analyses of cost and schedule, each with associated confidence levels, meet the requirement. A joint cost and schedule confidence level (JCL) is not required but may be used at KDP 0 and KDP B.

2.4.3.2 At KDP I/KDP C, tightly coupled and single-project programs (regardless of life-cycle cost) and projects with an estimated life-cycle cost greater than $250 million shall develop a resource-loaded schedule and perform a risk-informed probabilistic analysis that produces a JCL. The JCL is the product of a probabilistic analysis of the coupled cost and schedule to measure the likelihood of completing all remaining work at or below the budgeted levels and on or before the planned completion of Phase D.

2.4.4 Mission Directorates shall plan and budget tightly coupled and single-project programs (regardless of life-cycle cost) and projects with an estimated life-cycle cost greater than $250 million based on a 70 percent joint cost and schedule confidence level, or as approved by the Decision Authority.

2.4.4.1 Any JCL approved by the Decision Authority at less than 70 percent shall be justified and documented.

2.4.4.2 Mission Directorates shall ensure funding for these projects is consistent with the Management Agreement and in no case less than the equivalent of a 50 percent JCL.

2.4.4.3 When a tightly coupled program, single-project program, or project with an estimated life-cycle cost greater than $250M is rebaselined, the JCL should be recalculated and approved as a part of the rebaselining approval process.

2.4.5 Loosely coupled and uncoupled programs are not required to develop program cost and schedule confidence levels. These programs shall provide analysis that provides a status of the program's risk posture that is presented to the governing PMC as each new project reaches KDP B and C or when a project's ABC is rebaselined.

Chapter 3. Program and Project Management Roles and Responsibilities

3.1 Governance

3.1.1 The fundamental principles of NASA governance are defined in NPD 1000.0, NASA Governance and Strategic Management Handbook. The governance model prescribes a management structure that employs checks and balances among key organizations to ensure that decisions have the benefit of different points of view and are not made in isolation. This structure is made up of two authorities: Programmatic and Institutional. Programmatic Authority consists of the Mission Directorates and their respective programs and projects. The Institutional Authority consists of those organizations not in the Programmatic Authority. As part of Institutional Authority, NASA established the Technical Authority process as a system of checks and balances to provide independent oversight of programs and projects in support of safety and mission success through the selection of specific individuals with delegated levels of authority. Individuals with these formal delegations are Technical Authorities. The requirements related to Technical Authority are contained in Section 3.3.

3.2 Roles and Responsibilities

3.2.1 The roles and responsibilities of NASA management are defined in NPD 1000.0, NASA Governance and Strategic Management Handbook, and further outlined in NPD 1000.3, The NASA Organization. The key roles and responsibilities specific to programs and projects can be summarized as follows:

a. The Administrator leads the Agency and is accountable to the President for all aspects of the Agency's mission, including establishing and articulating the Agency's vision and strategic priorities and ensuring successful implementation of supporting policies, programs, and performance assessments. The Administrator performs all necessary functions to govern NASA operations and exercises the powers vested in NASA by law.

b. The NASA Associate Administrator is responsible for the technical and programmatic integration of programs at the Agency level and serves as the Decision Authority for programs and Category 1 projects with the advice of the APMC. He or she monitors the status and performance of the programs and projects via reports from the MDAA; Center Director; and through Agency-level review, such as the APMC and the Baseline Performance Review (BPR) process. The NASA AA may delegate Decision Authority to MDAAs.

c. MDAAs are responsible for Programmatic Authority in managing programs and projects within their Mission Directorate. They establish directorate policies applicable to programs, projects, and supporting elements; support the Agency's strategic acquisition process; initiate new programs and projects; recommend assignment of programs and Category 1 projects to Centers; assign Category 2 and 3 projects to Centers; serve as the KDP Decision Authority for Category 2 and 3 projects; are responsible for all program-level requirements; establish program and project budgets; approve Formulation Agreements and Program and Project Plans; oversee program and project performance via the MDPMC; and approve launch readiness. The MDAAs may delegate some of their Programmatic Authority to deputy associate administrators, division directors, or their equivalent, such as program directors, and Center Directors. The MDAAs also plan and manage independent

reviews with support from Centers for the Mission Directorate program and project portfolio, organize and staff the independent review teams, monitor execution of the reviews, and capture lessons learned with support from Centers, the Office of the Chief Financial Officer, and OCE [7]. The MDAAs proactively work with Center Directors to develop constructive solutions for the formulation and implementation of programs and projects conducted at their Centers and to resolve issues as they arise.

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[7]Reference the NASA Independent Assessment Principles and Approach white paper approved at the May 18, 2016, Agency Program Management Council (APMC), which can be found on the OCE menu under the "Other Policy Documents" tab in NODIS.

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d. Center Directors are responsible and accountable for all activities assigned to their Center. They are responsible for the institutional activities and for ensuring the proper planning for and assuring the proper execution of programs and projects assigned to the Center. This includes:

(1) Performing their delegated Technical Authority duties in accordance with Section 3.3;

(2) Ensuring the Center is capable of accomplishing the programs, projects, and other activities assigned to it in accordance with Agency policy and the Center's best practices and institutional policies by establishing, developing, and maintaining institutional capabilities (processes and procedures, human capital - including trained/certified program/project personnel, facilities, and infrastructure) required for the execution of programs and projects;

(3) Establishing and maintaining ongoing processes and forums, including the CMC, to monitor the status and progress of programs and projects at their Center;

(4) Performing periodic program and project reviews to assess technical and programmatic progress to ensure performance in accordance with their Center's and the Agency's requirements, procedures, processes, etc.;

(5) Reporting the executability of all aspects of their programs and projects (programmatic, technical, and all others) along with major risks, mitigation strategies, and significant concerns to the Decision Authority and other appropriate forums;

(6) Working with the Mission Directorate and the programs and project managers, once assigned, to assemble the program/project team(s) and to provide needed Center resources;

(7) Providing support and guidance to programs and projects in resolving technical and programmatic issues and risks;

(8) Concurring on the adequacy of cost/schedule estimates and the consistency of these estimates with Agency requirements, workforce, and other resources stipulated in proposed Program and Project Plans;

(9) Working proactively with the Mission Directorates, programs, projects, and other Institutional Authorities to find constructive solutions to problems to benefit both the programs and projects and the overall Agency long-term health; and

(10) Certifying that programs and/or projects have been accomplished properly as part of the launch approval process.

(11) Supporting Mission Directorates to plan and manage independent reviews.

e. The program manager is responsible for the formulation and implementation of the program as described in this document and NPR 7123.1. This includes responsibility and accountability for the

program safety; technical integrity; technical, cost, and schedule performance; and mission success. (Refer to the NASA Space Flight Program and Project Management Handbook and the NASA Project Planning and Control Handbook for additional information.)

f. The project manager is responsible for the formulation and implementation of the project as described in this document and NPR 7123.1. This includes responsibility and accountability for the project safety; technical integrity; technical, cost, and schedule performance; and mission success. (Refer to the NASA Space Flight Program and Project Management Handbook and the NASA Project Planning and Control Handbook for additional information)

g. The Chief Financial Officer oversees all financial management, budget, strategic planning, and performance activities relating to the programs and operations of the Agency. The Office of the Chief Financial Officer provides Agency programmatic (cost and schedule) analysis capability leadership; establishes cost and schedule analyses policies, methods, and standards; and assists in identification of personnel with analytical expertise to support in-line programmatic activities of NASA programs and projects, as well as independent programmatic assessments (e.g., SRB).

h. The NASA Chief Engineer establishes policy, oversight, and assessment of the NASA engineering and program/project management processes; implements the Engineering Technical Authority process; and serves as principal advisor to the Administrator and other senior officials on matters pertaining to the technical capability and readiness of NASA programs and projects to execute according to plans. The Chief Engineer directs the NASA Engineering and Safety Center (NESC) and ensures that programs/projects respond to requests from the NESC for data and information needed to make independent technical assessments and then respond to NESC assessments. The Chief Engineer leads the mission and program/project performance assessment for the BPR; ensures that space asset protection functional support is provided to NASA missions and management, including at a minimum, preparation of program threat summaries and project protection plans; and co-chairs the SMSR with the Office of Safety and Mission Assurance (OSMA).

i. The Chief, Safety and Mission Assurance ensures the existence of robust safety and mission assurance processes and activities through the development, implementation, assessment, and functional oversight of Agency-wide safety, reliability, maintainability, quality, and risk management policies and procedures. The Chief, SMA serves as principal advisor to the Administrator and other senior officials on Agency-wide safety, reliability, maintainability, and quality; performs independent program and project compliance verification audits; implements the SMA Technical Authority process; monitors, collects, and assesses Agency-wide safety and mission assurance financial and performance results; oversees the prompt investigation of NASA mishaps and assures the appropriate closure; and co-chairs the Safety and Mission Success Review (SMSR) with the OCE.

j. The Chief Health and Medical Officer establishes policy, oversight, and assessment on all health and medical matters associated with NASA missions, is responsible for implementation of the Health and Medical Technical Authority process, and serves as principal advisor to the Administrator and other senior officials on health and medical issues related to the Agency workforce.

k. The Mission Support Directorate (MSD) Associate Administrator establishes policy and procedures for institutional oversight for mission support functional areas (e.g., procurement).

l. Roles and responsibilities for other NASA organizations can be found in NPD 1000.3.

3.3 Technical Authority

3.3.1 Programs and projects shall follow the Technical Authority (TA) process established in this Section 3.3. NASA established this process as part of its system of checks and balances to provide independent oversight of programs and projects in support of safety and mission success through the selection of specific individuals with delegated levels of authority. These individuals are the Technical Authorities. In this document, the term TA is used to refer to such an individual, but is also used to refer to elements of the TA process. The responsibilities of a program or project manager are not diminished by the implementation of TA. The program or project manager is ultimately responsible for the safe conduct and successful outcome of the program or project in conformance with governing requirements. This includes meeting programmatic, institutional, technical, safety, cost, and schedule commitments.

3.3.1.1 TA originates with the Administrator and is formally delegated to the NASA AA and then to the NASA Chief Engineer for Engineering Technical Authority; the Chief, Safety and Mission Assurance for SMA Technical Authority; and then to the Center Directors. The Administrator delegates Health and Medical Technical Authority (HMTA) to the NASA Chief Health and Medical Officer. HMTA may then be delegated to the Center Chief Medical Officer with the concurrence of the Center Director. Subsequent TA delegations are made to selected individuals who are funded independent of the Programmatic Authority. Such delegations are formal and traceable to the Administrator. TAs located at Centers remain part of their Center organization, and their personnel performance appraisal is signed by the management of that Center organization. The Center Director (or designee) is responsible for establishing and maintaining Center TA policies and practices, consistent with Agency policies and standards.

3.3.2 Other Technical Authority Roles

3.3.2.1 Top-level documents developed by a program detailing Agency-level requirements for human-rated systems are signed by the Administrator or his/her formally delegated designee.

3.3.2.2 On decisions related to technical and operational matters involving safety and mission success residual risk, formal concurrence by the responsible TAs (Engineering, Safety and Mission Assurance, and/or Health and Medical) is required. This concurrence is to be based on the technical merits of the case. For residual risks to personnel or high-value hardware, the cognizant safety organization needs to agree that the risk is acceptable. For matters involving human safety risk, the actual risk taker(s) (or official spokesperson(s) and their supervisory chain) need to formally consent to taking the risk and the responsible program, project, or operations manager needs to formally accept the risk.

3.3.3 At the program or project level, the responsibilities common to each of the individuals with delegated TA (Engineering Technical Authority (ETA), SMA TA, and HMTA) are delineated below. (See paragraphs 3.3.6 to 3.3.9 for unique aspects of each of the TAs.) These individuals:

a. Serve as members of program or project control boards, change boards, and internal review boards.

b. Work with the Center management and other TA personnel, as necessary, to ensure that the quality and integrity of program or project processes, products, and standards of performance related to engineering, SMA, and health and medical reflect the level of excellence expected by the Center or, where appropriate, by the NASA TA community.

c. Ensure that requests for waivers or deviations from TA requirements are submitted to and acted on by the appropriate level of TA. ("Technical Authority requirements" is defined in Appendix A.)

d. Assist the program or project in making risk-informed decisions that properly balance technical

merit, cost, schedule, and safety across the system.

e. Provide the program or project with the TA view of matters based on their knowledge and experience and raise a Dissenting Opinion (see Section 3.4) on a decision or action, when appropriate.

f. Serve as an effective part of NASA's overall system of checks and balances.

3.3.3.1 At all Centers (except Johnson Space Center, where the chief medical officer serves this function), the program/project-level ETA and SMA TA are responsible to serve as the awareness and communication links for potential HMTA issues and to inform the appropriate level of HMTA, the program/project manager, and Center management of potential HMTA issues. (See NPR 7120.11, NASA Health and Medical Technical Authority (HMTA) Implementation.)

3.3.4 The day-to-day involvement of the TAs in program/project activities ensures that significant views from the TAs will be available to the program/project in a timely manner and should be handled during the normal program/project processes. TAs are expected to keep their discipline chain of authority informed of issues as they are arise, including direct communication between the Center's engineering director, SMA director (or equivalent), and chief medical officer with their counterparts at NASA Headquaters.

3.3.5 Infrequent circumstances may arise when a TA and the program or project manager disagree on a proposed programmatic or technical action and judge that the issue rises to a level of significance that should be brought to the attention of the next higher level of management (i.e., a Dissenting Opinion exists). In such circumstances:

a. Resolution occurs prior to Implementation whenever possible. However, if considered to be in the best interest of the program/project, the program/project manager has the authority to proceed at risk in parallel with the pursuit of a resolution. In such circumstances, the next higher level of Programmatic and TA is informed of the decision to proceed at risk.

b. Resolution is jointly attempted at successively higher levels of Programmatic Authority and TA until resolved. Final appeals are made to the NASA Administrator.

3.3.6 **The Engineering Technical Authority (ETA)** establishes and is responsible for the engineering design processes, specifications, rules, best practices, etc., necessary to fulfill programmatic mission performance requirements.

3.3.6.1 The NASA Chief Engineer provides overall leadership for the ETA process for programs and projects, including Agency engineering policy direction, requirements, and standards. The NASA Chief Engineer approves the appointment of the Center engineering directors (or equivalent) and of ETAs on programs and Category 1 projects and is notified of the appointment of other Engineering TAs. The NASA Chief Engineer hears appeals of engineering decisions when they cannot be resolved at lower levels.

3.3.6.2 The Center Director (or designee) develops the Center's ETA policies and practices, consistent with Agency policies and standards. The following individuals are responsible for implementing ETA at the Center:

a. Center Director - The Center Director (or the Center engineering director or designee) is the Center ETA responsible for Center engineering design processes, specifications, rules, best practices, etc., necessary to fulfill mission performance requirements for programs, projects, and/or major systems implemented by the Center. The Center Director delegates Center ETA implementation responsibility to an individual in the Center's engineering leadership. The Center ETA supports the TAs in processing changes to and waivers or deviations from requirements that

are the responsibility of the ETA. This includes all applicable Agency and Center engineering directives, requirements, procedures, and standards. The Center Director appoints, with the approval of the NASA Chief Engineer, individuals for the position of Center engineering director (or equivalent) and for the ETA positions down to and including program chief engineers and Category 1 project chief engineers (or equivalents). [7] The Center Director appoints Category 2 and 3 project chief engineers and lead discipline engineers.

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[7] Centers may use an equivalent term for these positions, such as Program/Project Systems Engineer.

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b. Program/Project Chief Engineer (PCE) - The PCE is the position to which the program/project-level ETA has been delegated. Different Centers use different titles for this position.

c. Lead Discipline Engineer (LDE) - The LDE is a senior technical engineer in a specific discipline at the Center. Different Centers use different titles for this position. The LDE assists the program/project through direct involvement with working-level engineers to identify engineering requirements in accordance with NPR 7120.10, Technical Standards for NASA Programs and Projects and other documents, and develop solutions that comply with the requirements. The LDE works through and with the PCE to ensure the proper application and management of discipline-specific engineering requirements and Agency standards.

3.3.6.3 The ETA for the program or project leads and manages the engineering activities, including systems engineering, design, development, sustaining engineering, and operations. A Center may have more than one engineering organization and delegates ETA to different areas as needed. To support the program/project and maintain ETA independence and an effective check and balance system:

a. The program/project manager concurs in the appointment of the program/project-level ETAs.

b. The ETA cannot approve a request for relief from a non-technical derived requirement established by a Programmatic Authority.

c. An ETA may approve a request for relief from a technical derived requirement if he/she ensures that the appropriate independent Institutional Authority subject matter expert who is the steward for the involved technology has concurred in the decision to approve the requirement relief.

3.3.7 Although a limited number of individuals make up the ETAs, their work is enabled by the contributions of the program's or project's working-level engineers and other supporting personnel (e.g., contracting officers). The working-level engineers do not have formally delegated TA and consequently may not serve in an ETA capacity. These engineers perform the detailed engineering and analysis for the program/project with guidance from their Center management and/or LDEs and support from the Center engineering infrastructure. They deliver the program/project products (e.g., hardware, software, designs, analysis, and technical alternatives) that conform to applicable programmatic, Agency, and Center requirements. They are responsible for raising issues to the program/project manager, Center engineering management, and/or the PCE, as appropriate, and are a key resource for resolving these issues.

3.3.8 **The Safety and Mission Assurance (SMA) TA** establishes and is responsible for the SMA processes, specifications, rules, best practices, etc., necessary to fulfill safety and programmatic mission performance requirements. (Refer to NASA-STD-8709.20, Management of Safety and Mission Assurance Technical Authority (SMA TA) Requirements. The following individuals are responsible for implementing SMA TA at the Center:

3.3.8.1 The Chief, SMA hears appeals of SMA decisions when issues cannot be resolved below the Agency level.

3.3.8.2 The Center Director (or the Center SMA director or designee) is the Center SMA TA responsible for Center safety and mission assurance processes, specifications, rules, best practices, etc., necessary to fulfill mission performance requirements for programs, projects, and/or major systems implemented by the Center. The Center Director (or designee) also monitors, collects, and assesses institutional, program, and project SMA financial metrics and performance results. The Center Director delegates Center SMA TA implementation responsibility to an individual in the Center's safety and mission assurance leadership. The Center SMA TA supports the lower level SMA TAs in processing changes to and waivers or deviations from requirements that are the responsibility of the SMA TA. This includes all applicable Agency and Center SMA directives, requirements, procedures, and standards. The Center Director appoints, with the approval of the NASA Chief, SMA, individuals for the position of Center SMA director (or equivalent). The Center SMA director, in consultation with the NASA Chief, SMA, appoints program- and project-level chief safety and mission assurance officers (CSOs) to exercise the TA role within programs and projects.

3.3.9 **The Health and Medical Technical Authority (HMTA)** is the NASA Chief Health and Medical Officer (CHMO). The CHMO establishes and is responsible for the health and medical Agency-level requirements, specifications, rules, best practices, etc., necessary to fulfill programmatic mission performance requirements.

3.3.9.1 Due to Center infrastructure differences, the flow down of HMTA processes and responsibilities from the CHMO varies between Centers. Additionally, the CHMO entered into an agreement with SMA and OCE to have engineering and safety TA personnel serve as awareness and communication links for HMTA. The HMTA flow down and communication processes, including roles and responsibilities, are specified in NPR 7120.11, Health and Medical Technical Authority Implementation, and further described in the Center HMTA implementation plan. This NPR recognizes that medical staff have a special obligation to protect the handling and dissemination of an individual's medical information and the necessity of respecting these restrictions.

3.3.9.2 When applicable, the Program Plan or Project Plan will describe how the program or project will comply with HMTA requirements and processes as described in NPR 7120.11. The CHMO hears appeals of HMTA decisions when issues cannot be resolved below the Agency level.

3.4 Process for Handling Dissenting Opinions

3.4.1 Programs and projects shall follow the Dissenting Opinion process in this Section 3.4. NASA teams have full and open discussions, with all facts made available, to understand and assess issues. Diverse views are to be fostered and respected in an environment of integrity and trust with no suppression or retribution. In the team environment in which NASA operates, team members often have to determine where they stand on a decision. In assessing a decision or action, a member has three choices: agree, disagree but be willing to fully support the decision, or disagree and raise a Dissenting Opinion. Unresolved issues of any nature (e.g., programmatic, safety, engineering, health and medical, acquisition, accounting) within a team should be quickly elevated to achieve resolution at the appropriate level.

3.4.2 When time permits, the disagreeing parties jointly document the issue, including agreed-to facts, discussion of the differing positions with rationale and impacts, and the parties' recommendations. The joint documentation needs to be approved by the representative of each view, concurred with by affected parties, and provided to the next higher level of the involved authorities

with notification to the second higher level of management. This may involve a single authority (e.g., the Programmatic Authority) or multiple authorities (e.g., Programmatic and TAs). In cases of urgency, the disagreeing parties may jointly present the information stated above orally with all affected organizations represented, advance notification to the second-higher level of management, and documentation follow up.

3.4.3 Management's decision on the dissent memorandum (or oral presentation) is documented and provided to the dissenter and to the notified managers and becomes part of the program or project record. If the dissenter is not satisfied with the process or outcome, the dissenter may appeal to the next higher level of management. The dissenter has the right to take the issue upward in the organization, even to the NASA Administrator, if necessary.

3.5 Principles Related to Tailoring Requirements

3.5.1 Programs and projects shall follow the tailoring process in this Section.

3.5.2 It is NASA policy that all prescribed requirements (requirements levied on a lower organizational level by a higher organizational level) are complied with unless relief is formally granted. Policy also recognizes that each program or project has unique aspects that must be accommodated to achieve mission success in an efficient and economical manner. Tailoring is the process used to adjust or seek relief from a prescribed requirement to meet the needs of a specific program or project. Tailoring is both an expected and accepted part of establishing proper requirements. For requests for relief from requirements that are the responsibility of the Chief, SMA, NASA-STD-8709.20 contains the SMA-specific process. Refer to the NASA Space Flight Program and Project Management Handbook for additional explanation and guidance related to the tailoring process.

3.5.3 The evaluation and disposition of requests for tailoring (including Agency-level requirements and standards) comply with the following:

a. The request for relief from a requirement includes the rationale, a risk evaluation, and reference to all material that provides the justification supporting acceptance. The request for requirement relief is referred to as a "deviation" or "waiver" depending on the timing of the request. Deviations apply before a requirement is put under configuration control at the level the requirement will be implemented, and waivers apply after.

b. The organization submitting the tailoring request informs the next higher level of involved management in a timely manner of the tailoring request.

c. The organization at the level that established the requirement dispositions the request for tailoring of that requirement unless this authority has been formally delegated elsewhere. Such delegations will maintain the separation of Programmatic and Institutional Authorities required by governance.

d. The dispositioning organization consults with the other organizations that were involved in the establishment of the specific requirement and obtains the concurrence of those organizations having a substantive interest.

e. Approved tailoring requests become part of the retrievable program or project records.

3.5.4 A prescribed requirement that is not relevant and/or not capable of being applied to a specific program, project, system, or component can be approved as Non-Applicable by the individual who has been delegated oversight authority by the organization that established the requirement. This approval can be granted at the level where the requirement was specified for implementation (e.g., the project-level ETA could approve a Non-Applicable designation for an engineering requirement).

The request and approval documentation become part of the retrievable program or project records. No other formal deviation or waiver process is required.

3.5.5 A request for a permanent change to a prescribed requirement in an Agency or Center document that is applicable to all programs and projects shall be submitted as a "change request" to the office responsible for the requirement policy document unless formally delegated elsewhere.

3.5.6 Tailoring NPR 7120.5

3.5.6.1 Tailoring of NPR 7120.5 requirements is dispositioned by the designated officials shown in Table 3-1, unless formally delegated elsewhere. Requests for tailoring may be submitted in the form of the Compliance Matrix (Appendix C) or by using a waiver request (see the NASA Space Flight Program and Project Management Handbook) individually or in groups. Regardless of whether the waiver is documented as a stand-alone document or as part of the Compliance Matrix, the required signatures from the responsible organizations are to be obtained.

Table 3-1 Waiver Approval Authority for NPR 7120.5 Requirements

	Project Manager	Program Manager	Center Director	MDAA	Chief Engineer	NASA AA	Approval Authority for Waivers or Deviations with Dissent
Programs		R	C**	R	A	I	NASA AA
Category 1, 2, and 3 Projects	R	R	C**	R	A	I	NASA AA
Reimbursable Space Flight Projects	R		C**	R*	A	I	NASA AA

R = Recommends; C = Concurs; A = Approves; I = Informed

* As applicable

**Unless otherwise delegated

3.6 Reimbursable Space Flight Work

3.6.1 A Center negotiating reimbursable space flight work with another agency shall propose NPR 7120.5 as the basis by which it will perform the space flight work. If the sponsoring agency does not want NPR 7120.5 requirements (or a subset of those requirements) to be followed, then the interagency Memorandum of Understanding/Memorandum of Agreement (MOU/MOA) or the contract needs to explicitly identify those requirements that will not be followed, along with the substitute requirements for equivalent processes and any additional program/project management requirements the sponsoring agency wants. The Center obtains a formal waiver by the NASA Chief Engineer for those NPR 7120.5 requirements that are not to be followed or the Center cannot accept the work.

3.7 Use of the Metric System

3.7.1 The International System of Units (commonly known as the Systeme Internationale (SI) or metric system of measurement) is to be used for all new space flight projects and programs, especially in cooperative efforts with International Partners. 15 U.S.C. §205b and Executive Order 12770 provide relief from this preferential use of SI if it is found that obtaining components in SI units would result in a substantial increase in cost or unacceptable delays in schedule. Each program and project shall perform and document an assessment to determine an approach that maximizes the use of SI. This assessment will document an integration strategy if both SI and U.S. customary units are used in a project or program. The assessment is to be completed and documented in the Program Plan or Project Plan no later than the SDR.

Appendix A. Definitions

Acquisition. The process for obtaining the systems, research, services, construction, and supplies that NASA needs to fulfill its missions. Acquisition--which may include procurement (contracting for products and services)--begins with an idea or proposal that aligns with the NASA Strategic Plan and fulfills an identified need and ends with the completion of the program or project or the final disposition of the product or service.

Acquisition Plan. The integrated acquisition strategy that enables a program or project to meet its mission objectives and provides the best value to NASA. (See a description in Section 3.4 of the Program Plan and Project Plan templates, appendices G and H.)

Acquisition Strategy Meeting. A forum where senior Agency management reviews major acquisitions in programs and projects before authorizing significant budget expenditures. The ASM is held at the Mission Directorate/Mission Support Office level, implementing the decisions that flow out of the earlier Agency acquisition strategy planning. The ASM is typically held early in Formulation, but the timing is determined by the Mission Directorate. The ASM focuses on considerations such as impacting the Agency workforce, maintaining core capabilities and make-or-buy planning, and supporting Center assignments and potential partners.

Agency Baseline Commitment. Establishes and documents an integrated set of project requirements, cost, schedule, technical content, and an agreed-to JCL that forms the basis for NASA's commitment to the external entities of OMB and Congress. Only one official baseline exists for a NASA program or project, and it is the Agency Baseline Commitment.

Agency Program Management Council. The senior management group, chaired by the NASA Associate Administrator or designee that is responsible for reviewing Formulation performance, recommending approval, and overseeing implementation of programs and Category 1 projects according to Agency commitments, priorities, and policies.

Agreement. The statement (oral or written) of an exchange of promises. Parties to a binding agreement can be held accountable for its proper execution and a change to the agreement requires a mutual modification or amendment to the agreement or a new agreement.

Analysis of Alternatives. A formal analysis method that compares alternative approaches by estimating their ability to satisfy mission requirements through an effectiveness analysis and by estimating their life-cycle costs through cost analysis. The results of these two analyses are used together to produce a cost-effectiveness comparison that allows decision makers to assess the relative value or potential programmatic returns of the alternatives. An analysis of alternatives broadly examines multiple elements of program/project alternatives (including technical performance, risk, LCC, and programmatic aspects).

Announcement of Opportunity. An AO is one form of a NASA Broad Agency Announcement, which is a form of public/private competition. NASA solicits, accepts, and evaluates proposals submitted by all categories of proposers in response to an AO, including academia, industry, not-for-profits, Government laboratories, Federally Funded Research and Development Centers (FFRDC), NASA Centers, and the Jet Propulsion Laboratory. Regulatory coverage of AOs appears in NASA Federal Acquisition Regulation (FAR) Supplement (NFS) Part 1872. NASA typically uses a one-step or a two-step AO process. In a one-step AO process, proposals for new projects are evaluated competitively and selected for Formulation in a single step. In two-step competitions, several proposals for new projects may be selected in Step 1 and given time to mature their concepts in a funded concept study before the Step 2 down-selection.

Approval. Authorization by a required management official to proceed with a proposed course of action. Approvals are documented.

Approval (for Implementation). Acknowledgment by the Decision Authority that the program /project has met stakeholder expectations and Formulation requirements and is ready to proceed to Implementation. By approving a program/project, the Decision Authority commits the budget resources necessary to continue into Implementation. Approval (for Implementation) is documented.

Assure. To promise or say with confidence. It is more about saying than doing. (An example is: I assure you that you will be warm enough.)

Architectural Control Document. A configuration-controlled document or series of documents that embodies a cross-Agency mission architecture(s), including the structure, relationships, interfaces, principles, assumptions, and results of the analysis of alternatives that govern the design and implementation of the enabling mission systems.

Baseline (document context). Implies the expectation of a finished product, though updates may be needed as circumstances warrant. All approvals required by Center policies and procedures have been obtained.

Baseline (general context). An agreed-to set of requirements, cost, schedule, designs, documents, etc., that will have changes controlled through a formal approval and monitoring process.

Baseline Performance Review. A monthly Agency-level independent assessment to inform senior leadership of performance and progress toward the Agency's mission and program/project performance. The monthly meeting encompasses a review of crosscutting mission support issues and all NASA mission areas.

Baseline Science Requirements. The mission performance requirements necessary to achieve the full science objectives of the mission. (Also see Threshold Science Requirements.)

Basis of Estimate. The documentation of the ground rules, assumptions, and drivers used in developing the cost and schedule estimates, including applicable model inputs, rationale or justification for analogies, and details supporting cost and schedule estimates. The basis of estimate is contained in material available to the SRB and management as part of the LCR and KDP process.

Budget. A financial plan that provides a formal estimate of future revenues and obligations for a definite period of time for approved programs, projects, and activities. (See NPR 9420.1 and NPR 9470.1 for other related financial management terms and definitions.)

Center Management Council. The council at a Center that performs oversight of programs and projects by evaluating all program and project work executed at that Center.

Change Request. A change to a prescribed requirement set forth in an Agency or Center document intended for all programs and projects for all time.

Compliance Matrix. The Compliance Matrix (Appendix C) documents whether and how the program or project complies with the requirements of NPR 7120.5. It provides rationale and approvals for waivers from requirements and is part of retrievable program and project records.

Component Facilities. Complexes that are geographically separated from the NASA Center or institution to which they are assigned, but are still part of the Agency.

Concept Documentation (formerly Mission Concept Report). Documentation that captures and

communicates a feasible concept that meets the goals and objectives of the mission, including results of analyses of alternative concepts, the concept of operations, preliminary risks, and potential descopes. It may include images, tabular data, graphs, and other descriptive material.

Concurrence. A documented agreement by a management official that a proposed course of action is acceptable.

Confidence Level. A probabilistic assessment of the level of confidence of achieving a specific goal.

Configuration Management. A management discipline applied over a product's life cycle to provide visibility into and control changes to performance, functionality, and physical characteristics.

Conflict of Interest. A conflict of interest involves the abuse - actual, apparent, or potential - of the trust that NASA has in its personnel. A conflict of interest is a situation in which financial or other personal considerations have the potential to compromise or bias professional judgment and objectivity. An apparent conflict of interest is one in which a reasonable person would think that the individual's judgment is likely to be compromised. A potential conflict of interest involves a situation that may develop into an actual conflict of interest. A conflict of interest exists whether or not decisions are affected by a personal interest; a conflict of interest implies only the potential for bias, not likelihood.

Continuous Risk Management. A systematic and iterative process that efficiently identifies, analyzes, plans, tracks, controls, communicates, and documents risks associated with implementation of designs, plans, and processes.

Contract. A mutually binding legal relationship obligating the seller to furnish the supplies or services (including construction) and the buyer to pay for them. It includes all types of commitments that obligate the Government to an expenditure of appropriated funds and that, except as otherwise authorized, are in writing. In addition to bilateral instruments, contracts include (but are not limited to) awards and notices of awards; job orders or task letters issued under basic ordering agreements; letter contracts; orders, such as purchase orders, under which the contract becomes effective by written acceptance or performance; and bilateral contract modifications. Contracts do not include grants and cooperative agreements.

Convening Authority. The management official(s) responsible for convening a program/project review; establishing the Terms of Reference, including review objectives and success criteria; appointing the SRB chair; and concurring in SRB membership. These officials receive the documented results of the review.

Cost Analysis Data Requirement. A formal document designed to help managers understand the cost and cost risk of space flight projects. The Cost Analysis Data Requirement (CADRe) consists of a Part A "Narrative" and a Part B "Technical Data" in tabular form, both provided by the program/project or Cost Analysis Division. Also, the project team produces the project life-cycle cost estimate, schedule, and risk identification, which is appended as Part C.

Decision Authority (program and project context). The individual authorized by the Agency to make important decisions on programs and projects under their authority.

Decision Memorandum. The document that summarizes the decisions made at KDPs or as necessary in between KDPs. The decision memorandum includes the Agency Baseline Commitment (if applicable), Management Agreement cost and schedule, UFE, and schedule margin managed above the project, as well as life-cycle cost and schedule estimates, as required.

Decommissioning. The process of ending an operating mission and the attendant project as a result of a planned end of the mission or project termination. Decommissioning includes final delivery of any remaining project deliverables, disposal of the spacecraft and all its various supporting systems, closeout of contracts and financial obligations, and archiving of project/mission operational and scientific data and artifacts. Decommissioning does not mean that scientific data analysis ceases, only that the project will no longer provide the resources for continued research and analysis.

Derived Requirements. Requirements arising from constraints, consideration of issues implied but not explicitly stated in the high-level direction provided by NASA Headquarters and Center institutional requirements, factors introduced by the selected architecture, and the design. These requirements are finalized through requirements analysis as part of the overall systems engineering process and become part of the program/project requirements baseline. Derived non-technical requirements are established by, and are the responsibility of, the Programmatic Authority. Derived technical requirements are the responsibility of the Institutional Authority.

Design Documentation. A document or series of documents that captures and communicates to others the specific technical aspects of a design. It may include images, tabular data, graphs, and other descriptive material. Design documentation is different from the CADRe, though parts of design documentation may be repeated in the latter.

Development Costs. The total of all costs from the period beginning with the approval to proceed to Implementation at the beginning of Phase C through operational readiness at the end of Phase D.

Deviation. A documented authorization releasing a program or project from meeting a requirement before the requirement is put under configuration control at the level the requirement will be implemented.

Disposal. The process of eliminating a project's assets, including the spacecraft and ground systems. Disposal includes the reorbiting, deorbiting, and/or passivation (i.e., the process of removing stored energy from a space structure at the end of mission that could result in an explosion or deflagration of the space structure) of a spacecraft.

Dissenting Opinion. A disagreement with a decision or action that is based on a sound rationale (not on unyielding opposition) that an individual judges is of sufficient importance that it warrants a specific review and decision by higher-level management, and the individual specifically requests that the dissent be recorded and resolved by the Dissenting Opinion process.

Earned Value Management. A tool for measuring and assessing project performance through the integration of technical scope with schedule and cost objectives during the execution of the project. EVM provides quantification of technical progress, enabling management to gain insight into project status and project completion costs and schedules. Two essential characteristics of successful EVM are EVM system data integrity and carefully targeted monthly EVM data analyses (e.g., identification of risky WBS elements).

Earned Value Management System. An integrated management system and its related subsystems that allow for planning all work scope to completion; assignment of authority and responsibility at the work performance level; integration of the cost, schedule, and technical aspects of the work into a detailed baseline plan; objective measurement of progress (earned value) at the work performance level; accumulation and assignment of actual costs; analysis of variances from plans; summarization and reporting of performance data to higher levels of management for action; forecast of achievement of milestones and completion of events; forecast of final costs; and disciplined baseline maintenance and incorporation of baseline revisions in a timely manner.

Engineering Requirements. Requirements defined to achieve programmatic requirements and

relating to the application of engineering principles, applied science, or industrial techniques.

Environmental Impact. The direct, indirect, or cumulative beneficial or adverse effect of an action on the environment.

Ensure. To do or have what is necessary for success. (An example is: I ensure that you will be warm enough.)

Environmental Management. The activity of ensuring that program and project actions and decisions that may potentially affect or damage the environment are assessed during the Formulation Phase and reevaluated throughout Implementation. This activity is performed according to all NASA policy and Federal, State, Tribal government and local environmental laws and regulations.

Evaluation. The continual self- and independent assessment of the performance of a program or project and incorporation of the evaluation findings to ensure adequacy of planning and execution according to plans.

Final (document context). Implies the expectation of a finished product. All approvals required by Center policies and procedures have been obtained.

Formulation. The identification of how the program or project supports the Agency's strategic goals; the assessment of feasibility, technology, and concepts; risk assessment, team building, development of operations concepts, and acquisition strategies; establishment of high-level requirements and success criteria; the preparation of plans, budgets, and schedules essential to the success of a program or project; and the establishment of control systems to ensure performance to those plans and alignment with current Agency strategies.

Formulation Agreement. The Formulation Agreement is prepared by the project to establish the technical and acquisition work that needs to be conducted during Formulation and defines the schedule and funding requirements during Phase A and Phase B for that work.

Formulation Authorization Document. The document issued by the MDAA to authorize the formulation of a program whose goals will fulfill part of the Agency's Strategic Plan and Mission Directorate strategies and establish the expectations and constraints for activity in the Formulation Phase. In addition, a FAD or equivalent is used to authorize the formulation of a project. (See Appendix E.)

Funding (budget authority). The authority provided by law to incur financial obligations that will result in expenditures. There are four basic forms of budget authority, but only two are applicable to NASA: appropriations and spending authority from offsetting collections (reimbursables and working capital funds). Budget authority is provided or delegated to programs and projects through the Agency's funds distribution process.

Health and Medical Requirements. Requirements defined by the Office of the Chief Health and Medical Officer.

Highly Specialized Information Technology. Highly specialized Information Technology (IT) is a part of, internal to, or embedded in a mission platform. The platform's function (e.g., avionics, guidance, navigation, flight controls, simulation, radar, etc.) is enabled by IT but not driven by IT itself (e.g., computer hardware and software to automate internal functions of a spacecraft or spacecraft support system such as spacecraft control and status, sensor signal and data processing, and operational tasking). Representative examples of highly specialized IT include: avionics software, real-time control systems, onboard processors, the Deep Space Network, spacecraft instrumentation software, wind tunnel control system, human physiology monitoring systems,

ground support environment, experiment simulators, Mission Control Centers, and launch cameras. (For the complete definition, see NPR 7120.7, NASA Information Technology and Institutional Infrastructure Program and Project Management Requirements.)

Implementation. The execution of approved plans for the development and operation of the program/project, and the use of control systems to ensure performance to approved plans and continued alignment with the Agency's goals.

Independent Assessment(s) (includes reviews, evaluations, audits, analysis oversight, investigations). Assessments are independent to the extent the involved personnel apply their expertise impartially and without any conflict of interest or inappropriate interference or influence, particularly from the organization(s) being assessed.

Independent Funding (context of Technical Authority). The funding of Technical Authorities is considered independent if funding originating from the Mission Directorate or other Programmatic Authorities is provided to the Center in a manner that cannot be used to influence the technical independence or security of Technical Authorities.

Industrial Base. The capabilities residing in either the commercial or government sector required to design, develop, manufacture, launch, and service the program or project. This encompasses related manufacturing facilities, supply chain operations and management, a skilled workforce, launch infrastructure, research and development, and support services.

Information Technology. Any equipment or interconnected system(s) or subsystem(s) of equipment that is used in the automatic acquisition, storage, analysis, evaluation, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information by the Agency.

Infrastructure Requirements. The facilities and environmental, aircraft, personal property, equipment, and information technology resources that are needed to support programs and projects. Utilization of the capability afforded by the infrastructure includes consideration of the maintenance and other liabilities it presents.

Institutional Authority. Institutional Authority encompasses all those organizations and authorities not in the Programmatic Authority. This includes Engineering, Safety and Mission Assurance, and Health and Medical organizations; Mission Support organizations; and Center Directors.

Institutional Requirements. Requirements that focus on how NASA does business that are independent of the particular program or project. There are five types: Engineering, program/project management, safety and mission assurance, health and medical, and Mission Support Office functional requirements.

Integrated Baseline Review. A risk-based review conducted by Program/Project Management to ensure a mutual understanding between the customer and supplier of the risks inherent in the supplier's Performance Measurement Baseline (PMB) and to ensure that the PMB is realistic for accomplishing all of the authorized work within the authorized schedule and budget.

Integrated Center Management Council. The forum used by projects and programs that are being implemented by more than one Center and includes representatives from all participating Centers. The ICMC will be chaired by the director of the Center (or representative) responsible for program or project management.

Integrated Logistics Support. The management, engineering activities, analysis, and information management associated with design requirements definition, material procurement and distribution, maintenance, supply replacement, transportation, and disposal that are identified by space flight and

ground systems supportability objectives.

Integrated Master Schedule. A logic network-based schedule that reflects the total project scope of work, traceable to the WBS, as discrete and measurable tasks/milestones and supporting elements that are time phased through the use of valid durations based on available or projected resources and well-defined interdependencies.

Integration Plan. The integration and verification strategies for a project interface with the system design and decomposition into the lower-level elements. The integration plan is structured to bring the elements together to assemble each subsystem and to bring all of the subsystems together to assemble the system/product. The primary purposes of the integration plan are: (1) to describe this coordinated integration effort that supports the implementation strategy, (2) to describe for the participants what needs to be done in each integration step, and (3) to identify the required resources and when and where they will be needed.

Integrated Program Management Report. The IPMR is the primary means of communicating program/project cost and schedule information between a contractor and the Government. The IPMR consists of seven report formats that provide program/project managers information to: (1) integrate cost and schedule performance data with technical performance measures, (2) identify the magnitude and impact of actual and potential problem areas causing significant cost and schedule variances, (3) forecast schedule completions, and (4) provide valid, timely program/project status information to higher management for effective decision making. This is a contract data requirement when EVM is required.

Interface Control Document. An agreement between two or more parties on how interrelated systems will interface with each other. It documents interfaces between things like electrical connectors (what type, how many pins, what signals will be on each of the pins, etc.); fluid connectors (type of connector or of fluid being passed, flow rates of the fluid, etc.); mechanical (types of fasteners, bolt patterns, etc.); and any other interfaces that might be involved.

Joint Cost and Schedule Confidence Level. (1) The probability that cost will be equal to or less than the targeted cost and schedule will be equal to or less than the targeted schedule date. (2) A process and product that helps inform management of the likelihood of a project's programmatic success. (3) A process that combines a project's cost, schedule, and risk into a complete picture. JCL is not a specific methodology (e.g., resource-loaded schedule) or a product from a specific tool. The JCL calculation includes consideration of the risk associated with all elements, regardless of whether or not they are funded from appropriations or managed outside of the project. JCL calculations include the period from KDP C through the hand over to operations, i.e., end of the on-orbit checkout.

Key Decision Point. The event at which the Decision Authority determines the readiness of a program/project to progress to the next phase of the life cycle (or to the next KDP).

Knowledge Management. A collection of policies, processes, and practices relating to the use of intellectual and knowledge-based assets in an organization.

Learned Lession. Captured knowledge or understanding gained through experience which, if shared, would benefit the work of others. Unlike a best practice, lessons learned describes a specific event that occurred and provides recommendations for obtaining a repeat of success or for avoiding reoccurrence of an adverse work practice or experience.

Life-Cycle Cost. The total of the direct, indirect, recurring, nonrecurring, and other related expenses both incurred and estimated to be incurred in the design, development, verification, production, deployment, prime mission operation, maintenance, support, and disposal of a project, including

closeout, but not extended operations. The LCC of a project or system can also be defined as the total cost of ownership over the project or system's planned life cycle from Formulation (excluding Pre-Phase A) through Implementation (excluding extended operations). The LCC includes the cost of the launch vehicle.

Life-Cycle Review. A review of a program or project designed to provide a periodic assessment of the technical and programmatic status and health of a program or project at a key point in the life cycle, e.g., Preliminary Design Review (PDR) or Critical Design Review (CDR). Certain life-cycle reviews provide the basis for the Decision Authority to approve or disapprove the transition of a program/project at a KDP to the next life-cycle phase.

Loosely Coupled Programs. These programs address specific objectives through multiple space flight projects of varied scope. While each individual project has an assigned set of mission objectives, architectural and technological synergies and strategies that benefit the program as a whole are explored during the Formulation process. For instance, Mars orbiters designed for more than one Mars year in orbit are required to carry a communication system to support present and future landers.

Management Agreement. Within the Decision Memorandum, the parameters and authorities over which the program or project manager has management control constitute the program or project Management Agreement. A program or project manager has the authority to manage within the Management Agreement and is accountable for compliance with the terms of the agreement.

Margin. The allowances carried in budget, projected schedules, and technical performance parameters (e.g., weight, power, or memory) to account for uncertainties and risks. Margins are allocated in the formulation process, based on assessments of risks, and are typically consumed as the program/project proceeds through the life cycle.

Metric. A measurement taken over a period of time that communicates vital information about the status or performance of a system, process, or activity.

Mission. A major activity required to accomplish an Agency goal or to effectively pursue a scientific, technological, or engineering opportunity directly related to an Agency goal. Mission needs are independent of any particular system or technological solution.

Mission Directorate Program Management Council. The forum that evaluates all programs and projects executed within that Mission Directorate and provides input to the MDAA. For programs and Category 1 projects, the MDAA carries forward the MDPMC findings and recommendations to the APMC.

Mission Support Office Requirements. Requirements defined by Mission Support Offices (e.g., procurement and medical).

Non-Applicable Requirement. Any requirement not relevant; not capable of being applied.

Operations Concept (formerly Mission Operations Concept). A description of how the flight system and the ground system are used together to ensure that the concept of operation is reasonable. This might include how mission data of interest, such as engineering or scientific data, are captured, returned to Earth, processed, made available to users, and archived for future reference. The Operations Concept should describe how the flight system and ground system work together across mission phases for launch, cruise, critical activities, science observations, and end of mission to achieve the mission.

Orbital Debris. Any object placed in space by humans that remains in orbit and no longer serves any useful function. Objects range from spacecraft to spent launch vehicle stages to components and

also include materials, trash, refuse, fragments, and other objects that are overtly or inadvertently cast off or generated.

Performance Measurement Baseline. The time-phased cost plan for accomplishing all authorized work scope in a project's life cycle, which includes both NASA internal costs and supplier costs. The project's performance against the PMB is measured using earned value management, if required, or other performance measurement techniques if EVM is not required. The PMB does not include UFE.

Preliminary (document context). Implies that the product has received initial review in accordance with Center best practices. The content is considered correct, though some TBDs may remain. All approvals required by Center policies and procedures have been obtained. Major changes are expected.

Prescribed Requirement. A requirement levied on a lower organizational level by a higher organizational level.

Primary Risks. Those undesirable events having both high probability and high impact/severity.

Principal Investigator. A person who conceives an investigation and is responsible for carrying it out and reporting its results. In some cases, PIs from industry and academia act as project managers for smaller development efforts with NASA personnel providing oversight.

Procurement Strategy Meeting. A forum where management reviews and approves the approach for the Agency's major and other selected procurements. Chaired by the assistant administrator for Procurement (or designee), the Procurement Strategy Meeting (PSM) addresses and documents information, activities, and decisions required by the FAR and NFS and incorporates NASA strategic guidance and decisions from the ASM strategic acquisition meeting to ensure the alignment of the individual procurement action with NASA's portfolio and mission.

Program. A strategic investment by a Mission Directorate or Mission Support Office that has a defined architecture and/or technical approach, requirements, funding level, and management structure that initiates and directs one or more projects. A program implements a strategic direction that the Agency has identified as needed to accomplish Agency goals and objectives. (See Section 2.1.2.)

Program Commitment Agreement. The contract between the AA and the responsible MDAA that authorizes transition from Formulation to Implementation of a program. (See Appendix D.)

Program/Project Management Requirements. Requirements that focus on how NASA and Centers perform program and project management activities.

Program Plan. The document that establishes the program's baseline for Implementation, signed by the MDAA, Center Director(s), and program manager.

Program (Project) Team. All participants in program (project) Formulation and Implementation. This includes all direct reports and others that support meeting program (project) responsibilities.

Programmatic Authority. Programmatic Authority includes the Mission Directorates and their respective program and project managers. Individuals in these organizations are the official voices for their respective areas. Programmatic Authority sets, oversees, and ensures conformance to applicable programmatic requirements.

Programmatic Requirements. Requirements set by the Mission Directorate, program, project, and PI, if applicable. These include strategic scientific and exploration requirements, system performance requirements, safety requirements, and schedule, cost, and similar nontechnical

constraints.

Project. A space flight project is a specific investment identified in a Program Plan having defined requirements, a life-cycle cost, a beginning, and an end. A project also has a management structure and may have interfaces to other projects, agencies, and international partners. A project yields new or revised products that directly address NASA's strategic goals.

Project Plan. The document that establishes the project's baseline for Implementation, signed by the responsible program manager, Center Director, project manager, and the MDAA, if required. (See Appendix H.)

Rebaselining. The process that results in a change to a project's Agency Baseline Commitment.

Reimbursable Program/Project. A project (including work, commodities, or services) for customers other than NASA for which reimbursable agreements have been signed by both the customer and NASA. The customer provides funding for the work performed on their behalf.

Replanning. The process by which a program or project updates or modifies its plans.

Request for Action/Review Item Discrepancy. The most common names for the comment forms that reviewers submit during life-cycle reviews that capture their comments, concerns, and/or issues about the product or documentation. Often, RIDs are used in a more formal way, requiring boards to disposition them and having to get agreements with the submitter, project, and board members for their disposition and closeout. RFAs are often treated more informally, almost as suggestions that may or may not be reacted to.

Reserves. Obsolete term. See Unallocated Future Expenses.

Residual Risk. The remaining risk that exists after all mitigation actions have been implemented or exhausted in accordance with the risk management process. (See NPD 8700.1.)

Risk. In the context of mission execution, risk is the potential for performance shortfalls, which may be realized in the future, with respect to achieving explicitly established and stated performance requirements. The performance shortfalls may be related to any one or more of the following mission execution domains: (1) safety, (2) technical, (3) cost, and (4) schedule. (See NPR 8000.4, Agency Risk Management Procedural Requirements.)

Risk Assessment. An evaluation of a risk item that determines: (1) what can go wrong, (2) how likely is it to occur, (3) what the consequences are, (4) what the uncertainties are that are associated with the likelihood and consequences, and (5) what the mitigation plans are.

Risk Management. Risk management includes risk-informed decision making (RIDM) and continuous risk management (CRM) in an integrated framework. RIDM informs systems engineering decisions through better use of risk and uncertainty information in selecting alternatives and establishing baseline requirements. CRM manages risks over the course of the development and the Implementation Phase of the life cycle to ensure that safety, technical, cost, and schedule requirements are met. This is done to foster proactive risk management, to better inform decision making through better use of risk information, and then to more effectively manage Implementation risks by focusing the CRM process on the baseline performance requirements emerging from the RIDM process. (See NPR 8000.4, Agency Risk Management Procedural Requirements.) These processes are applied at a level of rigor commensurate with the complexity, cost, and criticality of the program.

Risk-Informed Decision Making. A risk-informed decision-making process uses a diverse set of performance measures (some of which are model-based risk metrics) along with other

considerations within a deliberative process to inform decision making.

Safety. Freedom from those conditions that can cause death, injury, occupational illness, damage to or loss of equipment or property, or damage to the environment.

Safety and Mission Assurance Requirements. Requirements defined by the SMA organization related to safety and mission assurance.

Security. Protection of people, property, and information assets owned by NASA that covers physical assets, personnel, IT, communications, and operations.

Signature. A distinctive mark, characteristic, or thing that indicates identity; one's name as written by oneself.

Single-Project Programs. These programs tend to have long development and/or operational lifetimes, represent a large investment of Agency resources, and have contributions from multiple organizations/agencies. These programs frequently combine program and project management approaches, which they document through tailoring.

Stakeholder. An individual or organizational customer having an interest (or stake) in the outcome or deliverable of a program or project.

Standards. Formal documents that establish a norm, requirement, or basis for comparison, a reference point to measure or evaluate against. A technical standard, for example, establishes uniform engineering or technical criteria, methods, processes, and practices. (Refer to NPR 7120.10, Technical Standards for NASA Programs and Projects.)

Standing Review Board. The board responsible for conducting independent reviews (life cycle and special) of a program/project and providing objective, expert judgments to the convening authorities. The reviews are conducted in accordance with approved Terms of Reference (ToR) and life-cycle requirements per this document and NPR 7123.1.

Success Criteria. That portion of the top-level requirements that defines what is to be achieved to successfully satisfy NASA Strategic Plan objectives addressed by the program or project.

Suppliers. Each project office is a customer having a unique, multi-tiered hierarchy of suppliers to provide it products and services. A supplier may be a contractor, grantee, another NASA Center, university, international partner, or other government agency. Each project supplier is also a customer if it has authorized work to a supplier lower in the hierarchy.

Supply Chain. The specific group of suppliers and their interrelationships that is necessary to design, develop, manufacture, launch, and service the program or project. This encompasses all levels within a space system, including providers of raw materials, components, subsystems, systems, systems integrators, and services.

System. The combination of elements that function together to produce the capability required to meet a need. The elements include all hardware, software, equipment, facilities, personnel, processes, and procedures needed for this purpose.

Systems Engineering. A disciplined approach for the definition, implementation, integration, and operation of a system (product or service). The emphasis is on achieving stakeholder functional, physical, and operational performance requirements in the intended use environments over planned life within cost and schedule constraints. Systems engineering includes the engineering processes and technical management processes that consider the interface relationships across all elements of the system, other systems, or as a part of a larger system.

Tailoring. The process used to adjust or seek relief from a prescribed requirement to accommodate the needs of a specific task or activity (e.g., program or project). The tailoring process results in the generation of deviations and waivers depending on the timing of the request.

Technical Authority. Part of NASA's system of checks and balances that provides independent oversight of programs and projects in support of safety and mission success through the selection of individuals at delegated levels of authority. These individuals are the Technical Authorities. Technical Authority delegations are formal and traceable to the Administrator. Individuals with Technical Authority are funded independently of a program or project.

Technical Authority Requirements. Requirements invoked by OCE, OSMA, and Office of the Chief Health and Medical Officer (OCHMO) documents (e.g., NPRs or technical standards cited as program or project requirements) or contained in Center institutional documents. These requirements are the responsibility of the office or organization that established the requirement unless delegated elsewhere.

Technical Standard. Common and repeated use of rules, conditions, guidelines, or characteristics for products or related processes and production methods and related management systems practices; the definition of terms, classification of components; delineation of procedures; specification of dimensions, materials, performance, designs, or operations; measurement of quality and quantity in describing materials, processes, products, systems, services, or practices; test methods and sampling procedures; or descriptions of fit and measurements of size or strength. (Source: OMB Circular No. A-119, Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities.) (See NPR 7120.10, Technical Standards for NASA Programs and Projects.)

Technology Readiness Level. Provides a scale against which to measure the maturity of a technology. TRLs range from 1, Basic Technology Research, to 9, Systems Test, Launch, and Operations. Typically, a TRL of 6 (i.e., technology demonstrated in a relevant environment) is required for a technology to be integrated into a flight system. (See Systems Engineering Handbook NASA/SP-2007-6105 Rev 1, p. 296 for more information on TRL levels and technology assessment.)

Termination Review. A review initiated by the Decision Authority for the purpose of securing a recommendation as to whether to continue or terminate a program or project. Failing to stay within the parameters or levels specified in controlling documents will result in consideration of a termination review.

Terms of Reference. A document specifying the nature, scope, schedule, and ground rules for an independent review or independent assessment.

Threshold Science Requirements. The mission performance requirements necessary to achieve the minimum science acceptable for the investment. In some AOs used for competed missions, threshold science requirements may be called the "science floor" for the mission. (Also see Baseline Science Requirements.)

Tightly Coupled Programs. Programs with multiple projects that execute portions of a mission(s). No single project is capable of implementing a complete mission. Typically, multiple NASA Centers contribute to the program. Individual projects may be managed at different Centers. The program may also include other agency or international partner contributions.

Unallocated Future Expenses. The portion of estimated cost required to meet specified confidence level that cannot yet be allocated to the specific project WBS sub-elements because the estimate includes probabilistic risks and specific needs that are not known until these risks are realized.

Uncoupled Programs. Programs implemented under a broad theme and/or a common program implementation concept, such as providing frequent flight opportunities for cost-capped projects selected through AO or NASA Research Announcements. Each such project is independent of the other projects within the program.

Validation. The process of showing proof that the product accomplishes the intended purpose based on stakeholder expectations. May be determined by a combination of test, analysis, demonstration, and inspection. (Answers the question, "Am I building the right product?")

Verification. Proof of compliance with requirements. Verification may be determined by a combination of test, analysis, demonstration, and inspection. (Answers the question, "Did I build the product right?")

Waiver. A documented authorization releasing a program or project from meeting a requirement after the requirement is put under configuration control at the level the requirement will be implemented.

Work Breakdown Structure. A product-oriented hierarchical division of the hardware, software, services, and data required to produce the program's or project's end product(s), structured according to the way the work will be performed and reflecting the way in which program/project costs and schedule, technical, and risk data are to be accumulated, summarized, and reported.

Appendix B. Acronyms

AA	Associate Administrator
ABC	Agency Baseline Commitment
ACD	Architectural Control Document
AI&T	Assembly, Integration, and Test
AO	Announcement of Opportunity
APMC	Agency Program Management Council
ASM	Acquisition Strategy Meeting
BOE	Basis of Estimate
BPR	Baseline Performance Review
CAD	Cost Analysis Division
CADRe	Cost Analysis Data Requirement
CD	Center Director
CDR	Critical Design Review
CE	Chief Engineer
CERR	Critical Events Readiness Review
CFO	Chief Financial Officer
CHMO	Chief Health and Medical Officer
CMC	Center Management Council
COI	Conflict of Interest
COOP	Continuity of Operations
CPD	Center Policy Directive
CPR	Center Procedural Requirements
CRM	Continuous Risk Management
CSO	Chief Safety and Mission Assurance Officer
DA	Decision Authority (also Deputy Administrator)
DOD	Department of Defense
DR	Decommissioning Review
DRD	Data Requirements Description
DRM	Design Reference Mission
DRR	Disposal Readiness Review
EAC	Estimate at Completion
EC	Executive Council
ECC	Education Coordinating Council
ELV	Expendable Launch Vehicle
EMD	Environmental Management Division

EMS	Environmental Management System
EOMP	End of Mission Plan
ETA	Engineering Technical Authority
EVM	Earned Value Management
FAD	Formulation Authorization Document
FAR	Federal Acquisition Regulation
FC	Fully Compliant
FRED	Facilities Real Estate Division
FRR	Flight Readiness Review
FTE	Full-Time Employee
GDS	Ground Data System
GFY	Government Fiscal Year
HMTA	Health and Medical Technical Authority
ICD	Interface Control Document
ICMC	Integrated Center Management Council
ILS	Integrated Logistics Support
IMS	Integrated Master Schedule
IPMR	Integrated Program Management Report
IT	Information Technology
JCL	Joint Cost and Schedule Confidence Level
JPL	Jet Propulsion Laboratory, a Federally Funded Research and Development Center
KDP	Key Decision Point
LCC	Life-Cycle Cost
LCR	Life-Cycle Review
LDE	Lead Discipline Engineer
LMD	Logistics Management Division
LRR	Launch Readiness Review
MCR	Mission Concept Review
MD	Mission Directorate
MDAA	Mission Directorate Associate Administrator
MdM	Meta-Data Manager
MDPMC	Mission Directorate Program Management Council
MDR	Mission Definition Review
MOA	Memorandum of Agreement
MOS	Mission Operations System
MOU	Memorandum of Understanding
MRB	Mission Readiness Briefing

MRR	Mission Readiness Review
MSD	Mission Support Directorate
MSO	Mission Support Office
MSOD	Mission Support Office Director
NA	Not Applicable
NEN	NASA Engineering Network
NEPA	National Environmental Policy Act
NESC	NASA Engineering and Safety Center
NFS	NASA Federal Acquisition Regulation (FAR) Supplement
NID	NASA Interim Directive
NOA	New Obligation Authority
NODIS	NASA On-Line Directives Information System
NPD	NASA Policy Directive
NPR	NASA Procedural Requirements
OCE	Office of the Chief Engineer
OCFO	Office of the Chief Financial Officer
OCHMO	Office of the Chief Health and Medical Officer
OCIO	Office of the Chief Information Officer
OCT	Office of the Chief Technologist
OComm	Office of Communications
ODAR	Orbital Debris Assessment Report
OE	Office of Education
OER	Office of External Relations
OIIR	Office of International and Interagency Relations
OMB	Office of Management and Budget (Executive Office of the White House)
OPS	Office of Protective Services
ORR	Operational Readiness Review
OSMA	Office of Safety and Mission Assurance
PCA	Program Commitment Agreement
PCE	Program (or Project) Chief Engineer
PDLM	Product Data and Life-Cycle Management
PDR	Preliminary Design Review
PFAR	Post-Flight Assessment Review
PI	Principal Investigator
PIR	Program Implementation Review
PLAR	Post-Launch Assessment Review
PMB	Performance Measurement Baseline

PMC	Program Management Council
PPBE	Planning, Programming, Budgeting, and Execution
PRA	Probabilistic Risk Assessment
PRR	Production Readiness Review
PSM	Procurement Strategy Meeting
RFA	Request for Action
RFP	Request for Proposal
RID	Review Item Discrepancy
RIDM	Risk-Informed Decision Making
SAR	System Acceptance Review
SDR	System Definition Review
SEMP	Systems Engineering Management Plan
SI	Système Internationale (or metric) system of measurement
SIR	System Integration Review
SMA	Safety and Mission Assurance
SMATA	Safety and Mission Assurance Technical Authority
SMC	Strategic Management Council
SMD	Science Mission Directorate
SMSR	Safety and Mission Success Review
SRB	Standing Review Board
SRR	System Requirements Review
STEM	Science, Technology, Engineering, and Mathematics
TA	Technical Authority
TBD	To Be Determined
TBR	To Be Resolved
TRL	Technology Readiness Level
ToR	Terms of Reference
UFE	Unallocated Future Expenses
V&V	Verification and Validation
WBS	Work Breakdown Structure
WYE	Work Year Equivalent

Appendix C. Compliance Matrix

Template Instructions

The Compliance Matrix documents the program's or project's compliance with the requirements of NPR 7120.5 or how the program or project is tailoring the requirements in accordance with paragraph 3.5. The matrix lists:

• the paragraph reference,

• the NPR 7120.5 requirement statement,

• the requirement owner (the organization or individual responsible for the requirement),

• whether tailoring authority is held at Headquarters for the requirement,

• the organization or individual to whom the requirement applies (MDAA, CD, PM),

• a "Comply?" column to describe applicability or intent to tailor,

• the "Justification" column to justify how tailoring is to be applied, and

• the "Approval" column, when signatures are required to approve tailoring.

The "Requirement Owner" column designates which organization is responsible for maintaining the requirement for the Agency. The head of the requirement owner's organization has the authority for tailoring unless this authority has been formally delegated. An "X" indicates the Headquarters' requirements owner has retained approval authority for tailoring of the requirement. When there is no "X" in the "Tailor" column, tailoring authority may have been delegated by the responsible organization. In this case, program and project managers should work with the Center representative of the responsible organization (e.g., OSMA) to determine if tailoring authority has been delegated to a Center person and, if so, who the delegated authority is. Note that OCE delegations can be found in the "Letter of Delegation" located on the OCE tab under the "Other Policy Documents" menu in the NASA On-Line Directives Information System (NODIS).

The next three columns ("MDAA," "CD," and "PM") designate to whom the requirement applies. An "A" in the column indicates applicability.

The "Comply?" column is filled in by the program or project to identify the program's or project's approach to the requirement. The project inserts an "FC" for "fully compliant," "T" for "tailored," or "NA" for a requirement that is "not applicable," per paragraph 3.5.4. The column titled "Justification" documents the rationale for tailoring, documents how the requirement will be tailored, or justifies why the requirement is not applicable. It is expected that much of the rationale will already have been developed in retrievable program and/or project records and can simply be referenced (in an appropriate, accessible form). The level of documentation should be commensurate with the significance of departure from the norm and is determined by the requirements owner or as delegated. In the case where evaluation indicates that the tailoring of a requirement increases risk, evidence of official acceptance of that risk should be provided as referenced in retrievable program or project records. Columns in the Compliance Matrix can be adjusted to accommodate the necessary information.

For tailored requirements, the name, title, and signature of the responsible authority (requirement owner or delegate) goes in the "Approval" column to indicate that approval to tailor has been obtained from the head of the organization responsible for the requirement (or as delegated) with any required concurrences. The requirement owner consults with the other organizations that were involved in the establishment of the specific requirement and obtains the concurrence of those organizations having a substantive interest. The Compliance Matrix is submitted as part of the Formulation Agreement, Program Plan, or Project Plan. Redundant signatures are not required in the "Approval" column of the Compliance Matrix, if the requirements owner is already a required signatory (e.g., MDAA, CD, Program Manager, and Project Manager) on the Formulation Agreement, Program Plan, or Project Plan. An example of this would be OCE requirements that have been delegated to the Center Director (as designated by a blank in the "tailor" column and the "Letter of Delegation"). In this case, a separate signature by the Center Director is not required in the "Approval" column since the Center Director is a signatory on the plan. However, if tailoring was proposed for a requirement by an owner who isn't normally a signatory on the Formulation Agreement, Program Plan, or Project Plan (e.g., OSMA), the program or project manager should obtain the signature of the approving official in the "Approval" column of the Compliance Matrix prior to submitting the plan for final signature.

The Compliance Matrix is provided to streamline the waiver and deviation process described in paragraph 3.5. If the Compliance Matrix is completed in accordance with these instructions, it meets the requirements for requesting tailoring and serves as a group submittal for waivers to NPR 7120.5. Once the Formulation Agreement or Program or Project Plan is signed, the tailoring is approved. A copy is forwarded to OCE. If the Compliance Matrix changes or if compliance is phased for existing programs or projects, updated versions of the Compliance Matrix are incorporated into an approved Formulation Agreement or Program or Project Plan revision.

Approver Acronyms:

CAD	Cost Analysis Division
EMD	Environmental Management Division
FRED	Facilities Real Estate Division
LMD	Logistics Management Division
OCE	Office of the Chief Engineer
OCFO	Office of the Chief Financial Officer
OCIO	Office of the Chief Information Officer
OComm	Office of Communications
OCT	Office of the Chief Technologist
OE	Office of Education
OIIR	Office of International and Interagency Relations
OPS	Office of Protective Services
OSMA	Office of Safety and Mission Assurance
SMD	Science Mission Directorate

[Program or Project Name]

Para #	NPR 7120.5 Requirement Statement	Require-ment Owner	Tailor	MD AA	CD	PM	Com-ply?	Justification	Approval
1.1.2	NASA Centers, Mission Directorates, and other organizations that have programs or projects shall develop appropriate documentation to implement the requirements of this NPR.	OCE	X	A	A				
1.1.3	The Mission Directorate shall submit their plan for phased tailoring of the requirements of this NPR within 60 days of the effective date of this NPR.	OCE	X	A					
2.1.1	Regardless of the structure of a program or project meeting the criteria of Section P.2, this NPR shall apply to the full scope of the program or project and all the activities under it.	OCE	X			A			
2.1.4.1	Projects are Category 1, 2, or 3 and shall be assigned to a category based initially on: (1) the project life-cycle cost (LCC) estimate, the inclusion of significant radioactive material, and whether or not the system being developed is for human space flight;	OCE	X	A					

	is for human space flight, and (2) the priority level, which is related to the importance of the activity to NASA, the extent of international participation (or joint effort with other government agencies), the degree of uncertainty surrounding the application of new or untested technologies, and spacecraft/payload development risk classification.								
2.1.4.2	When projects are initiated, they are assigned to a NASA Center or implementing organization by the MDAA consistent with direction and guidance from the strategic planning process. They are either assigned directly to a Center by the Mission Directorate or are selected through a competitive process such as an Announcement of Opportunity (AO). For Category 1 projects, the assignment shall be with the concurrence of the NASA AA.	OCE	X	A					
2.2.1	Programs and projects shall follow their appropriate life cycle, which includes life-cycle phases; life-cycle gates and major events, including KDPs; major life-cycle reviews (LCRs); principal documents that govern the conduct of each phase; and the process of recycling through Formulation when program changes warrant such action.	OCE				A			
2.2.2	Each program and project performs the work required for each phase, which is described in the NASA Space Flight Program and Project Management Handbook, the NASA Project Planning and Control Handbook, which covers the functions and activities of the planning and control community, and NPR	OCE				A			

	7123.1. This work shall be organized by a product-based WBS developed in accordance with the Program and Project Plan templates (appendices G and H).								
2.2.3	The documents shown on the life-cycle figures and described below shall be prepared in accordance with the templates in appendices D, E, F, G, and H.	OCE				A			
2.2.4	Each program and project shall perform the LCRs identified in its respective figure in accordance with NPR 7123.1, applicable Center practices, and the requirements of this document.	OCE				A			
2.2.5	The program or project and an independent Standing Review Board (SRB) shall conduct the SRR, SDR/MDR, PDR, CDR, SIR, ORR, and PIR LCRs in figures 2-2, 2-3, 2-4, and 2-5.	OCE	X			A			
2.2.5.1	The Conflict of Interest (COI) procedures detailed in the NASA Standing Review Board Handbook shall be strictly adhered to.	OCE	X	A	A	A			
2.2.5.2	The portion of the LCRs conducted by the SRB shall be convened by the Convening Authorities in accordance with Table 2-2.	OCE	X	A	A	A			
2.2.5.3	The program or project manager, the SRB chair, and the Center Director (or designated Engineering Technical Authority representative) shall mutually assess the program's or project's expected readiness for the LCR and report any disagreements to the Decision Authority for final decision.	OCE	X		A	A			
2.2.6	In preparation for these LCRs, the program or project shall generate the appropriate documentation per the Appendix I tables of this document, NPR 7123.1, and Center practices, as	OCE	X			A			

	Center practices, as necessary, to demonstrate that the program's or project's definition and associated plans are sufficiently mature to execute the follow-on phase(s) with acceptable technical, safety, and programmatic risk.								
	Table I-1 Uncoupled and Loosely Coupled Program Milestone Products and Control Plans Maturity Matrix								
Tabl I-1	1. FAD [Baseline at SRR]	OCE		A		A			
Tabl I-1	2. PCA [Baseline at KDP I]	OCE		A					
Tabl I-1	3. Program Plan [Baseline at SDR]	OCE		A	A	A			
Tabl I-1	3.a. Mission Directorate requirements and constraints [Baseline at SRR]	OCE		A		A			
Tabl I-1	3.b. Traceability of program-level requirements on projects to the Agency strategic goals and Mission Directorate requirements and constraints [Baseline at SDR]	OCE		A		A			
Tabl I-1	3.c. Documentation of driving ground rules and assumptions on the program [Baseline at SDR]	OCE		A		A			
Tabl I-1	4. Interagency and international agreements [Baseline at SDR]	OCE		A		A			
Tabl I-1	5. ASM minutes	OCE		A		A			
Tabl I-1	6. Risk mitigation plans and resources for significant risks	OCE				A			
Tabl I-1	7. Documented Cost and Schedule Baselines [Baseline at SDR]	OCE				A			
Tabl I-1	8. Documentation of Basis of Estimate (cost and schedule) [Baseline at SDR]	OCE				A			
Tabl I-1	9. Documentation of performance against plan/baseline, including status/closure of formal actions from previous KDP	OCE				A			

Tabl I-1	10. Plans for work to be accomplished during Implementation	OCE				A			
	Program Plan Control Plans								
Tabl I-1	1. Technical, Schedule, and Cost Control Plan [Baseline at SDR]	OCE				A			
Tabl I-1	2. Safety and Mission Assurance Plan [Baseline at SDR] [per NPDs 8730.5 and 8720.1, NPRs 8715.3, 8705.2, 8705.6 and 8735.2, and NASA Stds 8719.13 and 8739.8]	OSMA				A			
Tabl I-1	3. Risk Management Plan [Baseline at SDR] [per NPR 8000.4]	OSMA				A			
Tabl I-1	4. Acquisition Plan [Baseline at SDR]	OCE				A			
Tabl I-1	5. Technology Development Plan [Baseline at SDR] [per NPR 7500.2]	OCT				A			
Tabl I-1	6. Systems Engineering Management Plan [Baseline at SDR]	OCE				A			
Tabl I-1	7. Review Plan [Baseline at SRR]	OCE				A			
Tabl I-1	8. Environmental Management Plan [Baseline at SDR] [per NPR 8580.1]	EMD				A			
Tabl I-1	9. Configuration Management Plan [Baseline at SDR]	OCE				A			
Tabl I-1	10. Security Plan [Baseline at SDR] [per NPD 1600.2 and NPRs 1600.1, 1040.1, and 2810.1]	OPS, OCE				A			
Tabl I-1	11. Threat Summary [Baseline at SDR]	OCE	X			A			
Tabl I-1	12. Technology Transfer (formerly Export) Control Plan [Baseline at SDR] [per NPR 2190.1]	OIIR				A			
Tabl I-1	13. Education Plan [Baseline at SDR]	OE				A			
Tabl I-1	14. Communications Plan [Baseline at SDR]	OComm				A			

Tabl I-1	15. Knowledge Management Plan [Baseline at SDR] [per NPD 7120.4 and NPD 7120.6]	OCE				A			
	Table I-2 Tightly Coupled Program Milestone Products Maturity Matrix								
Tabl I-2	1. FAD [Baseline at SRR]	OCE		A		A			
Tabl I-2	2. PCA [Baseline at PDR]	OCE		A					
Tabl I-2	3. Program Plan [Baseline at SDR]	OCE		A	A	A			
Tabl I-2	3.a. Mission Directorate requirements and constraints [Baseline at SRR]	OCE		A		A			
Tabl I-2	3.b. Traceability of program-level requirements on projects to the Agency strategic goals and Mission Directorate requirements and constraints [Baseline at SDR]	OCE		A		A			
Tabl I-2	3.c. Documentation of driving ground rules and assumptions on the program [Baseline at SDR]	OCE		A		A			
Tabl I2	4. Interagency and international agreements [Baseline at SDR]	OCE		A		A			
Tabl I-2	5. ASM minutes	OCE		A		A			
Tabl I-2	6. Risk mitigation plans and resources for significant risks	OCE				A			
Tabl I-2	7. Documented Cost and Schedule Baselines [Baseline at PDR]	OCE				A			
Tabl I-2	8. Documentation of Basis of Estimate (cost and schedule) [Baseline at PDR]	OCE				A			
Tabl I-2	9. Joint Cost and Schedule Confidence Level and supporting documentation [Baseline at PDR]	CAD	X			A			
Tabl I-2	10. Shared Infrastructure, Staffing, and Scarce Material Requirements and Plans	OCE				A			

Tabl I-2	11. Documentation of performance against plan/baseline, including status/closure of formal actions from previous KDP	OCE				A			
Tabl I-2	12. Plans for work to be accomplished during next life-cycle phase	OCE				A			
	Table I-3 Tightly Coupled Program Plan Control Plans Maturity Matrix								
Tabl I-3	1. Technical, Schedule, and Cost Control Plan [Baseline at SDR]	OCE				A			
Tabl I-3	2. Safety and Mission Assurance Plan [Baseline at SDR] [per NPDs 8730.5 and 8720.1, NPRs 8715.3, 8705.2, 8705.6 and 8735.2, and NASA Stds 8719.13 and 8739.8]	OSMA				A			
Tabl I-3	3. Risk Management Plan [Baseline at SDR] [per NPR 8000.4]	OSMA				A			
Tabl I-3	4. Acquisition Plan [Baseline at SDR]	OCE				A			
Tabl I-3	5. Technology Development Plan [Baseline at SDR] [per NPR 7500.2]	OCT				A			
Tabl I-3	6. Systems Engineering Management Plan [Baseline at SDR]	OCE				A			
Tabl I-3	7. Verification and Validation Plan [Baseline at PDR]	OCE				A			
Tabl I-3	8. Information Technology Plan [Baseline at SDR] [per NPDs 2200.1 and 1440.6 and NPRs 2200.2, 1441.1, and 2810.1]	OCIO				A			
Tabl I-3	9. Review Plan [Baseline at SRR]	OCE				A			
Tabl I-3	10. Missions Operations Plan [Baseline at ORR]	OCE				A			
Tabl I-3	11. Environmental Management Plan [Baseline at PDR] [per NPR 8580.1]	EMD				A			
Tabl I-3	12. Integrated Logistics Support Plan [Baseline at PDR] [per NPD 7500.1]	LMD				A			

Tabl I-3	13. Science Data Management Plan [Baseline at ORR] [per NPD 2200.1 and NPRs 2200.2, 1441.1, and 8020.12]	SMD				A			
Tabl I-3	14. Configuration Management Plan [Baseline at SDR]	OCE				A			
Tabl I-3	15. Security Plan [Baseline at PDR] [per NPD 1600.2 and NPRs 1600.1, 2810.1, and 1040.1]	OPS				A			
Tabl I-3	16. Threat Summary [Baseline at PDR]	OCE	X			A			
Tabl I-3	17. Technology Transfer (formerly Export) Control Plan [Baseline at PDR] [per NPR 2190.1]	OIIR				A			
Tabl I-3	18. Education Plan [Baseline at PDR]	OE				A			
Tabl I-3	19. Communications Plan [Baseline at PDR]	OComm				A			
Tabl I-3	20. Knowledge Management Plan [Baseline at SDR] [per NPD 7120.4 and NPD 7120.6]	OCE				A			
Tab1 I-3	21. Human Rating Certification Package [Initial at SRR; certified at MRR/FRR]	OSMA				A			
	Table I-4 Project Milestone Products Maturity Matrix								
	Headquarters and Program Products								
Tabl I-4	1. FAD [Baseline at MCR]	OCE		A		A			
Tabl I-4	2. Program Plan [Baseline at MCR]	OCE		A		A			
Tabl I-4	2.a. Applicable Agency strategic goals [Baseline at MCR]	OCE		A		A			
Tabl I-4	2.b. Documentation of program-level requirements and constraints on the project (from the Program Plan) and stakeholder expectations, including mission objectives/goals and mission success criteria [Baseline at SRR]	OCE		A		A			

Tabl I-4	2.c. Documentation of driving mission, technical, and programmatic ground rules and assumptions [Baseline at SDR/MDR]	OCE		A		A			
Tabl I-4	3. Partnerships and interagency and international agreements [Baseline U.S. partnerships and agreements at SDR/MDR; Baseline International agreements at PDR]	OCE		A		A			
Tabl I-4	4. ASM minutes	OCE		A		A			
Tabl I-4	5. NEPA compliance documentation per NPR 8580.1	EMD		A		A			
Tabl I-4	6. Mishap Preparedness and Contingency Plan [Baseline at SMSR] [per NPR 8621.1]	OSMA		A		A			
	Project Technical Products								
Tabl I-4	1. Concept Documentation [Approve at MCR]	OCE				A			
Tabl I-4	2. Mission, Spacecraft, Ground, and Payload Architectures [Baseline mission and spacecraft architecture at SRR; Baseline ground and payload architectures at SDR/MDR]	OCE				A			
Tabl I-4	3. Project-Level, System, and Subsystem Requirements [Baseline project-level and system-level requirements at SRR; Baseline subsystem requirements at PDR]	OCE				A			
Tabl I-4	4. Design Documentation [Baseline Preliminary Design at PDR; Baseline Detailed Design at CDR; Baseline As-built hardware and software at MRR/FRR]	OCE				A			
Tabl I-4	5. Operations Concept [Baseline at PDR]	OCE				A			
Tabl I-4	6. Technology Readiness Assessment Documentation	OCE				A			
Tabl I-4	7. Engineering Development Assessment Documentation	OCE				A			
Tabl I-4	8. Heritage Assessment Documentation	OCE				A			

Tabl I-4	9. Safety Data Packages [Baseline at CDR] [per NPRs 8715.3, 8735.1, and 8735.2]	OSMA				A			
Tabl I-4	10. ELV Payload Safety Process Deliverables [Baseline at SIR] [per NPR 8715.7]	OSMA				A			
Tabl I-4	11. Verification and Validation Report [Baseline at MRR/FRR]	OCE				A			
Tabl I-4	12. Operations Handbook [Baseline at ORR]	OCE				A			
Tabl I-4	13. Orbital Debris Assessment Report [Final at SMSR] [per NPR 8715.6]	OSMA		A		A			
Tabl I-4	14. End of Mission Plans per NPR 8715.6/NASA-STD 8719.14, App B [Baseline at SMSR]	OSMA		A		A			
Tabl I-4	15. Mission Report	OCE				A			
	Project Management, Planning, and Control Products								
Tabl I-4	1. Formulation Agreement [Baseline for Phase A at MCR; Baseline for Phase B at SDR/MDR]	OCE		A	A	A			
Tabl I-4	2. Project Plan [Baseline at PDR]	OCE		A	A	A			
Tabl I-4	3. Plans for work to be accomplished during next Implementation life-cycle phase [Baseline for Phase C at PDR; Baseline for Phase D at SIR; Baseline for Phase E at MRR/FRR; Baseline for Phase F at DR]	OCE				A			
Tabl I-4	4. Documentation of performance against Formulation Agreement (see #1 above) or against plans for work to be accomplished during Implementation life-cycle phase (see #3 above), including performance against baselines and status/closure of formal actions from previous KDP	OCE				A			

	previous KDP								
Tabl I-4	5. Project Baselines [Baseline at PDR]	OCE				A			
Tabl I-4	5.a. Top technical, cost, schedule and safety risks, risk mitigation plans, and associated resources	OCE				A			
Tabl I-4	5.b. Staffing requirements and plans	OCE				A			
Tabl I-4	5.c. Infrastructure requirements and plans, business case analysis for infrastructure Capitalizaton Determination Form (CDF) (NASA Form 1739), per NPR 9250.1	FRED OCFO				A			
Tabl I-4	5.d. Schedule [Baseline Integrated Master Schedule at PDR]	OCE				A			
Tabl I-4	5.e. Cost Estimate (Risk-Informed or Schedule-Adjusted Depending on Phase) [Baseline at PDR]	OCE				A			
Tabl I-4	5.f. Basis of Estimate (cost and schedule)	OCE				A			
Tabl I-4	5.g. Joint Cost and Schedule Confidence Level(s) and supporting documentation [Baseline at PDR]	CAD	X			A			
Tabl I-4	5.h. External Cost and Schedule Commitments [Baseline at PDR]	OCE		A		A			
Tabl I-4	5.i. CADRe [Baseline at PDR]	CAD	X			A			
Tabl I-4	6. Decommissioning/Disposal Plan [Baseline at DR]	OCE				A			
	Table I-5 Project Plan Control Plans Maturity Matrix								
Tabl I-5	1. Technical, Schedule, and Cost Control Plan [Baseline at SDR/MDR]	OCE				A			
Tabl I-5	2. Safety and Mission Assurance Plan [Baseline at SRR] [per NPDs 8730.5 and 8720.1, NPRs 8715.3, 8705.2, 8705.6, and 8735.2, and NASA Stds 8719.13 and 8739.8]	OSMA				A			

Tabl I-5	3. Risk Management Plan [Baseline at SRR] [per NPR 8000.4]	OSMA				A			
Tabl I-5	4. Acquisition Plan [Baseline at SRR]	OCE				A			
Tabl I-5	5. Technology Development Plan (may be part of Formulation Agreement) [Baseline at MCR] [per NPR 7500.2]	OCT				A			
Tabl I-5	6. Systems Engineering Management Plan [Baseline at SRR]	OCE				A			
Tabl I-5	7. Information Technology Plan [Baseline at SDR/MDR] [NPDs 2200.1 and 1440.6 and NPRs 2200.2, 1441.1, 2800.1, and 2810.1]	OCIO				A			
Tabl I-5	8. Software Management Plan(s) [Baseline at SDR/MDR] [per NPR 7150.2 and NASA-STD-8739.8]	OCE				A			
Tabl I-5	9. Verification and Validation Plan [Baseline at PDR]	OCE				A			
Tabl I-5	10. Review Plan [Baseline at SRR]	OCE				A			
Tabl I-5	11. Mission Operations Plan [Baseline at ORR]	OCE				A			
Tabl I-5	12. Environmental Management Plan [Baseline at SDR/MDR] [per NPR 8580.1]	EMD				A			
Tabl I-5	13. Integrated Logistics Support Plan [Baseline at PDR] [per NPD 7500.1]	LMD				A			
Tabl I-5	14. Science Data Management Plan [Baseline at ORR] [per NPD 2200.1 and NPRs 2200.2 and 1441.1]	SMD				A			
Tabl I-5	15. Integration Plan [Baseline at PDR]	OCE				A			
Tabl I-5	16. Configuration Management Plan [Baseline at SRR]	OCE				A			
Tabl I-5	17. Security Plan [Baseline at PDR] [per NPD 1600.2 and NPRs 1600.1 and 1040.1]	OPS				A			

Tabl I-5	18. Project Protection Plan [Baseline at PDR]	OCE				A			
Tabl I-5	19. Technology Transfer (formerly Export) Control Plan [Baseline at PDR] [per NPR 2190.1]	OIIR				A			
Tabl I-5	20. Knowledge Management Plan [Baseline at PDR] [per NPD 7120.4 and NPD 7120.6]	OCE				A			
Tabl I-5	21. Human Rating Certification Package [Initial at SRR;certified at MRR/FRR] [per NPR 8705.2]	OSMA				A			
Tabl I-5	22. Planetary Protection Plan [Baseline at PDR] [per NPD 8020.7 and NPR 8020.12]	SMD				A			
Tabl I-5	23. Nuclear Safety Launch Approval Plan [Baseline at SDR/MDR] [per NPR 8715.3]	OSMA				A			
Tabl I-5	24. Range Safety Risk Management Process Documentation [Baseline at SIR] [per NPR 8715.5]	OSMA				A			
Para #	NPR 7120.5 Requirement Statement	Require-ment Owner	Tailor	MD AA	CD	PM	Com-ply?	Justification	Approval
Tabl I-5	25. Education Plan [Baseline at PDR]	OE				A			
Tabl I-5	26. Communications Plan [Baseline at PDR]	OComm				A			
	Table I-6 Single-Project Program Milestone Products Maturity Matrix								
Tabl I-6	1. FAD [Baseline at MCR]	OCE		A		A			
Tabl I-6	2. PCA [Baseline at PDR]	OCE		A					
Tabl I-6	3. Traceability of Agency strategic goals and Mission Directorate requirements and constraints to program/project-level requirements and constraints [Baseline at SRR]	OCE		A		A			

Tabl I-6	4. Documentation of driving mission, technical, and programmatic ground rules and assumptions [Baseline at SDR/MDR]	OCE		A		A			
Tabl I-6	5. Partnerships and inter-agency and international agreements [Baseline U.S. partnerships and agreements at SDR/MDR; Baseline international agreements at PDR]	OCE		A		A			
Tabl I-6	6. ASM minutes	OCE		A		A			
Tabl I-6	7. NEPA compliance documentation per NPR 8580.1	EMD		A		A			
Tabl I-6	8. Mishap Preparedness and Contingency Plan [Baseline at SMSR]	OSMA		A		A			
	Single-Project Program Technical Products								
Tabl I-6	1. Concept Documentation	OCE				A			
Tabl I-6	2. Mission, Spacecraft, Ground, and Payload Architectures [Baseline mission and spacecraft architecture at SRR; baseline ground and payload architectures at SDR/MDR]	OCE				A			
Tabl I-6	3. Project-Level, System, and Subsystem Requirements [Baseline project-level and system-level requirements at SRR; baseline subsystem requirements at PDR]	OCE				A			
Tabl I-6	4. Design Documentation [Baseline Preliminary Design at PDR; baseline Detailed Design at CDR; baseline as-built hardware and software at MRR/FRR]	OCE				A			
Tabl I-6	5. Operations Concept [Baseline at PDR]	OCE				A			
Tabl I-6	6. Technology Readiness Assessment Documentation	OCE				A			
Tabl I-6	7. Engineering Development Assessment Documentation	OCE				A			

Tabl I-6	8. Heritage Assessment Documentation	OCE				A			
Tabl I-6	9. Safety Data Packages [Baseline at CDR]	OSMA				A			
Tabl I-6	10. ELV Payload Safety Process Deliverables [per NPR 8715.7]	OSMA				A			
Tabl I-6	11. Verification and Validation Report [Baseline at MRR/FRR]	OCE				A			
Tabl I-6	12. Operations Handbook [Baseline at ORR]	OCE				A			
Tabl I-6	13. Orbital Debris Assessment Report [Final at SMSR] [per NPR 8715.6]	OSMA		A		A			
Tabl I-6	14. End of Mission Plans [Baseline at SMSR] [per NPR 8715.6/NASA-STD-8719.14, App B]	OSMA		A		A			
Tabl I-6	15. Mission Report	OCE				A			
	Single-Project Program Management, Planning, and Control Products								
Tabl I-6	1. Formulation Agreement [Baseline for Phase A at MCR; baseline for Phase B at SDR/MDR]	OCE		A	A	A			
Tabl I-6	2. Program Plan [Baseline at PDR]	OCE		A	A	A			
Tabl I-6	3. Project Plan [Baseline at PDR]	OCE		A	A	A			
Tabl I-6	4. Plans for work to be accomplished during next Implementation life-cycle phase [Baseline for Phase C at PDR; baseline for Phase D at SIR; baseline for Phase E at MRR/FRR; baseline for Phase F at DR]	OCE				A			
Tabl I-6	5. Documentation of performance against Formulation Agreement (see #1 above) or against plans for work to be accomplished during Implementation life-cycle phase (see #3 above), including performance against baselines and status/closure	OCE				A			

	baselines and status/closure of formal actions from previous KDP								
Tabl I-6	6.Project Baselines [Baseline at PDR]	OCE				A			
Tabl I-6	6.a. Top technical, cost, schedule and safety risks, risk mitigation plans, and associated resources	OCE				A			
Tabl I-6	6.b. Staffing requirements and plans	OCE				A			
Tabl I-6	6.c. Infrastructure requirements and plans, business case analysis for infrastructure Capitalization Determination Form (CDF) (NASA Form 1739)	FRED	OCFO			A			
Tabl I-6	6.d. Schedule [Baseline Integrated Master Schedule at PDR]	OCE				A			
Tabl I-6	6.e. Cost Estimate (Risk-Informed or Schedule-Adjusted Depending on Phase) [Risk-informed and schedule-adjusted baseline at PDR]	OCE				A			
Tabl I-6	6.f. Basis of Estimate (cost and schedule)	OCE				A			
Tabl I-6	6.g. Joint Cost and Schedule Confidence Level(s) and supporting documentation [Baseline at PDR]	CAD	X			A			
Tabl I-6	6.h. External Cost and Schedule Commitments [Baseline at PDR]	OCE		A		A			
Tabl I-6	6.i. CADRe [Baseline at PDR]	CAD	X			A			
Tabl I-6	7. Decommissioning/Disposal Plan [Baseline at DR]	OCE				A			
	Table I-7 Single-Project Program Plan Control Plans Maturity Matrix								
Tabl I-7	1. Technical, Schedule, and Cost Control Plan [Baseline at SDR/MDR]	OCE				A			
Tabl I-7	2. Safety and Mission Assurance Plan [Baseline at SRR]	OSMA				A			

Tabl I-7	3. Risk Management Plan [Baseline at SRR]	OSMA				A			
Tabl I-7	4. Acquisition Plan [Baseline at SRR]	OCE				A			
Tabl I-7	5. Technology Development Plan (may be part of Formulation Agreement) [Baseline at MCR]	OCT				A			
Tabl I-7	6. Systems Engineering Management Plan [Baseline at SRR]	OCE				A			
Tabl I-7	7. Information Technology Plan [Baseline at SDR/MDR]	OCIO				A			
Tabl I-7	8. Software Management Plan(s) [Baseline at SDR/MDR]	OCE				A			
Tabl I-7	9. Verification and Validation Plan [Baseline at PDR]	OCE				A			
Tabl I-7	10. Review Plan [Baseline at SRR]	OCE				A			
Tabl I-7	11. Mission Operations Plan [Baseline at ORR]	OCE				A			
Tabl I-7	12. Environmental Management Plan [Baseline at SDR/MDR]	EMD				A			
Tabl I-7	13. Integrated Logistics Support Plan [Baseline at PDR]	LMD				A			
Tabl I-7	14. Science Data Management Plan [Baseline at ORR]	SMD				A			
Tabl I-7	15. Integration Plan [Baseline at PDR]	OCE				A			
Tabl I-7	16. Threat Summary [Baseline at PDR]	OCE	X			A			
Tabl I-7	17. Configuration Management Plan [Baseline at SRR]	OCE				A			
Tabl I-7	18. Security Plan [Baseline at PDR]	OPS				A			
Tabl I-7	19. Project Protection Plan [Baseline at PDR]	OCE				A			
Tabl I-7	20. Technology Transfer (formerly Export) Control Plan [Baseline at PDR]	OIIR				A			

Tabl I-7	21.Knowledge Management Plan [Baseline at PDR] [per NPD 7120.4 and NPD 7120.6]	OCE				A			
Tabl I-7	22. Human Rating Certification Package [Initial at SRR; certified at MRR/FRR]	OSMA				A			
Tabl I-7	23. Planetary Protection Plan [Baseline at PDR]	SMD				A			
Tabl I-7	24. Nuclear Safety Launch Approval Plan [Baseline at SDR/MDR]	OSMA				A			
Tabl I-7	25. Range Safety Risk Management Process Documentation [Baseline at SIR]	OSMA				A			
Tabl I-7	26. Education Plan [Baseline at PDR]	OE				A			
Tabl I-7	27. Communications Plan [Baseline at PDR]	OComm				A			
2.2.8	Projects in phases C and D (and programs at the discretion of the MDAA) with a life-cycle cost estimated to be greater than $20 million and Phase E project modifications, enhancements, or upgrades with an estimated development cost greater than $20 million shall perform earned value management (EVM) with an EVM system that complies with the guidelines in ANSI/EIA-748, Standard for Earned Value Management Systems.	OCE	X	A		A			
2.2.8.1	EVM system requirements shall be applied to appropriate suppliers, in accordance with the NASA Federal Acquisition Regulation (FAR) Supplement, and to in-house work elements.	OCE	X			A			
2.2.8.2	For projects requiring EVM, Mission Directorates shall conduct a pre-approval integrated baseline review as part of their preparations for KDP C to ensure that the	OCE		A		A			

	projects work is properly linked with its cost, schedule, and risk and that the management processes are in place to conduct project-level EVM.								
2.2.10	Each program and project shall complete and maintain a Compliance Matrix (see Appendix C) for this NPR and attach it to the Formulation Agreement for projects in Formulation and/or the Program or Project Plan. The program or project will use the Compliance Matrix to demonstrate how it is complying with the requirements of this document and verify the compliance of other responsible parties.	OCE	X			A			
2.3.1	Each program and project shall have a Decision Authority who is the Agency's responsible individual who determines whether and how the program or project proceeds through the life cycle and the key program or project cost, schedule, and content parameters that govern the remaining life-cycle activities.	OCE	X	A					
2.3.1.1	The NASA AA shall approve all Agency Baseline Commitments (ABCs) for programs requiring an ABC and projects with a life-cycle cost greater than $250 million.	OCE	X	A		A			
2.3.2	Each program and project shall have a governing PMC.	OCE	X	A					
2.3.3	The Center Director (or designee) shall oversee programs and projects usually through the CMC, which monitors and evaluates all program and project work (regardless of category) executed at that Center.	OCE	X		A				

2.3.4	Following each LCR, the independent SRB and the program or project shall brief the applicable management councils on the results of the LCR to support the councils' assessments.	OCE	X	A	A	A			
2.4.1	After reviewing the supporting material and completing discussions with concerned parties, the Decision Authority determines whether and how the program or project proceeds into the next phase and approves any additional actions. These decisions shall be summarized and recorded in the Decision Memorandum signed at the conclusion of the governing PMC by all parties with supporting responsibilities, accepting their respective roles.	OCE	X	A					
2.4.1.1	The Decision Memorandum shall describe the constraints and parameters within which the Agency, the program manager, and the project manager will operate; the extent to which changes in plans may be made without additional approval; any additional actions that came out of the KDP; and the supporting data (i.e., the cost and schedule datasheet) that provide further details.	OCE	X	A		A			
2.4.1.2	A divergence from the Management Agreement that any party identifies as significant shall be accompanied by an amendment to the Decision Memorandum.	OCE	X	A		A			
2.4.1.3	During Formulation, the Decision Memorandum shall establish a target life-cycle cost range (and schedule range, if applicable) as well as the Management Agreement addressing the schedule and resources required to complete Formulation.	OCE	X	A		A			

2.4.1.5	All projects and single-project programs shall document the Agency's life-cycle cost estimate and other parameters in the Decision Memorandum for Implementation (KDP C), and this becomes the ABC.	OCE	X	A		A			
2.4.1.6	Tightly coupled programs shall document their life-cycle cost estimate, in accordance with the life-cycle scope defined in the FAD or PCA, and other parameters in their Decision Memorandum and ABC at KDP I.	OCE	X	A		A			
2.4.1.7	Programs or projects shall be rebaselined when: (1) the estimated development cost exceeds the ABC development cost by 30 percent or more (for projects over $250 million, also that Congress has reauthorized the project); (2) the NASA AA judges that events external to the Agency make a rebaseline appropriate; or (3) the NASA AA judges that the program or project scope defined in the ABC has been changed or the tightly coupled program or project has been interrupted.	OFCO	X	A		A			
2.4.2	All programs and projects develop cost estimates and planned schedules for the work to be performed in the current and following life-cycle phases (see Appendix I tables). As part of developing these estimates, the program or project shall document the basis of estimate (BOE) in retrievable program or project records.	OCE	X			A			
2.4.3	Tightly coupled and single-project programs (regardless of life-cycle cost) and projects with an estimated life-cycle cost greater than $250 million shall develop probabilistic analyses of cost and schedule estimates to obtain a	CAD	X			A			

	estimates to obtain a quantitative measure of the likelihood that the estimate will be met in accordance with the following requirements.								
2.4.3.1	Tightly coupled and single-project programs (regardless of life-cycle cost) and projects with an estimated life-cycle cost greater than $250 million shall provide a range of cost and a range for schedule at KDP 0/KDP B, each range (with confidence levels identified for the low and high values of the range) established by a probabilistic analysis and based on identified resources and associated uncertainties by fiscal year.	CAD	X			A			
2.4.3.2	At KDP I/KDP C, tightly coupled and single-project programs (regardless of life-cycle cost) and projects with an estimated life-cycle cost greater than $250 million shall develop a resource-loaded schedule and perform a risk-informed probabilistic analysis that produces a JCL.	CAD	X			A			
2.4.4	Mission Directorates shall plan and budget tightly coupled and single-project programs (regardless of life-cycle cost) and projects with an estimated life-cycle cost greater than $250 million based on a 70 percent joint cost and schedule confidence level or as approved by the Decision Authority.	CAD	X	A					
2.4.4.1	Any JCL approved by the Decision Authority at less than 70 percent shall be justified and documented.	CAD	X	A		A			
2.4.4.2	Mission Directorates shall ensure funding for these projects is consistent with the Management Agreement and in no case less than the equivalent of a 50 percent JCL.	CAD	X	A					

2.4.5	Loosely coupled and uncoupled programs are not required to develop program cost and schedule confidence levels. These programs shall provide analysis that provides a status of the program's risk posture that is presented to the governing PMC as each new project reaches KDP B and C or when a project's ABC is rebaselined.	OCE	X	A		A			
3.3.1	Programs and projects shall follow the Technical Authority process established in Section 3.3 of this NPR.	OCE	X	A	A	A			
3.4.1	Programs and projects shall follow the Dissenting Opinion process in this Section 3.4.	OCE	X	A	A	A			
3.5.1	Programs and projects shall follow the tailoring process in this Section 3.5.	OCE	X	A	A	A			
3.5.5	A request for a permanent change to a prescribed requirement in an Agency or Center document that is applicable to all programs and projects shall be submitted as a "change request" to the office responsible for the requirements policy document unless formally delegated elsewhere.	OCE	X	A	A	A			
3.6.1	A Center negotiating reimbursable space flight work with another agency shall propose NPR 7120.5 as the basis by which it will perform the space flight work.	OCE	X		A	A			
3.7.1	Each program and project shall perform and document an assessment to determine an approach that maximizes the use of SI.	OCE	X			A			

Appendix D. Program Commitment Agreement Template

D.1 PCA Title Page

Program Commitment Agreement

(Provide a title for the candidate program and designate a short title or proposed acronym in parenthesis, if appropriate.)
It is the responsibility of each of the signing parties to notify the other in the event that a commitment cannot be met and to initiate the timely renegotiations of the terms of this agreement.

_____ _____
Mission Directorate Associate Administrator Date

_____ _____
Associate Administrator Date

By signing this document, signatories are certifying that the content herein is acceptable as direction for managing this program (or project) and that they will ensure its implementation by those over whom they have authority.

Figure D-1 Program Commitment Agreement Title Page

D.2 PCA Template

PROGRAM COMMITMENT AGREEMENT
(PROGRAM TITLE)

1.0 PROGRAM OBJECTIVES

Identify the broad program objectives. Describe the program's relationship to Mission Directorate goals and objectives as documented in the Directorate's plan. Convey the public good of the program to the taxpayer, stated in a way that can be understood by the average citizen.

2.0 PROGRAM OVERVIEW

Describe the strategy to achieve the above-mentioned objectives. Relationships with external organizations, other agencies, or international partners should be addressed if achievement of the

program objectives is dependent on their performance. Identify the associated projects to be included in the program as of the writing date. Specify the type of program (i.e., single-project, uncoupled, loosely coupled, or tightly coupled) and the basis for that classification.

3.0 PROGRAM AUTHORITY

Describe the NASA organizational structure for managing the program and projects from the MDAA to the NASA Center project managers. Include lines of authority and reporting, Center(s) responsibilities, the governing Program Management Councils (PMCs) for the oversight of the program and its known projects, and the approving official for new projects. Identify any delegated Decision Authority, per Section 2.3 of this NPR.

4.0 TECHNICAL PERFORMANCE COMMITMENT

Summarize the technical performance requirements, identifying baselines and thresholds needed to achieve the program objectives, as applicable. If the objectives include a technical performance target (goal) in addition to a threshold requirement, the commitment could be stated as a range. Demonstrate traceability to Agency strategic goals and outcomes and Agency requirements.

5.0 SCHEDULE COMMITMENT

Identify the following key target milestones for each project in the program, such as:

1. Start of Formulation.

2. Target date or timeframe for the SDR or MDR.

3. Target date or timeframe for the PDR or the start of implementation.

4. Start of operations.

5. End of prime operations and/or disposal, if applicable.

6. Other milestones or time periods, as appropriate, for a specific program/project.

6.0 COST COMMITMENT

Provide the estimated cost range for the program for the ten-year period beginning in the current fiscal year at a level of detail that identifies the approved individual projects. Identify the constraints and assumptions used to develop this estimated cost range and specifically identify those assumptions that drive the range. This cost range should contain all costs necessary to perform the program, including, but not limited to, customary project activities, required technology developments, facilities costs, launch vehicles, tracking, operations and sustainment, data analysis, and disposal. Either reference the most recent Agency budget to provide the first five years of the estimated program cost or provide the budget required for the next five years. The cost range should be updated when program content changes, such as the addition of new projects entering Implementation or when the estimated cost changes. Reference the annual budget contained in the Integrated Budget and Performance Document (IBPD) for cost phasing. The cost range should be updated when program content changes, such as the addition of new projects entering Implementation.

7.0 ACQUISITION STRATEGY

Provide a high-level summary of the Acquisition Plan (described in Appendix G, Section 3.4) to reflect the results of the process for acquisition process and the Acquisition Strategy Meeting (ASM).

8.0 HIGH-RISK AREAS

Identify the areas of highest risk for the program (covering safety, technical, institutional, cost, and schedule issues) in which failure may result in changes to the program/project baseline cost, schedule, safety, or technical performance requirements. This section should identify, where possible, the specific risk drivers, such as high-risk technologies upon which the program is dependent, and mitigation options.

9.0 INTERNAL AGREEMENTS

If the program is dependent on other NASA activities outside of the MDAA's control to meet program objectives, identify the required support and list any formal agreements required.

10.0 EXTERNAL AGREEMENTS

Explain the involvement of external organizations, other agencies, or international support necessary to meet the program objectives. Include a brief overview of the program/project relationships with such external organizations. Include an identification of the commitments being made by the external organizations, other agencies, or international partners and a listing of the specific agreements to be concluded. Any unique considerations affecting implementation of required NASA policies and processes necessitated by the external involvement should be clearly identified.

11.0 REVIEWS

Specify the program and project life-cycle reviews (per figures 2-2, 2-3, 2-4, and 2-5 in

Chapter 2) that are required to be conducted during the Implementation Phase. Include any other requirements, e.g., the ASM, and any known unique considerations, e.g., international participation.

12.0 OUTCOMES

Identify the discrete set of expected deliverables (outcomes) that flow from the Agency goals and objectives, as defined in the Agency Strategic Plan.

13.0 WAIVERS AND DEVIATIONS

Identify known waivers or deviations that will be sought for the program. Provide a rationale consistent with program characteristics such as scope, complexity, visibility, cost, safety, and acceptable risk.

14.0 PCA ACTIVITIES LOG

Provide and maintain a log of all PCA activities, including revisions that reflect all waivers to the original PCA. This log includes the information shown in Table D-1 and may be supplemented with an attached addendum for each change, describing the change. The PCA should be updated to add approved projects or whenever substantial change makes it necessary.

Table D-1 Sample Program Commitment Agreement Activities Log

				Termination	**MDAA**	**Associate Administrator**
Date	Event	Change	Addendum	Review Req'd	Signature	Signature
dd/mm/yy	Revalidation	None	N/A	No		
dd/mm/yy	Revalidation	None	N/A	No		

dd/mm/yy	Approval of new project		Addition of Project N	Ref. #1	No	

Appendix E. Formulation Authorization Document Template

E.1 Program FAD Title Page

[*Program Name*] Formulation Authorization Document

[*short title or acronym*]

(Provide a title for the candidate program and designate a short title or proposed acronym in parenthesis, if appropriate.)

_____	_____
Mission Directorate Associate Administrator	Date
_____	_____
Program Manager	Date
_____	_____
Associate Administrator	Date

By signing this document, signatories are certifying that the content herein is acceptable as direction for managing this program (or project) and that they will ensure its implementation by those over whom they have authority.

Figure E-1 Program Formulation Authorization Document Title Page

E.2 Project FAD Title Page

[*Project Name*] Formulation Authorization Document

[*short title or acronym*]

(Provide a title for the candidate project and designate a short title or proposed acronym in parenthesis, if appropriate.)

_____ _____
Mission Directorate Associate Administrator Date

_____ _____
Program Manager Date

By signing this document, signatories are certifying that the content herein is acceptable as direction for managing this program (or project) and that they will ensure its implementation by those over whom they have authority.

Figure E-2 Project Formulation Authorization Document Title Page

E.3 Program/Project FAD Template

[Program/Project Name] Formulation Authorization Document

[short title or acronym][

1.0 PURPOSE

Describe the purpose of the program/project, including a clear traceability from the goals and objectives in the Mission Directorate Strategies or Program Plan, as applicable. This need is independent of any particular technological solution and is stated in terms of functional capabilities.

2.0 AUTHORITY

Describe the NASA organizational structure for managing the Formulation process from the Mission Directorate Associate Administrator (MDAA) to the NASA Center program/project managers, as applicable. Include lines of authority, coordination, and reporting. For projects and single-project programs, the Formulation Authorization Agreement (FAD) provides the basis for the project's Formulation Agreement.

3.0 PROGRAM/PROJECT GOALS AND OBJECTIVES

Describe the level or scope of work, goals, and objectives to be accomplished in the Formulation Phase, Formulation cost targets and constraints, the time available, and any other constraints.

4.0 INTERNAL PARTICIPANTS

Identify Mission Directorates, Mission Support Offices, and Centers to be involved in the activity, their scope of work, and any known constraints related to their efforts (e.g., the program/project will

be co-funded by a different Mission Directorate).

5.0 EXTERNAL PARTICIPANTS

Identify participation external to NASA to be involved in the activity, their scope of work, and any known constraints related to their efforts (e.g., the program/project will be co-funded by the external participant).

6.0 BUDGET AND COST ESTIMATE

Identify, by fiscal year, the funding that will be committed to the program/project during each year of project Formulation. If the Formulation period is less than five years, provide estimated annual costs through the next five years. For projects, provide an estimated life-cycle cost range that is consistent with this five-year cost runout.

7.0 SCHEDULE

For each project, provide the planned date for the completion of Phase A and estimated completion of Phase B. Provide an estimated date (or range) for the completion of project development. Specify the planned prime operations period.

8.0 LIFE-CYCLE REVIEWS

Specify the program and project life-cycle reviews (per figures 2-2, 2-3, 2-4, and 2-5 in

Chapter 2 of this NPR) that are required to be conducted during the Formulation Phase. Include any other requirements, e.g., the ASM, and any known unique considerations, e.g., international participation.

Appendix F. Project Formulation Agreement Template

F.1 Formulation Agreement Template Instructions

F.1.1 The Formulation Agreement represents the project's or single-project program's response to the Formulation Authorization Document. (See Appendix E.) It establishes technical and acquisition work that needs to be conducted during Formulation and defines the schedule and funding requirements during Phase A and Phase B for that work. The Agreement focuses on the project or single-project program activities necessary to accurately characterize the complexity and scope of the project or single-project program; increase understanding of requirements; and identify and mitigate high technical, acquisition, safety, cost, and schedule risks. It identifies and prioritizes the Phase A and Phase B technical and acquisition work that will have the most value and enables the project or single-project program to develop high-fidelity cost and schedule range estimates at KDP B and high-fidelity cost and schedule commitments at KDP C.

F.1.2 The Formulation Agreement serves as a tool for communicating and negotiating the project's or single-project program's Formulation plans and resource allocations with the program and Mission Directorate. It allows for differences in approach between competed versus assigned missions. Variances with NPR 7120.5 product maturities as documented in Appendix I of NPR 7120.5 are identified with supporting rationale in the Agreement. The approved Agreement serves as authorization for these variances. The Agreement is approved and signed at KDP A and is updated and resubmitted for signature at KDP B. The Formulation Agreement for KDP A includes detailed Phase A information and preliminary Phase B information. The Formulation Agreement for KDP B identifies the progress made during Phase A and updates and details Phase B.

F.1.3 Each section of the Formulation Agreement template is required.If a section is not applicable to a particular project or single-project program, the project or single-project program indicates that in the appropriate section and provides a rationale. If a section is applicable but the project or single-project program desires to omit the section or parts of a section, then a waiver or deviation needs to be obtained in accordance with the tailoring process for NPR 7120.5. (See Section 3.5.) Approvals for waivers are documented in the Compliance Matrix, and the Compliance Matrix for this NPR is attached to the Formulation Agreement. If the format of the completed project or single-project Formulation Agreement differs from this template, a cross-reference table indicating where the information for each template paragraph is needs to be provided with the document when it is submitted for the MDAA signature.

F.1.4 The approval signatures of MDAA, the Center Director, and the program manager certify that the Formulation Agreement implements all the Agency's applicable institutional requirements or that the owner of those requirements, e.g., Safety and Mission Assurance, has agreed to the modification of those requirements contained in the Formulation Agreement.

F.1.5 Products developed as part of or as a result of the Formulation Agreement may be incorporated into the Project or Single-Project Program Plan, if appropriate, as the Project or Single-Project Program Plan is developed during Formulation. The project or single-project program may use the preliminary Project or Single-Project Program Plan to describe and control the project's or single-project program's execution as long as the Project or Single-Project Program Plan does not conflict with the Formulation Agreement.

F.2 Formulation Agreement Title Page

[*Project or Single-Project Program Name*] Formulation Agreement

[*short title or acronym*]

(Provide a title for the candidate project or single-project program and designate a short title or proposed acronym in parenthesis, if appropriate.)

_____	_____
Mission Directorate Associate Administrator	Date
_____	_____
Center Director (as many signature lines as needed)	Date
_____	_____
Program Manager	Date
_____	_____
Project Manager	Date

By signing this document, signatories are certifying that the content herein is acceptable as direction for managing this project or single-project program and that they will ensure its implementation by those over whom they have authority.

Figure F-1 Formulation Agreement Title Page

F.3 Formulation Agreement Template

[Project or Single-Project Program Name] Formulation Agreement

[short title or acronym]

1.0 Purpose

Describe the purpose of the program/project, including traceability from Formulation Authorization Agreement (FAD). (See Appendix E.)

2.0 Project or Single-Project Program Formulation Framework

Identify the project or single-project program organization chart for Formulation; identify the initial project or single-project program team, key personnel, and responsible Centers and partnerships (as known) that will contribute during Formulation. Define major roles and responsibilities and identify any Boards and Panels that will be used during Formulation for decision making and managing project or single-project program processes.

3.0 Project or Single-Project Program Plan and Project or Single-Project Program Control Plans

Document the project's or single-project program's proposed milestones for delivery of the Project or Single-Project Program Plan and project or single-project program control plans on the project or single-project program schedule and provide rationale for any differences from requirements in product maturities as documented in Appendix I of NPR 7120.5.

4.0 Project or Single-Project Program, System, and Subsystem Requirements Flow Down

Document the project's or single-project program's proposed milestones for flow down of requirements to the project or single-project program, system, and subsystem levels on the project or single-project program schedule, and provide rationale for any differences from requirements in product maturities as documented in Appendix I of NPR 7120.5. Document the project or single-project program schedule for development of any models needed to support requirements development.

5.0 Mission Scenario, Architectures, and Interfaces

Document the project's or single-project program's proposed milestones for producing the mission concept, mission scenario (or design reference mission), concept of operations, and mission, spacecraft, payload, and ground systems architectures down to the level of subsystem interfaces. Include these milestones on the project or single-project program schedule and provide rationale for any differences from requirements documented in the tables in Appendix I of this NPR.

Reference documentation of the feasible concept, concepts already evaluated, and plans for additional concepts to be evaluated during Formulation. Documentation should include ground rules, assumptions, and constraints used for analysis; key architecture drivers, such as redundancy; preliminary key performance parameters; top-level technical parameters and associated margins; and preliminary driving requirements. Documentation should also include feasible candidate architectures; open architecture issues and how and when those issues will be resolved; basic descriptions of each element; and descriptions of interfaces between elements.

At KDP B update the approved concept and architecture, including a preliminary definition of the operations concept and updated description of composition of payload/suite of instruments. Identify the work required to close all architecture and architectural interface issues.

6.0 Trade Studies

Identify spacecraft and ground systems design trade studies planned during phases A and B, including trade studies that address performance versus cost and risk.

7.0 Risk Mitigation

Document plans for managing risks during Formulation. Identify the project's or single-project program's major technical, acquisition, safety, cost, and schedule risks to be addressed during Formulation, including risks likely to drive the project's or single-project program's cost and schedule range estimates at KDP B, and cost and schedule estimates at KDP C. Describe the associated risk mitigation plans. Provide rationale for addressing these risks during Formulation.

Document the project's or single-project program's risk mitigation schedule and funding requirements. Include intermediate milestones and expected progress by KDP B and KDP C.

8.0 Technology Readiness Assessment and Development

[Identify the specific new technologies (Technology Readiness Levels (TRL) less than 6) that are part of this project or single-project program; their criticality to the project's or single-project program's objectives, goals, and success criteria; and the current status of each planned technology development, including TRL and associated risks. Describe the specific activities and risk mitigation

plans, the responsible organizations, models, and key tests to ensure that the technology maturity reaches TRL 6 by PDR. (Refer to NPR 7123.1 for TRL definitions.)

Identify off-ramp decision gates and strategies for ensuring there are alternative development paths available if technologies do not mature as expected. Identify potential cost, schedule, or performance impacts if the technology developments do not reach the required maturity levels.

Provide technology development schedules, including intermediate milestones and funding requirements, during Phases A and B for each identified technology development to achieve TRL 6 by PDR. Describe expected status of each technology development at SRR, MDR/SDR, and PDR. Reference the preliminary or final Technology Development Plan for details as applicable. Describe how the program will transition technologies from the development stage to manufacturing, production, and insertion into the end system. Identify any potential costs and risks associated with the transition to manufacturing, production, and insertion. Develop and document appropriate mitigation plans for the identified risks.

9.0 Engineering Development Assessment, Prototyping, and Software Models

Identify major engineering development risks and any engineering prototyping or software model development that needs to be accomplished during phases A and B to reduce development risk (Engineering development risks include components and assemblies that have not been previously built or flown in the planned environment or that have been significantly modified in functionality, interfaces, power consumption, size, or use of materials.). Provide rationale and potential impacts to project or single-project program performance, cost, and schedule if development risks are not addressed. Describe the scope of the prototyping and modeling activities and the expected reduction of cost and risk by performing this work during Formulation. Include the project or single-project program's testing philosophy, including functional, environmental, and qualification testing, any life testing and protoflight test plans, and rationale.

Describe the prototypes and software models to be built, their fidelity (form, fit, and function, etc.), test environments and objectives, and test dates. Identify any design alternatives if irresolvable problems are encountered.

Provide prototype and software model development and test schedules, including intermediate milestones and funding requirements during phases A and B. Describe expected status and accomplishments for each prototype or software model at SRR, MDR/SDR, and PDR.]

Focus during Phase A should be on component and subassembly prototypes built to approximately the correct size, mass, and power, with "flight-like" parts and materials, and tested in a laboratory environment over the extremes of temperature and radiation (if relevant). Focus during Phase B should be on testing form, fit, and function prototypes over the extremes of what will be experienced during flight.

Identify key performance parameters, associated modeling methodologies, and methods for tracking KPPs throughout Formulation. Identify key performance parameters, associated modeling methodologies, and methods for tracking KPPs throughout Formulation. In addition, identify any rocket propulsion testing and provide for analysis and selection of propulsion testing sites in accordance with NPD 8081.1, NASA Chemical Rocket Propulsion Testing.

10.0 Heritage Assessment and Validation

Identify the major heritage hardware and software assumptions and associated risks and the activities and reviews planned to validate those assumptions during Formulation. Identify schedule and funding requirements for those activities.

11.0 Acquisition Strategy and Long-lead Procurements

Identify acquisition and partnership plans during Formulation. Document the project's or single-project program's proposed milestones for in-house work and procurements, including completing any Contract Statements of Work (SOW) and Requests for Proposal (RFP) during the Formulation phase. Identify long-lead procurements to be initiated and provide associated rationale. Identify procurements of material and services necessary for life-cycle sustainment. Identify anticipated partnerships (other government agencies and U.S. and international partners), if any, including roles and contributed items and plans for getting commitments for contributions and finalizing open inter-agency agreements, domestic partnerships, and foreign contributions. Point to the preliminary or final Acquisition Plan for details, as applicable.

Identify major acquisition risks, including long-lead procurement risks and partnership risks.

Identify funding requirements for procurement activities, long-lead procurements, and partnerships.

12.0 Formulation Phase Reviews

Identify and provide schedules for the project or single-project program life-cycle reviews (SRR, SDR/MDR) and the system and subsystem-level reviews to be held during Formulation. Include inheritance reviews, prototype design reviews, technology readiness reviews, fault protection reviews, etc., necessary to reduce risk and enable more accurate cost and schedule range estimates at KDP B and more accurate cost and schedule estimates at KDP C.

13.0 Formulation Phase Cost and Schedule Estimates

Document the project's or single-project program's Formulation Phase schedule and phased funding requirements, including cost and schedule margins, aligned with the project or single-project program Work Breakdown Structure (WBS). Identify the critical path.

Ensure that all funding requirements in this Agreement are included and clearly identifiable. Summarize funding requirements both in dollars and estimated percent of total costs phases A-D.

Ensure that the schedules for all technology development, engineering prototyping, procurement and risk mitigation activities, and milestones identified in this Agreement are included and clearly identifiable. Provide schedule details to the appropriate level to justify Formulation funding requirements (typically subsystem level).

Include any additional milestones required in product maturities as documented in Appendix I in NPR 7120.5, including the development of life-cycle cost and schedule ranges due at KDP B and the JCL at KDP C, if required.

Identify the schedule for developing the project's or single-project program's EVM capabilities, if EVM is required.

14.0 Leading Indicators

Document the project's or single-project program's programmatic and technical leading indicators for the Formulation Phase.

Project or single-project programs develop and maintain the status of a set of programmatic and technical leading indicators to ensure proper progress and management of the project or single-project program are achieved during Formulation. These include:

• Requirement Trends (percent growth, TBD/TBR (to be resolved) closures, number of requirement changes);

• Interface Trends (percent Interface Control Document (ICD) approvals, TBD/TBR burn down, number of interface requirement changes);

• Review Trends (Review Item Discrepancy (RID)/Request for Action (RFA)/Action Item burn down per review);

• Formulation Cost Trends (Plan, actual, UFE, NOA);

• Schedule Trends (slack/float, critical milestone dates);

• Staffing Trends (Full-Time Employee (FTE)/Work Year Equivalent (WYE));

• Technical Performance Measures (Mass margin, power margin); and

• Additional project or single-project program-specific indicators, as needed.

These indicators are further explained in the NASA Space Flight Program and Project Management Handbook, the NASA Project Planning and Control Handbook, and in a white paper on the Program and Project Management Communities of Practice Web site.

15.0 Appendices

Appendix A Acronyms
Appendix B Definitions
Appendix C Compliance Matrix for this NPR

Appendix G. Program Plan Template

G.1 Template Instructions

G.1.1 The Program Plan is an agreement among the program manager, Center Director, and Mission Directorate Associate Administrator (MDAA). Other Center Directors providing a significant contribution to the program also concur with the Program Plan to document their commitment to provide required Center resources. The Program Plan defines the goals and objectives of the program, the environment within which the program operates, and the Management Agreement commitments of the program, including identifying the high-level requirements on both the program and each constituent project. These requirements on the project may be in the body of the Plan or added as appendices. The Program Plan is to be updated and approved during the program life cycle if warranted by changes in the stated Management Agreement commitments.

G.1.2 In this Program Plan template, all subordinate plans, collectively called control plans, are required unless they are not applicable. They are based on requirements in NASA Policy Directives (NPDs) and NASA Procedural Requirements (NPRs) that affect program/project planning. For tightly coupled programs, the SMA Plan, Risk Management Plan, Product Data and Life-Cycle Management (PDLM) Plan, and SEMP are required to be stand-alone plans with summaries and references provided in the Program Plan. If a control plan is not applicable to a particular program, indicate that by stating it is not applicable in the appropriate section and provide a rationale. The remaining control plans can either be part of the Program Plan or separate stand-alone documents referenced in the appropriate part of the Program Plan. In the case of the latter, the Program Plan contains a summary of and reference to the stand-alone document; the approval authority for the stand-alone Control Plan is the program manager.

G.1.3 Each section of the Program Plan template is required. If a section is not applicable to a particular program, indicate in the appropriate section and provide a rationale. If a section is applicable but the program desires to omit the section or parts of a section, then a waiver needs to be obtained in accordance with the requirement tailoring process for NPR 7120.5. Approvals are documented in Part 4.0, Waivers or Deviations Log, of the Program Plan. In addition, the program's Compliance Matrix for this NPR is attached to the Program Plan. If the format of the completed Program Plan differs from this template, a cross-reference table indicating where the information for each template paragraph is needs to be provided with the document when it is submitted for MDAA signature.

G.1.4 The approval signatures of the MDAA, the Center Director, and the program manager certify that the Program Plan implements all the Agency's applicable institutional requirements or that the authority responsible for those requirements, e.g., Safety and Mission Assurance, have granted a deviation or waiver to the modification of those requirements.

G.1.5 Single-project programs may combine the Program and Project Plans into a single document if the MDAA agrees.

G.2 Program Plan Title Page

[*Program Name*] Program Plan

[*short title or acronym*]

(Provide a title for the candidate program and designate a short title or proposed acronym in parenthesis, if appropriate.)

_____ _____
Mission Directorate Associate Administrator Date

_____ _____
Center Director (as many signature lines as needed)* Date

_____ _____
Program Manager Date

By signing this document, signatories are certifying that the content herein is acceptable as direction for managing this program and that they will ensure its implementation by those over whom they have authority.

* Where a program is managed from Headquarters exclusively, the NASA Associate Administrator signs in place of the Center Director or the NASA Associate Administrator may delegate this responsibility to the NASA Chief Engineer.

Figure G-1 Program Plan Title Page

G.3 Program Plan Template

[Program Name] Program Plan]
[short title or acronym]

1.0 PROGRAM OVERVIEW

1.1 Introduction

Briefly describe the background of the program and its current status, including results of

Formulation activities, decisions, and documentation.

1.2 Goals and Objectives

State program goals and specific objectives, and provide clear traceability to the Agency's strategic goals and to Mission Directorate strategic goals and objectives. Program performance goals and their relationship to NASA program goals set forth in NPD 1001.0, NASA Strategic Plan should be expressed in an objective, quantifiable, and measurable form. Goals and objectives should include specific commitments to safety and mission success.

1.3 Program Architecture

Briefly describe the architecture of the program, its major components, and the way they will be integrated. Describe how the major program components are intended to operate together, and with legacy systems, as applicable, to achieve program goals and objectives. Specify the type of program (i.e., single-project, uncoupled, loosely coupled, or tightly coupled) and the basis for that classification.

Provide a summary-level technical description of the program, including constituent projects and operations concepts. The description should also include mission description, program interfaces, facilities, logistics concepts, planned mission results, and data analysis, archiving, and reporting. Identify driving ground rules and assumptions and major constraints affecting program systems development (e.g., cost, launch window, required launch vehicle, mission planetary environment, fuel/engine design, and foreign partners).

Describe how the program will relate to other organizations within and outside NASA. Reference Section 3.4, Acquisition Plan of this document (below) or provide the following information here:

For organizations within NASA, describe the roles of each in the program, including technology efforts, space communications, and launch services.

For organizations outside NASA, describe the role of each in the program, including other government agencies, academia, industry, and international partners as they are known at the start of the program.

1.4 Stakeholder Definition

Identify the main stakeholders of the program (e.g., PI, science community, technology community, public, education community, and Mission Directorate sponsor(s)) and the process to be used within the program to ensure stakeholder advocacy.

1.5 Program Authority, Management Approach, and Governance Structure

Describe the program management structure, including each participating organization's responsibilities. Identify:

- The Center where the program manager resides; and
- Each Center's responsibilities, as they relate to their respective requirement allocations referenced in Section 2.1, Requirements Baseline below.

Describe the chain of accountability and decision path outlining the roles and responsibilities of the Mission Directorate sponsor(s), program manager, Center Director, and other authorities (including the Technical Authorities), as required. Provide a high-level description of the project's organization within the program, showing the chain of accountability. Describe clear lines of authority from projects and Centers to the program, and to the Mission Directorate, and frequency

of reporting for each. Illustrate the organization graphically. Describe the process by which projects are formulated, approved, and terminated.

1.6 Implementation Approach

Describe briefly the implementation approach of the program, including any applicable guidance or direction from the ASM review, the acquisition strategy (e.g., in-house, NASA Centers, and contractor primes), partners, and partner contributions, if appropriate. Include make-or-buy decision plans and trade studies.

Describe how knowledge management, lessons learned, and participating NASA Centers' implementation policies and practices will be utilized in the execution of the program. (Note: For tightly coupled programs, the program manager, the NASA Chief Engineer, and the Center Chief Engineers (or designees) participating in the program establish the engineering best practices for the program. These decisions are documented here.) Document the agreements on the use of implementation policies and practices between the program manager and participating NASA Centers in this section (or in appendices to the document), along with the program's approach to ensuring that interfaces do not increase risk to mission success.

2.0 PROGRAM BASELINES

2.1 Requirements Baseline

Program Requirements. Document the high-level program requirements, including performance, safety, and programmatic requirements and correlate them to Agency and Mission Directorate strategic objectives and requirements. Describe the process by which program requirements are verified for compliance. Describe the process for controlling changes to program requirements. Document the traceability of requirements that flow down from Agency- and Center-level policy to the program and from the program to projects.

Requirements Documentation. For tightly coupled programs and single-project programs, decompose these high-level requirements into requirements on constituent projects or systems, specified herein or in a separate, configuration-controlled, program requirements document to be prepared by the program manager and approved by the MDAA. Additional concurrences may be required at the option of the NASA AA. There may also be subordinate project requirements documents controlled at lower levels.

For uncoupled or loosely coupled programs, apply these high-level requirements to generate the program's requirements on each constituent project. This documentation is controlled by the Mission Directorate and may be located in the body of the Program Plan or in a subsequent appendix. Requirements thus documented, and any subsequent changes, require approval of the program manager, MDAA, and participating Center Director(s).

Program Requirements on Projects. For each project, provide a top-level description, including the mission's science or exploration objectives. Document the project's category, governing PMC, and risk classification. Describe the project's mission, performance, and safety requirements. For science missions, include both baseline science requirements and threshold science requirements. (See Appendix A for definitions.) Identify the mission success criteria for each project based on the threshold science requirements. State each requirement in objective, quantifiable, and verifiable terms. Identify the project's principal schedule milestones, including Preliminary Design Review (PDR), Critical Design Review (CDR), launch, mission operational-critical milestones, and the planned decommissioning date. State the development and/or total life-cycle cost constraints on the project. Set forth any budget constraints by fiscal year. State the specific conditions under which a

project Termination Review would be triggered. Describe any additional requirements on the project (e.g., international partners). If the mission characteristics indicate a greater emphasis is necessary on maintaining technical, cost, or schedule, then identify which is most important (e.g., state if the mission is cost capped; or if schedule is paramount, as for a planetary mission; or if it is critical to accomplish all of the technical objectives, as for a technology demonstration mission).

2.2 WBS Baseline

Provide the program's Work Breakdown Structure (WBS) and WBS dictionary down to the project level developed in accordance with guidance provided by the NASA WBS Handbook, NASA/SP-2010-3404, which can be found on the OCE tab under the "Other Policy Documents" menu in NODIS. The WBS will support cost and schedule allocation down to a project level that allows for unambiguous cost reporting.

2.3 Schedule Baseline

Present a summary of the program's integrated master schedule (IMS), including all critical milestones, major events, life-cycle reviews, and KDPs throughout the program life cycle. The summary of the master schedule should include the logical relationships (interdependencies) for the various program elements and projects and critical paths, as appropriate. Identify driving ground rules, assumptions, and constraints affecting the schedule baseline.

2.4 Resource Baseline

Present the program's funding requirements by fiscal year. State the New Obligation Authority (NOA) in real-year dollars for all years - prior, current, and remaining. The funding requirements are to be consistent with the program's WBS and include funding for all cost elements required by the Agency's full-cost accounting procedures. Funding requirements are to be consistent with the budget. Provide a breakdown of the program's funding requirements to the WBS Level 2 elements. Present the program-specific (i.e., not individual project) workforce requirements by fiscal year, consistent with the program's funding requirements and WBS. Throughout the Implementation Phase, baselines are to be based on the joint cost and schedule confidence level in accordance with NPD 1000.5 and NPR 7120.5.

Describe the program infrastructure requirements (acquisition, renovations, and/or use of real property/facilities, aircraft, personal property, and information technology). Identify means of meeting infrastructure requirements through synergy with other existing and planned programs and projects to avoid duplication of facilities and capabilities. Identify necessary upgrades or new developments, including those needed for environmental compliance.

Identify driving ground rules, assumptions, and constraints affecting the resource baseline.

Document the project Commitment Baselines.

2.5 Joint Cost and Schedule Confidence Level

For implementation and beyond for single-project and tightly coupled programs, document the joint cost and schedule confidence level approved by the Decision Authority.

3.0 PROGRAM CONTROL PLANS

3.1 Technical, Schedule, and Cost Control Plan

Document how the program plans to control program requirements, technical design, schedule, and cost to achieve its high-level requirements. This control plan will include the following:

Describe the plan to monitor and control the requirements, technical design, schedule, and cost of the program.

Describe the program's performance measures in objective, quantifiable, and measurable terms and document how the measures are traced from the program high-level requirements. Establish baseline and threshold values for the performance metrics to be achieved at each Key Decision Point (KDP), as appropriate. In addition, document the mission success criteria associated with the program-level requirements that, if not met, trigger consideration of a Termination Review.

Tightly coupled and single-project programs also develop and maintain the status of a set of programmatic and technical leading indicators to ensure proper progress and management of the program. These include:

Requirement Trends (percent growth, TBD/TBR closures, number of requirement changes);
Interface Trends (percent ICD approval, TBD/TBR burn down, number of interface requirement changes);

- Verification Trends (closure burn down, number of deviations/waivers approved/open);
- Review Trends (RID/RFA/Action Item burn down per review);
- Software Unique Trends (number of requirements per build/release versus plan);
- Problem Report/Discrepancy Report Trends (number open, number closed);
- Cost Trends (Plan, actual, UFE, EVM, NOA);
- Schedule Trends (critical path slack/float, critical milestone dates);
- Staffing Trends (FTE)/WYE);
- Technical Performance Measures (Mass margin, power margin); and
- Additional program-specific indicators, as needed.
  These indicators are further explained in the NASA Space Flight Program and Project Management Handbook, the NASA Project Planning and Control Handbook, and in a white paper on the Program and Project Management Communities of Practice Web site.

  For tightly coupled programs, describe the approach to monitor and control the program's Agency Baseline Commitment (ABC). Describe how the project will periodically report performance. Describe mitigation approach if the project is exceeding the development cost documented in the ABC to enable corrective action prior to triggering the 30 percent breach threshold. Describe how the project will support a baseline review in the event the Decision Authority (DA) directs one.

  Describe how the program will implement the Systeme Internationale (SI) and other systems of measurement and the identification of units of measure in all product documentation. Where full implementation of the SI system of measurement is not practical, hybrid configurations (i.e., a controlled mix of SI and non-SI system elements) may be used to support maximum practical use of SI units for design, development, and operations. Where hybrid configurations are used, describe the specific requirements established to control interfaces between elements using different measurement systems. (See NPR 7120.5, Section 3.7, for SI assessment timing requirement.)

  Describe the program's implementation of Technical Authority (Engineering, Safety and Mission Assurance, and Health and Medical).

  For tightly coupled programs, describe the program's Earned Value Management System (EVMS), if EVM requirements are to be levied at the program level. For loosely coupled or uncoupled programs, describe the EVM requirements flowed down to the projects. Include plan for flow down of EVM requirements and reporting to support project EVM.

  Describe any additional specific tools the program will use to implement the program control

processes, e.g., the requirements management system, the program scheduling system, the program information management systems.

Describe how the program will monitor and control the integrated master schedule (IMS).

Describe how the program will utilize its technical and schedule margins and Unallocated Future Expense (UFE) to control the Management Agreement.

Describe how the program plans to report technical, schedule, and cost status to the MDAA, including frequency and the level of detail.

Describe how the program will address technical waivers and deviations and how dissenting opinions will be handled.

3.2 Safety and Mission Assurance Plan

Develop a program Safety and Mission Assurance (SMA) Plan. The SMA Plan addresses life-cycle SMA functions and activities. The plan identifies and documents program-specific SMA roles, responsibilities, and relationships. This is accomplished through a program-unique mission assurance process map and matrix developed and maintained by the program with appropriate support and guidance of the Headquarters and/or Center SMA organization.

The Plan reflects a program life-cycle SMA process perspective, addressing areas including: procurement, management, design and engineering, design verification and test, software design, software verification and test, manufacturing, manufacturing verification and test, operations, pre-flight verification and test, maintenance, and retirement.

The Plan also addresses specific critical SMA disciplines including (as a minimum): safety per NPR 8715.3, NASA General Safety Program Requirements; quality assurance per NPD 8730.5, NASA Quality Assurance Program Policy; compliance verification, audit, safety and mission assurance reviews, and safety and mission assurance process maps per NPR 8705.6, Safety and Mission Assurance Audits, Reviews, and Assessments; reliability and maintainability per

NPD 8720.1, NASA Reliability and Maintainability (R&M) Program Policy; software safety and assurance per NASA-STD-8719.13, NASA Software Safety Standard; and NASA-STD-8739.8, NASA Standard for Software Assurance; quality assurance functions per NPR 8735.1, Procedures For Exchanging Parts, Materials, and Safety Problem Data Utilizing the Government-Industry Data Exchange Program and NASA Advisories and NPR 8735.2, Management of Government Quality Assurance Functions for NASA Contracts; and other applicable NASA procedural safety and mission success requirements.

Describe how the program will develop and manage a Closed Loop Problem Reporting and Resolution System. Describe how the program develops, tracks, and resolves problems. The process should include a well-defined data collection system and process for hardware and software problems and anomaly reports, problem analysis, and corrective action.

3.3 Risk Management Plan

Summarize how the program will implement the NASA risk management process (including risk-informed decision making (RIDM) and continuous risk management (CRM) in accordance with NPR 8000.4, Agency Risk Management Procedural Requirements. Include the initial Significant Risk List and appropriate actions to mitigate each risk. Programs with international or other U.S. Government agency contributions need to plan for, assess, and report on risks due to international or other government partners and plan for contingencies.

For tightly coupled programs, develop a stand-alone Risk Management Plan and reference the

stand-alone plan here.

3.4 Acquisition Plan

The program Acquisition Plan is developed by the program manager, supported by the Office of Procurement, and needs to be consistent with the results of the process for acquisition and the ASM. The elements of the program Acquisition Plan should be reflected in any resulting Procurement Strategy Meeting (PSM) for individual procurement activity supporting the program Acquisition Plan. It documents an integrated acquisition strategy that enables the program to meet its mission objectives and provides the best value to NASA. The Acquisition Plan should include, but is not limited to, the following:

Identify all major proposed acquisitions (such as engineering design study, hardware and software development, mission and data operations support, and sustainment) in relation to the program WBS. Provide summary information on each such proposed acquisition, including a Contract WBS; major deliverable items; recommended type of procurement (competitive, AO for instruments); type of contract (cost-reimbursable, fixed-price); source (institutional, contractor, other U.S. Government agency, or international organization); procuring activity; and surveillance approach. Identify those major procurements that require a PSM.

Describe completed or planned studies supporting make-or-buy decisions, considering NASA's in-house capabilities and the maintenance of NASA's core competencies, as well as cost and best overall value to NASA.

Describe the state of the industrial base capability and identify potential critical and single-source suppliers needed to design, develop, produce, support, and, if appropriate, restart an acquisition program or project. The acquisition plan should promote sufficient program/project stability to encourage industry to invest, plan, and bear their share of risk. Describe the internal and external mechanisms and procedures used to identify, monitor, and mitigate industrial base and supply chain risks. Include data reporting relationships to allow continuous surveillance of the entire supply chain that provides for timely notification and mitigation of potential risks associated with the industrial base or supply chain. Describe the process for reporting industrial base and supply chain risks to the MDAA.

Identify the program's approach to strengthen safety and mission assurance in the contract.

Describe how the program will establish and implement a risk management process per NPR 8000.4.

Describe all agreements, memoranda of understanding, barters, in-kind contributions, and other arrangements for collaborative and/or cooperative relationships. Include partnerships created through mechanisms other than those prescribed in the FAR and the NFS. List all such agreements (the configuration control numbers, the date signed or projected dates of approval, and associated record requirements) necessary for program success. Include or reference all agreements concluded with the authority of the program manager and reference agreements concluded with the authority of the MDAA and above. Include the following:

(1) NASA agreements, e.g., space communications, launch services, inter-Center memoranda of agreement.

(2) Non-NASA agreements:

(a) Domestic, e.g., U.S. Government agencies.

(b) International, e.g., memoranda of understanding.

3.5 Technology Development Plan

Describe the technology assessment, development, management, and acquisition strategies needed to achieve the program's mission objectives.

Describe how the program will assess its technology development requirements, including how the program will evaluate the feasibility, availability, readiness, cost, risk, and benefit of the new technologies. The approach should include timely reporting of new technologies to the Center Technology Transfer Office and supporting technology transfer activities in accordance with NPR 7500.2, NASA Technology Transfer Requirements.

Describe how the program will identify opportunities for leveraging ongoing technology efforts.

Describe how the program will transition technologies from the development stage to the manufacturing and production phases. Identify the supply chain needed to manufacture the technology and any costs and risks associated with the transition to the manufacturing and production phases. Develop and document appropriate mitigation plans for the identified risks.

Describe the program's strategy for ensuring that there are alternative development paths available if/when technologies do not mature as expected. (Refer to NPR 7123.1 for TRL definitions).

Describe how the program will remove technology gaps, including maturation, validation, and insertion plans, performance measurement at quantifiable milestones, off-ramp decision gates, and resources required.

Describe briefly how the program will ensure that all planned technology exchanges, contracts, and partnership agreements comply with all laws and regulations regarding export control and the transfer of sensitive and proprietary information.

Describe how the program will transition technologies from the development stage to manufacturing, production, and insertion into the end system. Identify any potential costs and risks associated with the transition to manufacturing, production, and insertion. Develop and document appropriate mitigation plans for the identified risks.

3.6 Systems Engineering Management Plan

Summarize the key elements of the program Systems Engineering Management Plan (SEMP). Include descriptions of the program's overall approach for systems engineering, to include system design and product realization processes (implementation and/or integration, verification and validation, and transition), as well as the technical management processes.

For tightly coupled programs, develop a stand-alone SEMP that includes the content required by NPR 7123.1, NASA Systems Engineering Processes and Requirements. Reference the stand-alone plan here.

3.7 Verification and Validation Plan

Summarize the approach for performing verification and validation of the program products. Indicate the methodology to be used in the verification/validation (test, analysis, inspection, or demonstration) as defined in NPR 7123.1, NASA Systems Engineering Processes and Requirements.

3.8 Information Technology Plan

Describe how the program will acquire and use information technology, addressing the following:

a. Describe the program's approach to knowledge capture, as well as the methods for contributing

knowledge to other entities and systems, including compliance with NPD 2200.1, Management of NASA Scientific and Technical Information, and NPR 2200.2, Requirements for Documentation, Approval, and Dissemination of NASA Scientific and Technical Information.

b. Describe how the program will manage information throughout its life cycle, including the development and maintenance of an electronic program library. Explain how the program will ensure identification, control, and disposition of program records in accordance with NPD 1440.6, NASA Records Management, and NPR 1441.1, NASA Records Retention Schedules.

c. Document the program's approach to implementing IT security requirements in accordance with NPR 2810.1, Security of Information Technology.

3.9 Review Plan

Summarize the program's approach for conducting a series of reviews, including internal reviews and program life-cycle reviews. In accordance with Center best practices, MD review requirements, and the requirements in NPR 7123.1, NASA Systems Engineering Processes and Requirements and NPR 7120.5, NASA Space Flight Program and Project Management Requirements, provide the names, purposes, content, and timing of the life-cycle reviews.

Identify any deviations from these documents that the program is planning or waivers that have been granted. Provide the technical, scientific, schedule, cost, and other criteria that will be utilized in the consideration of a Termination Review.

For tightly coupled programs that involve multiple Centers, document the program life-cycle review requirements on the supporting projects that represent an integrated review process for the various projects and take into consideration the participating Centers' review process best practices. For each program life-cycle review and KDP, document the sequencing of the associated project life-cycle reviews and KDPs, i.e., whether the associated project life-cycle reviews and KDPs precede or follow the program life-cycle review and KDP. In addition, document which projects should proceed to their KDPs together, which projects should proceed to their KDPs simultaneously with the program KDP, and which projects may proceed to their KDPs as individual projects.

The sequencing of project life-cycle reviews and KDPs with respect to program life-cycle reviews and KDPs is especially important for project PDR life-cycle reviews that precede KDP Cs. At KDP C, the Agency makes project technical, cost, and schedule commitments to its external stakeholders at the established JCL in accordance with NPR 7120.5 requirements. Since changes to one project can easily impact other projects' technical, cost, schedule, and risk baselines, projects and their program may need to proceed to KDP C/KDP I together.

3.10 Mission Operations Plan

This section is required only for tightly coupled and single-project programs. For those programs, describe the activities required to perform the mission. Describe how the program will implement the associated facilities, hardware, software, and procedures required to complete the mission. Describe mission operations plans, rules, and constraints. Describe the Mission Operations System (MOS) and Ground Data System (GDS) in the following terms:

- MOS and GDS human resources and training requirements;
- Procedures to ensure that operations are conducted in a reliable, consistent, and controlled manner using lessons learned during the program and from previous programs;
- Facilities requirements (offices, conference rooms, operations areas, simulators, and test beds);
- Hardware (ground-based communications and computing hardware and associated documentation); and

- Software (ground-based software and associated documentation).

3.11 Environmental Management Plan

Describe the activities to be conducted to comply with NPR 8580.1, Implementing the National Environmental Policy Act, and Executive Order 12114. After consultation with the NASA Headquarters National Environmental Policy Act (NEPA) coordinator, describe the program's NEPA strategy at all affected Centers, including decisions regarding programmatic NEPA documents. Insert into the program schedule the critical milestones associated with complying with these regulations.

3.12 Integrated Logistics Support Plan

Describe how the program will implement NPD 7500.1, Program and Project Life-Cycle Logistics Support Policy, including a maintenance and support concept; participation in the design process to enhance supportability; supply support; maintenance and maintenance planning; packaging, handling, and transportation; technical data and documentation; support and test equipment; training; manpower and personnel for Integrated Logistics Support (ILS) functions; facilities required for ILS functions; and logistics information systems for the life of the program.

3.13 Science Data Management Plan

Describe how the program will manage the scientific data generated and captured by the operational mission(s) and any samples collected and returned for analysis. Include descriptions of how data will be generated, processed, distributed, analyzed, and archived, as well as how any samples will be collected, stored during the mission, and managed when returned to Earth. The Plan should include definitions of data rights and services and access to samples, as appropriate. Explain how the program will accomplish the knowledge capture and information management and disposition requirements in NPD 2200.1, Management of NASA Scientific and Technical Information, NPR 2200.2, Requirements for Documentation, Approval, and Dissemination of NASA Scientific and Technical Information, NPR 1441.1, NASA Records Retention Schedules, as applicable to program science data.

State further that the program will adhere to all NASA sample handling, curation, and planetary protection directives and rules, including NPR 8020.12, Planetary Protection Provisions for Robotic Extraterrestrial Missions.

3.14 Configuration Management Plan

Describe the configuration management (CM) approach that the program team will implement, consistent with NPR 7123.1. Describe the structure of the CM organization and tools to be used. Describe the methods and procedures to be used for configuration identification, configuration control, interface management, configuration traceability, and configuration status accounting and communications. Describe how CM will be audited and how contractor CM processes will be integrated with the program. Reference the stand-alone program Configuration Management Plan, if applicable.

3.15 Security Plan

Describe the program's plans for ensuring security and technology protection, including:

Security Requirements: Describe the program's approach for planning and implementing the requirements for information, physical, personnel, industrial, and counterintelligence/counterterrorism security, and for security awareness/education requirements in accordance with NPR 1600.1, NASA Security Program Procedural Requirements, and NPD 1600.2, NASA Security Policy. Include provisions in the plan to protect personnel, facilities,

mission-essential infrastructure, and critical program information from potential threats and other vulnerabilities that may be identified during the threat and vulnerability assessment process.

Information Technology (IT) Security Requirements: Document the program's approach to implementing IT security requirements in accordance with NPR 2810.1, Security of Information Technology.

Emergency Response Requirements: Describe the program's emergency response plan in accordance with NPR 1040.1, NASA Continuity of Operations (COOP) Planning Procedural Requirements and define the range and scope of potential crises and specific response actions, timing of notifications and actions, and responsibilities of key individuals.

3.16 Threat Summary

Threat summaries attempt to document the threat environment that a NASA space system/constellation or aircraft is most likely to encounter as it reaches operational capability. These documents contain Top Secret/Sensitive Compartmented Information on the valid threats to U.S. space systems and are the basis for establishing threat levels that the Program Office will use to develop survivability strategies. Threat summaries are completed by an Agency team with proper clearances at the request of the program manager through the Office of the Chief Engineer. This team discusses with the program manager risk mitigation strategies, which are incorporated into the program Threat Summary. Classified information is handled appropriately and not included in the Program Plan.

Program managers will ensure that a preliminary baseline Threat Summary is prepared by KDP 0 and that a baseline document is completed by KDP I. Updates to the baseline Threat Summary during the Implementation Phase will be in accordance with product maturities, as documented in Appendix I of NPR 7120.5. Specific technical information that is relevant to the production of the Threat Summary will be added to an appendix of the baseline document for each project that makes up the program.

Program managers will provide program and project documentation to aid in the preparation of threat summaries, i.e., mission overviews/requirements and operations concepts to either crewed or robotic space protection program personnel to draft these documents. High-risk threat information will be extracted from the Threat Summary at the Secret level and transferred to the hostile threat section of the Project Protection Plan to develop mission survivability strategies and protection measures.

3.17 Technology Transfer Control Plan

Describe how the program will implement the export control requirements specified in NPR 2190.1, NASA Export Control Program.

3.18 Education Plan

Describe any planned activities to enhance Science, Technology, Engineering, or Math (STEM) education using the program's science and technical content. Describe plan for coordinating with the Mission Directorate Education Coordinating Council (ECC) member to ensure program education activities are aligned with NASA education portfolio offerings and requirements.

Define goals and outcomes for each activity. Address how the activity will advance NASA strategic goals for education. Identify target audience for each activity and discuss how it reaches and engages groups traditionally underrepresented and/or underserved in STEM disciplines.

Describe how each activity will be evaluated. Define specific metrics and describe how they will

be collected. Include a timeline with relevant milestones for achieving goals and outcomes for each activity.

Describe the relationship between the program and project(s) education plans.

3.19 Communications Plan

Describe plans to implement a diverse, broad, and integrated set of efforts and activities to communicate with, and engage target audiences, the public, and other stakeholders in understanding the program, its objectives, elements, and benefits. Describe how the plan relates to the larger NASA vision and mission. Focus should be placed on activities and campaigns that are relevant; compelling; accessible; and, where appropriate, participatory. Describe how these efforts and activities will promote interest and foster participation in NASA's endeavors. Address how these efforts and activities will develop exposure to, and appreciation for, STEM.

Define goals and outcomes, as well as key overarching messages and themes. Identify target audiences, stakeholders, and partnerships. Summarize and describe products to be developed and the tools, infrastructure, and methods that will be used to communicate, deploy, and disseminate those products, including media, multimedia, Web, social media, and publications for non-technical audiences, excluding those developed in the context of the Education Plan. Describe events, activities, and initiatives focused on public engagement and how they link with planned products and infrastructure. Identify milestones and resources required for implementation, and define metrics to measure success.

Describe the relationship between the program and project Communications Plans and the coordination between program and projects regarding communications activities.

3.20 Knowledge Management Plan

Describe the project's approach to creating the program's knowledge management strategy and processes. Strategy should include practices for examining the lessons learned database for relevant lessons that can be reflected in the program early in the planning process to avoid known issues; identifying, capturing and transferring knowledge and continuously capturing and documenting lessons learned throughout the program life cycle in accordance with NPD 7120.4, NASA Engineering and Program/Project Management Policy, and as described in NPD 7120.6, Knowledge Policy on Programs and Projects and other appropriate requirements and standards documentation.

3.21 Human Rating Certification Package

For human space flight missions, develop a Human Rating Certification Package per NPR 8705.2, Human Rating Requirements for Space Systems. Human rating certification focuses on the integration of the human into the system, preventing catastrophic events during the mission, and protecting the health and safety of humans involved in or exposed to space activities, specifically the public, crew, passengers, and ground personnel.

4.0 WAIVERS OR DEVIATIONS LOG

Identify NPR 7120.5 requirements for which a waiver or deviation has been requested and approved consistent with program characteristics such as scope, complexity, visibility, cost, safety, and acceptable risk, and provide rationale and approvals.

5.0 CHANGE LOG

Record changes in the Program Plan.

6.0 APPENDICES

Appendix A Acronyms
Appendix B Definitions
Appendix C Compliance Matrix for this NPR

Appendix H. Project Plan Template

H.1 Template Instructions

H.1.1 The Project Plan is an agreement among the project manager, program manager, Center Director, and the Mission Directorate Associate Administrator (MDAA). Other Center Directors providing a significant contribution to the project also concur with the Project Plan to document their commitment to provide required Center resources. It defines, at a high level, the scope of the project, the implementation approach, the environment within which the project operates, and the baseline commitments of the program and project. The Project Plan is consistent with the Program Plan. The Project Plan is updated and approved during the project life cycle in response to changes in program requirements on the project or the baseline commitments.

H.1.2 In this Project Plan template, all subordinate plans, collectively called control plans, are required unless they are not applicable. They are based on requirements in NASA Policy Directives (NPDs) and NASA Procedural Requirements (NPRs) that affect program/project planning. Certain control plans (the Safety and Mission Assurance (SMA) Plan, Risk Management Plan, Systems Engineering Management Plan (SEMP), and Software Management Plan) are required to be stand-alone plans with summaries and references provided in the Project Plan. If a control plan is not applicable to a particular project, indicate that by stating it is not applicable in the appropriate section and provide a rationale. The remaining control plans can either be a part of the Project Plan or separate stand-alone documents referenced in the appropriate part of the Project Plan. In the case of the latter, the Project Plan contains a summary of and reference to the stand-alone document; the approval authority for the stand-alone control plan is the project manager.

H.1.3 Each section of the Project Plan template is required. If a section is not applicable to a particular project, indicate by stating that in the appropriate section and provide a rationale. If a section is applicable but the project desires to omit the section or parts of a section, then a waiver or deviation needs to be obtained in accordance with the requirement tailoring process for

NPR 7120.5. If the format of the completed Project Plan differs from this template, a cross-reference table indicating where the information for each template paragraph is needs to be provided with the document when it is submitted for MDAA signature. Approvals are documented in Part 4.0, Waivers or Deviations Log, of the Project Plan. In addition, the project's Compliance Matrix for this NPR is attached to the Project Plan.

H.1.4 The approval signatures of the MDAA, the Center Director, program manager, and project manager certify that the Project Plan implements all the Agency's applicable institutional requirements or that the authority responsible for those requirements, e.g., Safety and Mission Assurance, have agreed to the modification of those requirements contained in the Project Plan.

H.1.5 Single-project programs may combine the Program and Project Plans into a single document if the MDAA agrees.

H.2 Project Plan Title Page

[*Project Name*] Project Plan

[*short title or acronym*]

(Provide a title for the candidate project and designate a short title or proposed acronym in parenthesis, if appropriate.)

_____ _____
Mission Directorate Associate Administrator Date

_____ _____
Center Director (as many signature lines as needed) Date

_____ _____
Program Manager Date

_____ _____
Project Manager Date

By signing this document, signatories are certifying that the content herein is acceptable as direction for managing this program (or project) and that they will ensure its implementation by those over whom they have authority.

Figure H-1 Project Plan Title Page

H.3 Project Plan Template

[Project Name] PROJECT PLAN
[short title or acronym]

1.0 PROJECT OVERVIEW

1.1 Introduction

Briefly describe the background of the project and its current status, including results of Formulation

activities, decisions, and documentation. Document the project's category and NASA payload development risk classification (see NPR 8705.4, Risk Classification for NASA Payloads), as stated in the program requirements on the project.

1.2 Objectives

State the specific project objectives and high-level performance goals levied on the project by the program. Include performance, schedule, cost, and technology development objectives, as applicable. Identify program requirements and constraints on the project. Provide clear traceability to applicable Agency strategic goals.

1.3 Mission Description and Technical Approach

Describe briefly the mission and the mission design. Include mission objectives and goals, mission success criteria, and driving ground rules and assumptions affecting the mission and mission design. Identify key characteristics of the mission, such as launch date(s), flight plans, and the key phases and events on the mission timeline, including end of mission. Use drawings, figures, charts, etc., for clarification. Describe planned mission results, data archiving, and reporting.

Provide a brief description of the technical approach, including constituent launch, flight, and ground systems, operations concepts, and logistics concepts. Describe the systems to be developed (hardware and software), legacy systems, system interfaces, and facilities. Identify driving technical ground rules and assumptions, and major constraints affecting system development (e.g., cost, launch window, required launch vehicle, mission planetary environment, fuel/engine design, and international partners).

1.4 Project Authority, Governance Structure, Management Structure, and Implementation Approach

Identify the Center where the project manager resides. Describe the governance structure based on the project category. Identify the governing PMC responsible for oversight of the project. Describe other Centers' responsibilities, if any. Describe the chain of accountability and decision path that outlines the roles and responsibilities of the project manager, program manager, Center Director, principal investigator, and project scientist, as appropriate, and other authorities as required per the project's categorization.

Define the relationships among various elements and organizations within the project structure, including all stakeholders, team members, and supporting organizations. (This includes Technical Authorities.) Describe the project's approach for fostering effective upward and downward communication of critical management, technical, risk, and safety information. (This includes the Dissenting Opinion process.) Describe the process that the project will follow to communicate with the Center Management Council (CMC) and the Integrated Center Management Council (ICMC) if applicable. Describe briefly the process for problem reporting and subsequent decision making, clearly describing the roles and responsibilities of all organizations. Describe any use of special boards and committees.

Describe the project management structure consistent with the project Work Breakdown Structure (WBS), including organization and responsibilities, its integration with the parent program management structure, and NASA Center(s) participation. Describe clear lines of authority within the project team and between the project, the program office, the primary Center, the Mission Directorate, other participating Centers, and other participating organizations. Illustrate the organization graphically.

Describe briefly the implementation approach of the project, including any applicable guidance or direction from the Acquisition Strategy Meeting (ASM) review, the acquisition strategy (e.g.,

in-house, NASA Centers, and contractor primes), partners, and partner contributions, if appropriate. Describe briefly other program/project dependencies with NASA, other U.S. Government agencies, and international activities, studies, and agreements. Include make-or-buy decision plans and trade studies.

Describe how knowledge management, lessons learned, and participating NASA Centers' implementation policies and practices will be utilized in the execution of the project. Document the agreements on the use of implementation policies and practices between the project manager and contributing NASA Centers in this section (or in appendices to the document), along with the project's approach to ensuring that interfaces do not increase risk to mission success.

1.5 Stakeholder Definition

Describe the stakeholders of the project (e.g., principal investigator (PI), science community, technology community, public, education community, parent program, and Mission Directorate sponsor) and the process to be used within the project to ensure stakeholder advocacy.

2.0 PROJECT BASELINES

Project baselines consist of a set of requirements, cost (including project-held UFE), schedule, and technical content that forms the foundation for program/project execution and reporting done as part of NASA's performance assessment and governance process. (For more detail, see

NPR 7120.5, Section 2.4, on baseline policy and documentation.)

2.1 Requirements Baseline

List or reference the requirements levied on the project by the program in the Program Plan and discuss how these are flowed down to lower levels by summarizing the requirements allocation process. Reference requirements documents used by the project.

2.2 WBS Baseline

Provide the project's WBS and WBS dictionary to the Level 2 elements in accordance with the standard template below and guidance provided by the NASA WBS Handbook, NASA/SP-2010-3404, which can be found on the OCE tab under the "Other Policy Documents" menu in NODIS. The WBS will support cost and schedule allocation down to a work package level; integrate both government and contracted work; integrate well with the EVMS approach; allow for unambiguous cost reporting; and be designed to allow project managers to monitor and control work package/product deliverable costs and schedule.

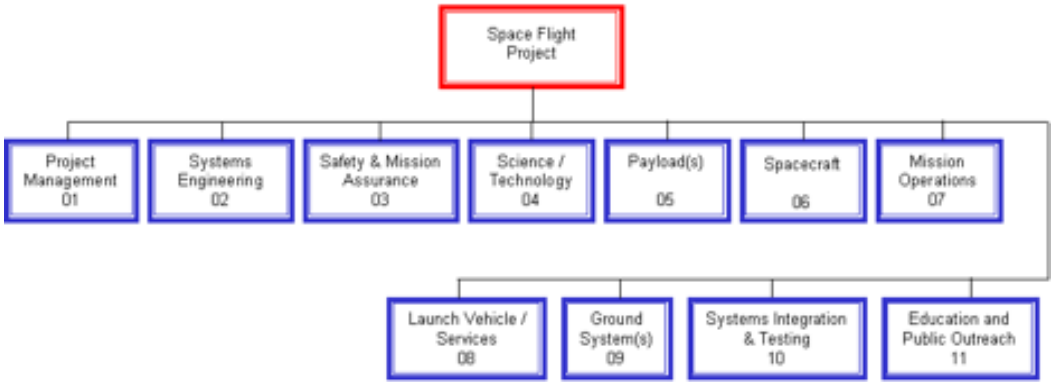

Figure H-2 Standard Level 2 WBS Elements for Space Flight Projects

2.3 Schedule Baseline

Present a summary of the project's IMS, including all critical milestones, major events, life-cycle reviews, and KDPs throughout the project life cycle. The summary of the master schedule should include the logical relationships (interdependencies) for the various project elements and critical paths, as appropriate. Identify driving ground rules, assumptions, and constraints affecting the schedule baseline.

2.4 Resource

Present the project funding requirements by fiscal year. State the New Obligation Authority (NOA) in real-year dollars for all years - prior, current, and remaining. The funding requirements are to be consistent with the project WBS and include funding for all cost elements required by the Agency's full-cost accounting procedures. Provide a breakdown of the project's funding requirements to the WBS Level 2 elements. Throughout the Implementation Phase, cost and schedule baselines are to be based on and maintained consistent with the approved joint cost and schedule confidence level in accordance with NPD 1000.5 and this NPR.

Present the project's workforce requirements by fiscal year, consistent with the project funding requirements and WBS. The workforce estimate is to encompass all work required to achieve project objectives. Include the actual full-cost civil service and support contractor workforce by the organizations providing them for any prior fiscal years. Include full-cost civil service and support contractor workforce requirements by the organizations providing them for the current fiscal year and remaining fiscal years.

Describe the project's infrastructure requirements (acquisition, renovations, and/or use of real property/facilities, aircraft, personal property, and information technology). Identify means of meeting infrastructure requirements through synergy with other existing and planned programs and projects to avoid duplication of facilities and capabilities. Identify necessary upgrades or new developments, including those needed for environmental compliance.

Identify driving ground rules, assumptions, and constraints affecting the resource baseline.

2.5 Joint Cost and Schedule Confidence Level

For Implementation and beyond of projects with an estimated life-cycle cost (LCC) greater than $250 million, document the project's joint cost and schedule confidence level approved by the Decision Authority (DA) and the basis for its consistency with the program's joint cost and schedule confidence level (JCL).

3.0 PROJECT CONTROL PLANS

3.1 Technical, Schedule, and Cost Control Plan

Document how the project plans to control project requirements, technical design, schedule, and cost to achieve the program requirements on the project. (If this information is best documented in other control plans, e.g., the Systems Engineering Management Plan, then reference those control plans.) This control plan documents the following:

Describe the plan to monitor and control the project requirements, technical design, schedule, and cost of the project to ensure that the high-level requirements levied on the project are met.

Describe the project's performance measures in objective, quantifiable, and measurable terms and document how the measures are traced from the program requirements on the project. In addition, document the minimum mission success criteria associated with the program requirements on the project that, if not met, trigger consideration of a Termination Review.

The project also develops and maintains the status of a set of programmatic and technical leading indicators to ensure proper progress and management of the project. These include:

- Requirement Trends (percent growth, TBD/TBR closures, number of requirement changes);
- Interface Trends (percent ICD approval, TBD/TBR burn down, number of interface requirement changes);
- Verification Trends (closure burn down, number of deviations/waivers approved/open);
- Review Trends (RID/RFA/Action Item burn down per review);
- Software Unique Trends (number of requirements per build/release versus plan);
- Problem Report/Discrepancy Report Trends (number open, number closed);
- Cost Trends (Plan, actual, UFE, EVM, NOA);
- Schedule Trends (critical path slack/float, critical milestone dates);
- Staffing Trends (FTE, WYE);
- Technical Performance Measures (Mass margin, power margin); and
- Additional project-specific indicators as needed.

These indicators are further explained in the NASA Space Flight Program and Project Management Handbook, the NASA Project Planning and Control Handbook, and in a white paper on the Program and Project Management Communities of Practice Web site.

Describe the approach to monitor and control the project's Agency Baseline Commitment (ABC). Describe how the project will periodically report performance. Describe mitigation approach if the project is exceeding the development cost documented in the ABC to take corrective action prior to triggering the 30 percent breach threshold. Describe how the project will support a baseline review in the event the DA directs one.

Describe the project's implementation of Technical Authority (Engineering, Health and Medical, and Safety and Mission Assurance).

Describe how the project will implement the SI and other systems of measurement and the identification of units of measure in all product documentation. Where full implementation of the SI system of measurement is not practical, hybrid configurations (i.e., a controlled mix of SI and non-SI system elements) may be used to support maximum practical use of SI units for design, development, and operations. Where hybrid configurations are used, describe the specific requirements established to control interfaces between elements using different measurement systems. (See NPR 7120.5, Section 3.7, for SI assessment timing requirement.)

Describe the project's implementation of Earned Value Management (EVM) including:

- How the PMB will be developed and maintained for the project and how UFE will be established and controlled;
- The methods the project will use to authorize the work and to communicate changes for the scope, schedule, and budget of all suppliers; how the plan is updated as make-buy decisions and agreements are made;
- The process to be used by the project to communicate the time-phased levels of funding that have

been forecast to be made available to each supplier;

- For the class of suppliers not required to use EVM, the schedule and resource information required of the suppliers to establish and maintain a baseline and to quantify schedule and cost variances; how contractor performance reports will be required; and
- How the cost and schedule data from all partners/suppliers will be integrated to form a total project-level assessment of cost and schedule performance.

Describe any additional specific tools necessary to implement the project's control processes (e.g., the requirements management system, project scheduling system, project information management systems, budgeting, and cost accounting system).

Describe the process for monitoring and controlling the IMS.

Describe the process for utilizing the project's technical and schedule margins and UFE to meet the Management and Commitment Baselines.

Describe how the project plans to report technical, schedule, and cost status to the program manager, including the frequency and level of detail of reporting.

Describe the project's internal processes for addressing technical waivers and deviations and handling dissenting opinions.

Describe the project's descope plans, including key decision dates and savings in cost and schedule, and show how the descopes are related to the project's threshold performance requirements.

Include a description of the systems engineering organization and structure and how the Project Chief Engineer (PCE) executes the overall systems engineering functions.

3.2 Safety and Mission Assurance Plan

Develop a project SMA Plan. The SMA Plan addresses life-cycle SMA functions and activities. The plan identifies and documents project-specific SMA roles, responsibilities, and relationships. This is accomplished through a project-unique mission assurance process map and matrix developed and maintained by the project with appropriate support and guidance of the Headquarters and/or Center-level SMA organization.

The plan reflects a project life-cycle SMA process perspective, addressing areas including: procurement, management, design and engineering, design verification and test, software design, software verification and test, manufacturing, manufacturing verification and test, operations, and pre-flight verification and test.

The plan also addresses specific critical SMA disciplines, including (as a minimum): safety per NPR 8715.3, NASA General Safety Program Requirements, and NPR 8705.2, NASA Human-Rating Requirements for Space Systems; quality assurance per NPD 8730.5, NASA Quality Assurance Program Policy; compliance verification, audit, safety and mission assurance reviews, and safety and mission assurance process maps per NPR 8705.6, Safety and Mission Assurance Audits, Reviews, and Assessments; reliability and maintainability per NPD 8720.1, NASA Reliability and Maintainability (R&M) Program Policy; software safety and assurance per NASA-STD-8719.13, NASA Software Safety Standard, and NASA-STD-8739.8, NASA Standard for Software Assurance; quality assurance functions per NPR 8735.1, Procedures For Exchanging Parts, Materials, and Safety Problem Data Utilizing the Government-Industry Data Exchange Program and NASA Advisories and NPR 8735.2, Management of Government Quality Assurance Functions for NASA Contracts; and other applicable NASA procedural safety and mission success requirements.

Describe how the project will develop and manage a Closed Loop Problem Reporting and Resolution System. Describe how the project develops, tracks, and resolves problems. The process should include a well-defined data collection system and process for hardware and software problem and anomaly reports, problem analysis, and corrective action.

Reference the stand-alone SMA Plan here.

3.3 Risk Management Plan

Summarize how the project will implement a risk management process (including risk-informed decision making (RIDM) and continuous risk management (CRM) in accordance with NPR 8000.4, Agency Risk Management Procedural Requirements). Include the initial Significant Risk List and appropriate actions to mitigate each risk. Projects with international or other U.S. Government agency contributions need to plan for, assess, and report on risks due to international or other government partners and plan for contingencies.

Develop a stand-alone Risk Management Plan that includes the content required by NPR 8000.4. Reference the stand-alone plan here.

3.4 Acquisition Plan

The project Acquisition Plan is developed by the project manager, supported by the host Center's Procurement Officer, and needs to be consistent with the results of the Agency strategic acquisition process and ASM. It documents an integrated acquisition strategy that enables the project to meet its mission objectives and provides the best value to NASA. The Acquisition Plan should include, but is not limited to, the following:

Identify all major proposed acquisitions (such as engineering design study, hardware and software development, mission and data operations support, and sustainment) in relation to the project WBS. Provide summary information on each such proposed acquisition, including a Contract WBS; major deliverable items; recommended type of procurement (competitive, AO for instruments); type of contract (cost-reimbursable, fixed-price); source (institutional, contractor, other U.S. Government agency, or international organization); procuring activity; and surveillance approach. Identify those major procurements that require a PSM.

Describe completed or planned studies supporting make-or-buy decisions, considering NASA's in-house capabilities and the maintenance of NASA's core competencies, as well as cost and best overall value to NASA.

Describe the supply chain and identify potential critical and single-source suppliers needed to design, develop, produce, support, and, if appropriate, restart an acquisition program or project. The acquisition plan should promote sufficient program/project stability to encourage industry to invest, plan, and bear their share of risk. Describe the internal and external mechanisms and procedures used to identify, monitor, and mitigate supply chain risks. Include data reporting relationships to allow continuous surveillance of the supply chain that provides for timely notification and mitigation of potential risks. Describe the process for reporting supply chain risks to the program.

Identify the project's approach to strengthen safety and mission assurance in contracts.

Describe how the project will establish and implement a risk management process per NPR 8000.4.

Describe all agreements, memoranda of understanding, barters, in-kind contributions, and other arrangements for collaborative and/or cooperative relationships. Include partnerships created through mechanisms other than those prescribed in the FAR and NFS. List all such agreements (the configuration control numbers, the date signed or projected dates of approval, and associated record

requirements) necessary for project success. Include or reference all agreements concluded with the authority of the project manager and reference agreements concluded with the authority of the program manager and above. Include the following:

(1) NASA agreements, e.g., space communications, launch services, inter-Center memoranda of agreement.

(2) Non-NASA agreements:

(a) Domestic, e.g., U.S. Government agencies.

(b) International, e.g., memoranda of understanding.

3.5 Technology Development Plan

Describe the technology assessment, development, management, and acquisition strategies needed to achieve the project's mission objectives.

Describe how the project will assess its technology development requirements, including how the project will evaluate the feasibility, availability, readiness, cost, risk, and benefit of the new technologies. The approach should include timely reporting of new technologies to the Center Technology Transfer Office and supporting technology transfer activities in accordance with NPR 7500.2, NASA Technology Transfer Requirements.

Describe how the project will identify opportunities for leveraging ongoing technology efforts.

Describe how the project will transition technologies from the development stage to the manufacturing and production phases. Identify the supply chain needed to manufacture the technology and any costs and risks associated with the transition to the manufacturing and production phases. Develop and document appropriate mitigation plans for the identified risks.

Describe the project's strategy for ensuring that there are alternative development paths available if/when technologies do not mature as expected. (Reference NPR 7123.1 for Technology Readiness Levels definitions.)

Describe how the project will remove technology gaps, including maturation, validation, and insertion plans, performance measurement at quantifiable milestones, off-ramp decision gates, and resources required.

Describe briefly how the project will ensure that all planned technology exchanges, contracts, and partnership agreements comply with all laws and regulations regarding export control and the transfer of sensitive and proprietary information.

3.6 Systems Engineering Management Plan

Summarize the key elements of the project Systems Engineering Management Plan (SEMP). Include descriptions of the project's overall approach for systems engineering to include system design and product realization processes (implementation and/or integration, verification and validation, and transition), as well as the technical management processes.

Develop a stand-alone SEMP that includes the content required by NPR 7123.1, NASA Systems Engineering Processes and Requirements. Reference the stand-alone Plan here.

3.7 Information Technology Plan

Describe how the project will acquire and use information technology, addressing the following:

Document the project's approach to implementing IT security requirements in accordance with NPR 2810.1, Security of Information Technology. Place special emphasis on describing how the project will meet the following requirements:

(1) Conduct the Information/System Security Categorization for IT systems during Phase A of the project.

(2) Perform the IT system risk assessment during Phase B of the project.

(3) Document and implement all technical, management, and operational security controls for IT systems during Phase D of the project.

(4) Meet the IT security certification and accreditation requirements for IT systems during Phase D of the project.

(5) Conduct an annual IT security assessment of IT systems during Phase E of the project.

Describe how the project will manage information throughout its life cycle in accordance with NPR 2800.1, Managing Information Technology, including the development and maintenance of an electronic program library. Explain how the project will ensure identification, control, and disposition of project records in accordance with NPD 1440.6, NASA Records Management, and NPR 1441.1, NASA Records Retention Schedules. Reference the stand-alone Records Management Plan, if applicable, to address all records described in NPR 7120.5.

Describe the project's approach to knowledge capture, as well as the methods for contributing knowledge to other entities and systems, including compliance with NPD 2200.1, Management of NASA Scientific and Technical Information, and NPR 2200.2, Requirements for Documentation, Approval, and Dissemination of NASA Scientific and Technical Information.

3.8 Software Management Plan

ummarize how the project will develop and/or manage the acquisition of software required to achieve project and mission objectives. Develop a stand-alone Software Management Plan that includes the content required by NPR 7150.2, Software Engineering Requirements, and NASA-STD-8739.8, Software Assurance Standard. The Plan should be coordinated with the Systems Engineering Management Plan. Reference the stand-alone Plan here.

3.9 Verification and Validation Plan

Summarize the approach for performing verification and validation of the project products. Indicate the methodology to be used in the verification/validation (test, analysis, inspection, or demonstration), as defined in NPR 7123.1, NASA Systems Engineering Processes and Requirements.

3.10 Review Plan

Summarize the project's approach for conducting a series of reviews, including internal reviews and project life-cycle reviews. In accordance with Center best practices, program review requirements, and the requirements in NPR 7123.1, NASA Systems Engineering Processes and Requirements and NPR 7120.5, NASA Space Flight Program and Project Management Requirements, provide the names, purposes, content, and timing of the life-cycle reviews.

Identify any deviations from these documents that the project is planning or waivers that have been granted. Provide the technical, scientific, schedule, cost, and other criteria that will be utilized in the consideration of a Termination Review.

For projects that are part of tightly coupled programs, project life-cycle reviews and KDPs should be planned in accordance with the project life cycle and KDP sequencing guidelines in the Program Plan. Document the sequencing of each project life-cycle review and KDP with respect to the associated Program life-cycle review and KDP. In addition, document which project KDPs should be conducted simultaneously with other projects' KDPs and which project KDPs should be conducted simultaneously with the associated program KDPs.

The sequencing of project life-cycle reviews and KDPs with respect to program life-cycle reviews and KDPs is especially important for project PDR life-cycle reviews that precede KDP Cs. At KDP C, the Agency makes project technical, cost, and schedule commitments to its external stakeholders at the established JCL in accordance with NPR 7120.5 requirements. Since changes to one project can easily impact other projects' technical, cost, schedule, and risk baselines, projects and their program may need to proceed to KDP C/KDP I together.

3.11 Mission Operations Plan

Describe the activities required to perform the mission. Describe how the project will implement the associated facilities, hardware, software, and procedures required to complete the mission. Describe mission operations plans, rules, and constraints. Describe the Mission Operations System (MOS) and Ground Data System (GDS) in the following terms:

- MOS and GDS human resources and training requirements;
- Procedures to ensure that operations are conducted in a reliable, consistent, and controlled manner using lessons learned during the program and from previous programs;
- Facilities requirements (offices, conference rooms, operations areas, simulators, and test beds);
- Hardware (ground-based communications and computing hardware and associated documentation); and
- Software (ground-based software and associated documentation).

3.12 Environmental Management Plan

Describe the activities to be conducted at all project locations with support from the responsible Environmental Management Office to comply with NPR 8580.1, Implementing the National Environmental Policy Act and Executive Order 12114. Specifically:

- Identify all required permits, waivers, documents, approvals, or concurrences required for compliance with applicable Federal, State, Tribal government, and local environmental laws and regulations.
- Plan the level of National Environmental Policy Act (NEPA) documentation required to satisfy NEPA requirements prior to KDP C and project Implementation; e.g., the Environmental Checklist (found on the program and project management Community of Practice website) and Record of Environmental Consideration (REC), Environmental Assessment (EA), and Environmental Impact Statement (EIS). The project's plans are based on the program's NEPA strategy at all affected Centers, which is developed in consultation with the NASA Headquarters NEPA coordinator to ensure the most effective, least resource-intensive strategy to meet NEPA requirements across the program and its constituent projects.
- Describe the documentation and schedule of events for complying with these regulations, including identifying any modifications to the Center's Environmental Management System (EMS) that would be required for compliance.

- Insert into the project schedule the critical milestones associated with complying with these regulations.

3.13 Integrated Logistics Support Plan

Describe how the project will implement NPD 7500.1, Program and Project Logistics Policy, including a maintenance and support concept; participation in the design process to enhance supportability; supply support; maintenance and maintenance planning; packaging, handling, and transportation; technical data and documentation; support and test equipment; training; manpower and personnel for ILS functions; facilities required for ILS functions; and logistics information systems for the life of the project.

3.14 Science Data Management Plan

Describe how the project will manage the scientific data generated and captured by the operational mission(s) and any samples collected and returned for analysis. Include descriptions of how data will be generated, processed, distributed, analyzed, and archived, as well as how any samples will be collected, stored during the mission, and managed when returned to Earth. The Plan should include definition of data rights and services and access to samples, as appropriate. Explain how the project will accomplish the knowledge capture and information management and disposition requirements in NPD 2200.1, Management of NASA Scientific and Technical Information, NPR 2200.2, Requirements for Documentation, Approval, and Dissemination of NASA Scientific and Technical Information, NPR 1441.1, NASA Records Retention Schedules, as applicable to project science data.

3.15 Integration Plan

Prepare an integration plan that defines the integration and verification strategies for a project interface with the system design and decomposition into the lower-level elements. The integration plan is structured to bring the elements together to assemble each subsystem and to bring all of the subsystems together to assemble the system/product. The primary purposes of the integration plan are: (1) to describe this coordinated integration effort that supports the implementation strategy, (2) to describe for the participants what needs to be done in each integration step, and (3) to identify the required resources and when and where they will be needed.

3.16 Configuration Management

Describe the configuration management (CM) approach that the project team will implement, consistent with NPR 7123.1 and SAE EIA 649B Standard for Configuration Management. Describe the structure of the CM organization and tools to be used. Describe the methods and procedures to be used for configuration identification, configuration control, interface management, configuration traceability, and configuration status accounting and communications. Describe how CM will be audited and how contractor CM processes will be integrated with the project. Reference the stand-alone project Configuration Management Plan, if applicable.

3.17 Security Plan

Describe the project's plans for ensuring security and technology protection, including:

Security Requirements: Describe the project's approach for planning and implementing the requirements for information, physical, personnel, industrial, and counterintelligence/ counterterrorism security and for security awareness/education requirements in accordance with NPR 1600.1, NASA Security Program Procedural Requirements and NPD 1600.2, NASA Security Policy. Include in the plan provisions to protect personnel, facilities, mission-essential infrastructure, and critical project information from potential threats and other vulnerabilities that may be

identified during the threat and vulnerability process.

Emergency Response Requirements: Describe the project's emergency response plan in accordance with NPR 1040.1, NASA Continuity of Operations (COOP) Planning Procedural Requirements, and define the range and scope of potential crises and specific response actions, timing of notifications and actions, and responsibilities of key individuals.

3.18 Project Protection Plan

Ensure that a project Protection Plan is completed according to the schedule identified in product maturities, as documented in Appendix I of NPR 7120.5.

Project Protection Plans are based on program threat summaries that document the threat environment that a NASA space system/constellation or aircraft is most likely to encounter as it reaches operational capability. These documents contain Top Secret/Sensitive Compartmented Information on the valid threats to U.S. space systems and are the basis for establishing threat levels that the Program Office will use to develop survivability strategies. Threat summaries are completed by an Agency team with proper clearances at the request of the program manager through the Office of the Chief Engineer. This team discusses with the program manager risk mitigation strategies, which are incorporated into the program Threat Summary. Top Secret information is handled appropriately in the Threat Summary. The project Protection Plan will be classified Secret.

Project Protection Plans recommend potential countermeasures to ensure the protection of the infrastructure elements that support a NASA space system. Hostile threats are extracted from program threat summaries, and major environmental threats (such as category 3, 4, and 5 hurricanes) are predicted based on historical probabilities provided by the National Weather Service. Survivability strategies are driven by existing policies, approved mission requirements, and fiscal realities.

Since protection measures can be implemented either by designing the space systems architecture to be more resilient or by enhancing the capabilities provided by institutional security providers, it is important that the document identify to institutional security providers (both internal and external to NASA) the critical nodes and single points-of-failure in the space system(s). The project Security Plan (see Section 3.17) should address how institutional security measures are implemented on each project to protect its critical nodes.

Protection plans provide technical information on NASA space systems to specific commands and agencies in the Department of Defense and Intelligence Community to assist those organizations in providing timely support to NASA in the event of an incident involving a NASA mission. This capability is implemented via multiple classified computer systems.

3.19 Technology Transfer Control Plan

Describe how the project will implement the export control requirements specified in NPR 2190.1, NASA Export Control Program.

3.20 Knowledge Management Plan

Describe the project's approach to creating the knowledge management strategy and processes. Strategy should include practices for identifying, capturing, and transferring knowledge, and capturing and documenting lessons learned throughout the project life cycle in accordance with NPD 7120.4, NASA Engineering and Program/Project Management Policy and as described in NPD 7120.6, Knowledge Policy on Programs and Projects and other appropriate requirements and standards documentation.

3.21 Human Rating Certification Package

For human space flight missions, develop a Human Rating Certification Package per NPR 8705.2, Human Rating Requirements for Space Systems. Human rating certification focuses on the integration of the human into the system, preventing catastrophic events during the mission, and protecting the health and safety of humans involved in or exposed to space activities, specifically the public, crew, passengers, and ground personnel.

3.22 Planetary Protection Plan

Prepare a plan that specifies management aspects of the planetary protection activities of the project. Planetary protection encompasses: (1) the control of terrestrial microbial contamination associated with space vehicles intended to land, orbit, flyby, or otherwise encounter extraterrestrial solar system bodies, and (2) the control of contamination of the Earth by extraterrestrial material collected and returned by missions. The scope of the plan contents and level of detail will vary with each project based upon the requirements in NASA policies

NPR 8020.12, Planetary Protection Provisions for Robotic Extraterrestrial Missions, and NPD 8020.7, Biological Contamination Control for Outbound and Inbound Planetary Spacecraft.

3.23 Nuclear Safety Launch Approval Plan

Prepare a nuclear safety launch approval plan for any U.S. space mission involving the use of radioactive materials. Procedures and levels of review and analysis required for nuclear launch safety approval vary with the quantity of radioactive material planned for use and potential risk to the general public and the environment. NPR 8715.3, NASA General Safety Program Requirements, specifies the procedural requirements for characterizing and reporting potential risks associated with a planned launch of radioactive materials into space, on launch vehicles and spacecraft, and during flight.

3.24 Range Flight Safety Risk Management Process Documentation

Develop documentation that details a vehicle program's Range Flight Safety Risk Management process in accordance with NPR 8715.5, Range Flight Safety Program. This applies to launch and entry vehicle programs, scientific balloons, sounding rockets, drones and Unmanned Aircraft Systems. This does not apply to programs developing a payload that will fly on board a vehicle. The range flight safety concerns associated with a payload are addressed by the vehicle's range flight safety process. The focus is on the protection of the public, workforce, and property during range flight operations.

3.25 Expendable Launch Vehicle Payload Safety Process Deliverables

For Expendable Launch Vehicle payloads, develop the payload safety process deliverables in accordance with NPR 8715.7, Expendable Launch Vehicle Payload Safety Program. This applies to uninhabited orbital and uninhabited deep space payloads that fly onboard Expendable Launch Vehicles and are managed by NASA, whether developed by NASA or any contractor or independent agency in a joint venture with NASA. The focus is on payload design, fabrication, testing, vehicle integration, launch processing, launch, and planned recovery; payload-provided upper stages; interface hardware that is flown as part of a payload; and Ground Support Equipment used to support payload-related operations. NASA-STD 8719.24 provides more details on payload processing for launch.

3.26 Education Plan

Describe any planned activities to enhance Science, Technology, Engineering or Math (STEM)

education using the project's science and technical content. Describe plan for coordinating with the Mission Directorate Education Coordinating Council (ECC) member to ensure project education activities are aligned with NASA education portfolio offerings and requirements.

Define goals and outcomes for each activity. Address how activity will advance NASA strategic goals for education. Identify target audience for each activity and discuss how it reaches and engages groups traditionally underrepresented and/or underserved in STEM disciplines.

Describe how each activity will be evaluated. Define specific metrics and describe how they will be collected. Include a timeline with relevant milestones for achieving goals and outcomes for each activity.

Describe the relationship between the project and program education plans.

3.27 Communications Plan

Describe plans to implement a diverse, broad, and integrated set of efforts and activities to communicate with, and engage target audiences, the public, and other stakeholders in, understanding the project, its objectives, elements and benefits, and how it relates to the larger NASA vision and mission. Focus should be placed on activities and campaigns that are relevant, compelling, accessible, and where appropriate, participatory. Describe how these efforts and activities will promote interest and foster participation in NASA's endeavors. Address how these efforts and activities will develop exposure to, and appreciation for, STEM.

Define goals and outcomes, as well as key overarching messages and themes. Identify target audiences, stakeholders, and partnerships. Summarize and describe products to be developed and the tools, infrastructure, and methods that will be used to communicate, deploy, and disseminate those products, including media, multimedia, Internet, social media, and publications for non-technical audiences, excluding those developed in the context of the Education Plan. Describe events, activities, and initiatives focused on public engagement and how they link with planned products and infrastructure. Identify milestones and resources required for implementation, and define metrics to measure success.

Describe the relationship between communications project plan elements and program plan elements, and coordination between the project and program regarding communications activities.

4.0 WAIVERS OR DEVIATIONS LOG

Identify NPR 7120.5 requirements for which a waiver or deviation has been requested and approved consistent with project characteristics such as scope, complexity, visibility, cost, safety, and acceptable risk, and provide rationale and approvals.

5.0 CHANGE LOG

Track and document changes to the Project Plan.

6.0 APPENDICES

Appendix A Acronyms
Appendix B Definitions
Appendix C Compliance Matrix for this NPR

Appendix I. Program and Project Products by Phase

I.1 For non-configuration-controlled documents, the following terms and definitions are used in tables I-1 through I-7:

a. "Initial" is applied to products that are continuously developed and updated as the program or project matures.

b. "Final" is applied to products that are expected to exist in this final form, e.g., minutes and final reports.

c. "Summary" is applied to products that synthesize the results of work accomplished.

d. "Plan" is applied to products that capture work that is planned to be performed in the following phases.

e. "Update" is applied to products that are expected to evolve as the formulation and implementation processes evolve. Only expected updates are indicated. However, any document may be updated, as needed.

I.2 For configuration-controlled documents, the following terms and definitions are used in tables I-1 through I-7:

a. "Preliminary" is the documentation of information as it stabilizes but before it goes under configuration control. It is the initial development leading to a baseline. Some products will remain in a preliminary state for multiple LCRs. The initial preliminary version is likely to be updated at subsequent LCRs but remains preliminary until baselined.

b. "Baseline" indicates putting the product under configuration control so that changes can be tracked, approved, and communicated to the team and any relevant stakeholders. The expectation on products labeled "baseline" is that they will be at least final drafts going into the designated LCR and baselined coming out of the LCR. Baselining of products that will eventually become part of the Program or Project Plan indicates that the product has the concurrence of stakeholders and is under configuration control. Updates to baselined documents require the same formal approval process as the original baseline.

c. "Approve" is used for a product, such as Concept Documentation, that is not expected to be put under classic configuration control but still requires that changes from the "Approved" version are documented at each subsequent "Update."

d. "Update" is applied to products that are expected to evolve as the formulation and implementation processes evolve. Only expected updates are indicated. However, any document may be updated, as needed. Updates to baselined documents require the same formal approval process as the original baseline.

Table I-1 Uncoupled and Loosely Coupled Program Milestone Products and Control Plans Maturity Matrix

Products	Formulation		Implementation
	KDP I1		KDP I1
	SRR	SDR	PIR
1. FAD	Baseline		
2. PCA	Preliminary	Baseline	
3. Program Plan	Preliminary	Baseline	Update
3.a. Mission Directorate requirements and constraints	Baseline	Update	
3.b. Traceability of program-level requirements on projects to the Agency strategic goals and Mission Directorate requirements and constraints	Preliminary	Baseline	
3.c. Documentation of driving ground rules and assumptions on the program	Preliminary	Baseline	
4. Interagency and international agreements	Preliminary	Baseline	
5. ASM minutes		Final	
6. Risk mitigation plans and resources for significant risks	Initial	Update	Update
7. Documented Cost and Schedule Baselines	Preliminary	Baseline	Update
8. Documentation of Basis of Estimate (cost and schedule)	Preliminary	Baseline	Update
9. Documentation of performance against plan/baseline, including status/closure of formal actions from previous KDP.	Summary	Summary	Summary
10. Plans for work to be accomplished during Implementation		Plan	Plan
Program Plan Control Plans2			
1. Technical, Schedule, and Cost Control Plan	Preliminary	Baseline	
2. Safety and Mission Assurance Plan	Preliminary	Baseline	
3. Risk Management Plan	Preliminary	Baseline	
4. Acquisition Plan	Preliminary	Baseline	
5. Technology Development Plan	Preliminary	Baseline	
6. Systems Engineering Management Plan	Preliminary	Baseline	
7. Review Plan	Baseline	Update	
8. Environmental Management Plan		Baseline	
9. Configuration Management Plan		Baseline	
10. Security Plan		Baseline	
11. Threat Summary		Baseline	Update annually

12. Technology Transfer (formerly Export) Control Plan		Baseline	
13. Education Plan		Baseline	
14. Communications Plan		Baseline	
15. Knowledge Management Plan	Preliminary	Baseline	

[1] If desired, the Decision Authority may request a KDP 0 be performed generally following SRR.

2 Requirements for and scope of control plans will depend on scope of program. As noted in the template, control plans may be a part of the basic Program Plan.

Table I-2 Tightly Coupled Program Milestone Products Maturity Matrix

Products	Formulation			Implementation				
	KDP 0		KDP I	KDP II		KDP III		KDP n
	SRR	SDR	PDR	CDR	SIR	ORR	MRR/FRR	DR
1. FAD	Baseline							
2. PCA		Preliminary	Baseline					
3. Program Plan	Preliminary	Baseline	Update	Update	Update	Update	Update	Update
3.a. Mission Directorate requirements and constraints	Baseline	Update	Update					
3.b. Traceability of program-level requirements on projects to the Agency strategic goals and Mission Directorate requirements and constraints	Preliminary	Baseline	Update					
3.c. Documentation of driving ground rules and assumptions on the program	Preliminary	Baseline	Update	Update	Update			
4. Interagency and international agreements	Preliminary	Baseline	Update					
5. ASM minutes		Final						
6. Risk mitigation plans and resources for significant risks	Initial	Update	Update	Update	Update	Update	Update	Update
7. Documented Cost and Schedule Baselines	Preliminary	Preliminary	Baseline	Update	Update	Update	Update	Update
8. Documentation of Basis of Estimate (cost and schedule)	Preliminary	Preliminary	Baseline	Update	Update	Update	Update	Update
9. Confidence Level(s) and supporting documentation		Preliminary cost confidence level and preliminary schedule confidence level	Baseline Joint Cost and Schedule Confidence Level					
10. Shared Infrastructure[1], Staffing, and Scarce Material Requirements and Plans	Initial	Update	Update	Update				

11. Documentation of performance against plan/baseline, including status/closure of formal actions from previous KDP		Summary	Summary	Summary	Summary	Summary	Summary	Summary
12. Plans for work to be accomplished during next life-cycle phase	Plan		Plan		Plan		Plan	Plan

[1] Shared infrastructure includes facilities that are required by more than one of the program's projects.

Table I-3 Tightly Coupled Program Plan Control Plans Maturity Matrix

NPR 7120.5 Program Plan Control Plans (See template in Appendix G for control plan details.)	Formulation			Implementation				
	KDP 0		KDP I	KDP II		KDP III		KDP n
	SRR	SDR	PDR	CDR	SIR	ORR	MRR/FRR	DR
1. Technical, Schedule, and Cost Control Plan	Preliminary	Baseline	Update					
2. Safety and Mission Assurance Plan	Preliminary	Baseline	Update	Update			Update (SMSR)	
3. Risk Management Plan	Preliminary	Baseline	Update					
4. Acquisition Plan	Preliminary Strategy	Baseline	Update					
5. Technology Development Plan	Preliminary	Baseline	Update					
6. Systems Engineering Management Plan	Preliminary	Baseline						
7. Verification and Validation Plan		Preliminary	Baseline	Update	Update			
8. Information Technology Plan	Preliminary	Baseline	Update					
9. Review Plan[1]	Baseline	Update	Update					
10. Missions Operations Plan					Preliminary	Baseline	Update	
11. Environmental Management Plan		Preliminary	Baseline	Update				
12. Integrated Logistics Support Plan		Preliminary	Baseline	Update				
13. Science Data Management Plan			Preliminary			Baseline	Update	
14. Configuration Management Plan[2]	Preliminary	Baseline	Update					
15. Security Plan		Preliminary	Baseline					
16. Threat Summary		Preliminary	Baseline	Update	Update	Update	Update annually	
17. Technology Transfer (formerly Export) Control Plan		Preliminary	Baseline	Update				

18. Education Plan		Preliminary	Baseline	Update		Update		
19. Communications Plan		Preliminary	Baseline	Update		Update		
20. Knowledge Management Plan	Preliminary	Baseline	Update					
21. Human Rating Certification Package	Initial	Update	Update	Update		Update	Approve Certification	

[1] Review Plan should be baselined before the first review.

2 Software and hardware configuration management may be preliminary at SRR and updated at SDR.

Table I-4 Project Milestone Products Maturity Matrix

Products	Pre-Phase A KDP A	Phase A KDP B		Phase B KDP C	Phase C KDP D		Phase D KDP E		Phase E KDP F	Phase F
	MCR	SRR	SDR/MDR	PDR	CDR	SIR	ORR	MRR/ FRR	DR	DRR
Headquarters and Program Products1										
1. FAD	Baseline									
2. Program Plan	Baseline									
2.a. Applicable Agency strategic goals	Baseline	Update	Update							
2.b. Documentation of program-level requirements and constraints on the project (from the Program Plan) and stakeholder expectations, including mission objectives/goals and mission success criteria	Preliminary	Baseline	Update	Update						
2.c. Documentation of driving mission, technical, and programmatic ground rules and assumptions	Preliminary	Preliminary	Baseline	Update	Update	Update				
3. Partnerships and interagency and international agreements	Preliminary	Update	Baseline U.S. partnerships and agreements	Baseline international agreements						
4. ASM minutes		Final								
5. NEPA compliance documentation per NPR 8580.1				Final documentation per NPR 8580.1						
6. Mishap Preparedness and Contingency Plan				Preliminary		Update		Baseline (SMSR)	Update	Update
Project Technical Products2										
1. Concept Documentation	Approve	Update	Update	Update						
2. Mission, Spacecraft, Ground, and Payload Architectures	Preliminary mission and spacecraft architecture(s) with key drivers	Baseline mission and spacecraft architecture, preliminary ground and payload architectures. Classify payload(s) by risk per NPR 8705.4.	Update mission and spacecraft architecture, baseline ground and payload architectures	Update mission, spacecraft, ground and payload architectures						
3. Project-Level, System, and Subsystem Requirements	Preliminary project-level requirements	Baseline project-level and system-level requirements	Update Project-level and system-level requirements, Preliminary subsystem requirements	Update project-level and system-level requirements. Baseline subsystem requirements						

4. Design Documentation			Preliminary	Baseline Preliminary Design	Baseline Detailed Design	Update		Baseline As-built hardware and software		
5. Operations Concept	Preliminary	Preliminary	Preliminary	Baseline						
6. Technology Readiness Assessment Documentation	Initial	Update	Update	Update	Update					
7. Engineering Development Assessment Documentation	Initial	Update	Update	Update						
8. Heritage Assessment Documentation	Initial	Update	Update	Update						
9. Safety Data Packages [Baseline at CDR] [per NPRs 8715.3, 8735.1, and 8735.2]				Preliminary	Baseline	Update	Update	Update		
10. ELV Payload Safety Process Deliverables				Preliminary	Preliminary	Baseline				
11. Verification and Validation Report							Preliminary	Baseline		
12. Operations Handbook						Preliminary	Baseline	Update		
13. Orbital Debris Assessment per NPR 8715.6	Preliminary Assessment			Preliminary design ODAR	Detailed design ODAR			Final ODAR (SMSR)		
14. End of Mission Plans per NPR 8715.6/NASA-STD 8719.14, App B								Baseline End of Mission Plan (SMSR)	Update EOMP annually	Update EOMP
15. Mission Report										Final
Project Management, Planning, and Control Products										
1. Formulation Agreement	Baseline for Phase A; Preliminary for Phase B		Baseline for Phase B							
2. Project Plan			Preliminary	Baseline						
3. Plans for work to be accomplished during next Implementation life-cycle phase				Baseline for Phase C		Baseline for Phase D		Baseline for Phase E	Baseline for Phase F	
4. Documentation of performance against Formulation Agreement (see #1 above) or against plans for work to be accomplished during Implementation life-cycle phase (see #3 above), including performance against baselines and status/closure of formal actions from previous KDP		Summary	Summary	Summary	Summary	Summary	Summary	Summary	Summary	
5.Project Baselines			Preliminary	Baseline	Update	Update	Update	Update		
5.a. Top technical, cost, schedule and safety risks, risk mitigation plans, and associated resources	Initial	Update	Update	Update	Update	Update	Update	Update	Update	Update
5.b. Staffing requirements and plans	Initial	Update	Update	Update	Update		Update			
5.c. Infrastructure requirements and plans, business case analysis for infrastructure Capitalization Determination Form (CDF) (NASA Form 1739), per NPR 9250.1	Initial	Update	Update	Update	Update					

5.d. Schedule	Risk informed at project level with preliminary Phase D completion ranges	Risk informed at system level with preliminary Phase D completion ranges	Risk informed at subsystem level with preliminary Phase D completion ranges. Preliminary Integrated Master Schedule	Risk informed and cost- or resource-loaded. Baseline Integrated Master Schedule	Update IMS	Update IMS	Update IMS			
5.e. Cost Estimate (Risk-Informed or Schedule-Adjusted Depending on Phase)	Preliminary Range estimate	Update	Risk-informed schedule-adjusted range estimate	Risk-informed and schedule-adjusted Baseline	Update	Update	Update	Update	Update	Update
5.f. Basis of Estimate (cost and schedule)	Initial (for range)	Update (for range)	Update (for range)	Update for cost and schedule estimate	Update	Update	Update	Update	Update	Update
5.g. Confidence Level(s) and supporting documentation			Preliminary cost confidence level and preliminary schedule confidence level	Baseline Joint Cost and Schedule Confidence Level						
5.h. External Cost and Schedule Commitments			Preliminary for ranges	Baseline						
5.i. CADRe			Baseline	Update	Update	Update		Update[3]	Update	
6. Decommissioning/Disposal Plan									Baseline	Update Disposal portions

[1] These products are developed by the Mission Directorate.

[2] These document the work of the key technical activities performed in the associated phases.

[3] The CADRe for MRR/FRR is considered the "Launch CADRe" to be completed after the launch.

Table I-5 Project Plan Control Plans Maturity Matrix

NPR 7120.5 Project Plan Control Plans (See template in Appendix H for control plan details)	**Pre-Phase A**	**Phase A KDP B**		**Phase B KDP C**	**Phase C KDP D**		**Phase D KDP E**		**Phase E KDP F**
	MCR	**SRR**	**SDR/MDR**	**PDR**	**CDR**	**SIR**	**ORR**	**MRR/ FRR**	**DR**
1. Technical, Schedule, and Cost Control Plan	Approach for managing schedule and cost during Phase A [1]	Preliminary	Baseline	Update					
2. Safety and Mission Assurance Plan		Baseline	Update	Update	Update			Update (SMSR)	Update
3. Risk Management Plan	Approach for managing risks during Phase A [1]	Baseline	Update	Update					
4. Acquisition Plan	Preliminary Strategy	Baseline	Update	Update					
5. Technology Development Plan (may be part of Formulation Agreement)	Baseline	Update	Update	Update					
6. Systems Engineering Management Plan	Preliminary	Baseline	Update	Update					
7. Information Technology Plan		Preliminary	Baseline	Update					
8. Software Management Plan(s)		Preliminary	Baseline	Update					

9. Verification and Validation Plan	Preliminary Approach[2]		Preliminary	Baseline	Update	Update			
10. Review Plan	Preliminary	Baseline	Update	Update					
11. Mission Operations Plan						Preliminary	Baseline	Update	
12. Environmental Management Plan			Baseline						
13. Integrated Logistics Support Plan	Approach for managing logistics[2]	Preliminary	Preliminary	Baseline	Update				
14. Science Data Management Plan				Preliminary			Baseline	Update	
15. Integration Plan	Preliminary approach[2]		Preliminary	Baseline	Update				
16. Configuration Management Plan		Baseline	Update	Update					
17. Security Plan			Preliminary	Baseline					Update annually
18. Project Protection Plan			Preliminary	Baseline	Update	Update	Update	Update	Update annually
19. Technology Transfer (formerly Export) Control Plan			Preliminary	Baseline	Update				
20. Knowledge Management Plan	Approach for managing during Phase A [1]		Preliminary	Baseline	Update				
21. Human Rating Certification Package	Preliminary approach [2]	Initial	Update	Update	Update		Update	Approve Certification	
22. Planetary Protection Plan			Planetary Protection Certification (if required)	Baseline					
23. Nuclear Safety Launch Approval Plan			Baseline (mission has nuclear materials)						
24. Range Safety Risk Management Process Documentation				Preliminary	Preliminary	Baseline			
25. Education Plan			Preliminary	Baseline	Update		Update		
26. Communications Plan			Preliminary	Baseline	Update		Update		

[1]Not the Plan, but documentation of high-level process. May be documented in MCR briefing package.

[2] Not the Plan, but documentation of considerations that might impact the cost and schedule baselines. May be documented in MCR briefing package.

Table I-6 Single-Project Program Milestone Products Maturity Matrix

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Products	Pre-Phase A KDP A	Phase A KDP B		Phase B KDP C	Phase C KDP D		Phase D KDP E		Phase E KDP F	Phase F
	MCR	SRR	SDR/MDR	PDR	CDR	SIR	ORR	MRR/FRR	DR	DRR
Headquarters Products1										
1. FAD	Baseline									
2. PCA			Preliminary	Baseline						

3. Traceability of Agency strategic goals and Mission Directorate requirements and constraints to program/project-level requirements and constraints.	Preliminary	Baseline	Update	Update						
4. Documentation of driving mission, technical, and programmatic ground rules and assumptions	Preliminary	Preliminary	Baseline	Update	Update	Update				
5. Partnerships and inter-agency and international agreements	Preliminary	Update	Baseline U.S. partnerships and agreements	Baseline international agreements						
6. ASM minutes		Final								
7. NEPA compliance documentation per NPR 8580.1				Final documentation per NPR 8580.1						
8. Mishap Preparedness and Contingency Plan				Preliminary		Update		Baseline (SMSR)	Update	Update
Single-Project Program Technical Products2										
1. Concept Documentation	Approve	Update	Update	Update						
2. Mission, Spacecraft, Ground, and Payload Architectures	Preliminary mission and spacecraft architecture(s) with key drivers	Baseline mission and spacecraft architecture, preliminary ground and payload architectures. Classify payload(s) by risk per NPR 8705.4.	Update mission and spacecraft architecture, baseline ground and payload architectures	Update mission, spacecraft, ground, and payload architectures						
3. Project-Level, System, and Subsystem Requirements	Preliminary project-level requirements	Baseline project-level and system-level requirements	Update Project-level and system-level requirements, Preliminary subsystem requirements	Update project-level and system-level requirements. Baseline subsystem requirements						
4. Design Documentation			Preliminary	Baseline Preliminary Design	Baseline Detailed Design	Update		Baseline as-built hardware and software		
5. Operations Concept	Preliminary	Preliminary	Preliminary	Baseline						
6. Technology Readiness Assessment Documentation	Initial	Update	Update	Update	Update					
7. Engineering Development Assessment Documentation	Initial	Update	Update	Update						
8. Heritage Assessment Documentation	Initial	Update	Update	Update						
9. Safety Data Packages [Baseline at CDR]				Preliminary	Baseline	Update	Update	Update		
10. ELV Payload Safety Process Deliverables				Preliminary	Preliminary	Baseline				
11. Verification and Validation Report							Preliminary	Baseline		
12. Operations Handbook						Preliminary	Baseline	Update		

13. Orbital Debris Assessment per NPR 8715.6	Preliminary Assessment			Preliminary design ODAR	Detailed design ODAR			Final ODAR (SMSR)		
14. End of Mission Plans per NPR 8715.6/NASA-STD 8719.14, App B								Baseline End of Mission Plan (SMSR)	Update EOMP annually	Update EOMP
15. Mission Report										Final
Single-Project Program Management, Planning, and Control Products										
1. Formulation Agreement	Baseline for Phase A; Preliminary for Phase B		Baseline for Phase B							
2. Program Plan3			Preliminary	Baseline						
3. Project Plan3			Preliminary	Baseline						
4. Plans for work to be accomplished during next Implementation life-cycle phase				Baseline for Phase C		Baseline for Phase D		Baseline for Phase E	Baseline for Phase F	
5. Documentation of performance against Formulation Agreement (see #1 above) or against plans for work to be accomplished during Implementation life-cycle phase (see #3 above), including performance against baselines and status/closure of formal actions from previous KDP		Summary	Summary	Summary	Summary	Summary	Summary	Summary	Summary	
6.Project Baselines			Preliminary	Baseline	Update	Update	Update	Update		
6.a. Top technical, cost, schedule and safety risks, risk mitigation plans, and associated resources	Initial	Update	Update	Update	Update	Update	Update	Update	Update	Update
6.b. Staffing requirements and plans	Initial	Update	Update	Update	Update		Update			
6.c. Infrastructure requirements and plans, business case analysis for infrastructure Capitalization Determination Form (CDF) (NASA Form 1739), per NPR 9250.1	Initial	Update	Update	Update	Update					
6.d. Schedule	Risk informed at project level with preliminary Phase D completion ranges	Risk informed at system level with preliminary Phase D completion ranges	Risk informed at subsystem level with preliminary Phase D completion ranges. Preliminary Integrated Master Schedule	Risk informed and cost- or resource-loaded. Baseline Integrated Master Schedule	Update IMS	Update IMS	Update IMS			
6.e. Cost Estimate (Risk-Informed or Schedule-Adjusted Depending on Phase)	Preliminary Range estimate	Update	Risk-informed schedule-adjusted range estimate	Risk-informed and schedule-adjusted baseline	Update	Update	Update	Update	Update	Update
6.f. Basis of Estimate (cost and schedule)	Initial (for range)	Update (for range)	Update (for range)	Update for cost and schedule estimate	Update	Update	Update	Update	Update	Update
6.g. Confidence Level(s) and supporting documentation			Preliminary cost confidence level and preliminary schedule confidence level	Baseline Joint Cost and Schedule Confidence Level						

6.h. External Cost and Schedule Commitments			Preliminary for ranges	Baseline						
6.i. CADRe			Baseline	Update	Update	Update		Update[4]	Update	
7. Decommissioning/ Disposal Plan									Baseline	Update disposal portions

[1] These products are developed by the Mission Directorate.

[2] These document the work of the key technical activities performed in the associated phases.

[3] The program and project plans may be combined with the approval of the MDAA.

[4] The CADRe for MRR/FRR is considered the "Launch CADRe" to be completed after the launch.

Table I-7 Single-Project Program Plan Control Plans Maturity Matrix

NPR 7120.5 Program and Project Plan Control Plans (See template in Appendices G and H for control plan details)	**Pre-Phase A**	**Phase A KDP B**		**Phase B KDP C**	**Phase C KDP D**		**Phase D KDP E**		**Phase E KDP F**
	MCR	**SRR**	**SDR/MDR**	**PDR**	**CDR**	**SIR**	**ORR**	**MRR/ FRR**	**DR**
1. Technical, Schedule, and Cost Control Plan	Approach for managing schedule and cost during Phase A[1]	Preliminary	Baseline		Update				
2. Safety and Mission Assurance Plan		Baseline	Update	Update	Update			Update (SMSR)	Update
3. Risk Management Plan	Approach for managing risks during Phase A[1]	Baseline	Update	Update					
4. Acquisition Plan	Preliminary Strategy	Baseline	Update	Update					
5. Technology Development Plan (may be part of Formulation Agreement)	Baseline	Update	Update	Update					
6. Systems Engineering Management Plan	Preliminary	Baseline	Update	Update					
7. Information Technology Plan		Preliminary	Baseline	Update					
8. Software Management Plan(s)		Preliminary	Baseline	Update					
9. Verification and Validation Plan	Preliminary Approach2		Preliminary	Baseline	Update	Update			
10. Review Plan	Preliminary	Baseline	Update	Update					
11. Mission Operations Plan						Preliminary	Baseline	Update	
12. Environmental Management Plan			Baseline						
13. Integrated Logistics Support Plan	Approach for managing logistics[2]	Preliminary	Preliminary	Baseline	Update				
14. Science Data Management Plan				Preliminary			Baseline	Update	

15. Integration Plan	Preliminary approach[2]		Preliminary	Baseline	Update				
16. Threat Summary			Preliminary	Baseline	Update	Update	Update	Update annually	
17. Configuration Management Plan		Baseline	Update	Update					
18. Security Plan			Preliminary	Baseline					Update annually
19. Project Protection Plan			Preliminary	Baseline	Update	Update	Update	Update	Update annually
20. Technology Transfer (formerly Export) Control Plan			Preliminary	Baseline	Update				
21. Knowledge Management Plan	Approach for managing during Phase A [1]		Preliminary	Baseline	Update				
22. Human Rating Certification Package	Preliminary approach[2]	Initial	Update	Update	Update		Update	Approve Certification	
23. Planetary Protection Plan			Planetary Protection Certification (if required)	Baseline					
24. Nuclear Safety Launch Approval Plan			Baseline (mission has nuclear materials)						
25. Range Safety Risk Management Process Documentation				Preliminary	Preliminary	Baseline			
26. Education Plan			Preliminary	Baseline	Update		Update		
27. Communications Plan			Preliminary	Baseline	Update		Update		

[1] Not the Plan, but documentation of high-level process. May be documented in MCR briefing package.

[2] Not the Plan, but documentation of considerations that might impact the cost and schedule baselines. May be documented in MCR briefing package.

Appendix J. References

a. 15 U.S.C. § 205b, reference: Metric Conversion Act, Pub. L. No. 94-168, December 3, 1975, as amended by the Omnibus Trade and Competitiveness Act of 1988, Pub. L. No. 100-418.

b. Metric Use in Federal Government Programs, Exec. Order No. 12770, dated July 25, 1991.

c. NPD 1440.6, NASA Records Management.

d. NPD 1600.2, NASA Security Policy.

e. NPD 2200.1, Management of NASA Scientific and Technical Information.

f. NPD 7120.4, NASA Engineering and Program/Project Management Policy.

g. NPD 7500.1, Program and Project Logistics Policy.

h. NPD 8010.3, Notification of Intent to Decommission or Terminate Operating Space Systems and Terminate Missions.

i. NPD 8081.1, NASA Chemical Rocket Propulsion Testing.

j. NPD 8020.7, Biological Contamination Control for Outbound and Inbound Planetary Spacecraft.

k. NPD 8700.1, NASA Policy for Safety and Mission Success.

l. NPD 8720.1, NASA Reliability and Maintainability (R&M) Program Policy.

m. NPD 8730.5, NASA Quality Assurance Program Policy.

n. NPD 8900.5, NASA Health and Medical Policy for Human Space Exploration.

o. NPR 1040.1, NASA Continuity of Operations (COOP) Planning Procedural Requirements.

p. NPR 1441.1, NASA Records Retention Schedules.

q. NPR 1600.1, NASA Security Program Procedural Requirements.

r. NPR 2190.1, NASA Export Control Program.

s. NPR 2200.2, Requirements for Documentation, Approval, and Dissemination of NASA Scientific and Technical Information.

t. NPR 2810.1, Security of Information Technology.

u. NPR 2800.1, Managing Information Technology.

v. NPD 7120.6, Knowledge Policy on Programs and Projects.

w. NPR 7120.7, NASA Information Technology and Institutional Infrastructure Program and Project Management Requirements.

x. NPR 7120.8, NASA Research and Technology Program and Project Management Requirements.

y. NPR 7120.10, Technical Standards for NASA Programs and Projects.

z. NPR 7150.2, NASA Software Engineering Requirements.

aa. NPR 7500.2, NASA Technology Transfer Requirements.

bb. NPR 8000.4, Agency Risk Management Procedural Requirements.

cc. NPR 8020.12, Planetary Protection Provisions for Robotic Extraterrestrial Missions.

dd. NPR 8580.1, Implementing The National Environmental Policy Act and Executive Order 12114.

ee. NPR 8705.2, Human-Rating Requirements for Space Systems.

ff. NPR 8705.4, Risk Classification for NASA Payloads.

gg. NPR 8705.5, Technical Probabilistic Risk Assessment (PRA) Procedures for Safety and Mission Success for NASA Programs and Projects.

hh. NPR 8705.6, Safety and Mission Assurance (SMA) Audits, Reviews, and Assessments.

ii. NPR 8715.3, NASA General Safety Program Requirements.

jj. NPR 8715.7, NASA Expendable Launch Vehicle Payload Safety Program.

kk. NPR 8735.1, Procedures For Exchanging Parts, Materials, and Safety Problem Data Utilizing the Government-Industry Data Exchange Program and NASA Advisories.

ll. NPR 8735.2, Management of Government Quality Assurance Functions for NASA Contracts.

mm. NPR 8715.5, Range Flight Safety Program.

nn. NPR 8715.6, NASA Procedural Requirements for Limiting Orbital Debris.

oo. NPR 8900.1, Health and Medical Requirements for Human Space Exploration.

pp. NPR 9060.1, Cost Accruals.

qq. NPR 9420.1, Budget Formulation.

rr. NPR 9250.1, Property, Plant, and Equipment and Operating Materials and Supplies.

ss. NPR 9470.1, Budget Execution.

tt. SAE EIA 649B Standard for Configuration Management.

uu. NASA-STD-8709.20, Management of Safety and Mission Assurance Technical Authority (SMA TA) Requirements.

vv. NASA-STD-8719.13, NASA Software Safety Standard.

ww NASA-STD 8719.14, Process for Limiting Orbital Debris.

xx. NASA-STD 8719.24, NASA Expendable Launch Vehicle Payload Safety Requirements.

yy. NASA-STD-8739.8, Software Assurance Standard.

zz. NASA/SP-2014-3706, Standing Review Board Handbook at ntrs.nasa.gov.

aaa. NASA/SP-2014-3705, Space Flight Program and Project Management Handbook at ntrs.nasa.gov.

bbb. NASA/SP-2014-3404, Project Planning and Control Handbook at ntrs.nasa.gov.

ccc. NASA Federal Acquisition Regulation (FAR) Supplement.

ddd. NASA/SP-2011-3422 NASA Risk Management Handbook.

eee. NASA/SP-2010-3404, NASA WBS Handbook.

fff. NP-2007-01-456-NP, NASA Education Strategic Coordination Framework.

ggg. NASA Independent Assessment Principles and Approach" white paper approved at the May 18, 2016 Agency Program Management (APMC).