MPR 7120.1
REVISION H-1
EFFECTIVE DATE: October 20, 2016
EXPIRATION DATE: October 20, 2021

MARSHALL PROCEDURAL REQUIREMENTS

DA01

MSFC ENGINEERING AND PROGRAM/PROJECT MANAGEMENT REQUIREMENTS

With Change 1 (5/2/17)

COMPLIANCE IS MANDATORY
DIRECTIVE IS UNCONTROLLED WHEN PRINTED
Verify current version before use at https://dml.msfc.nasa.gov/directives

DOCUMENT HISTORY LOG

Status (Baseline/ Revision/ Change/ Revalidation/ Canceled)	Document Revision/ Change	Effective Date	Description
Baseline		5/14/99	Document converted from MSFC-P02.1 to a Directive. Previous history retained in system as part of canceled or superseded ISO Document files.
Revision	A	3/6/00	Revised to include PPMPT Team recommendations.
Revision	B	10/3/00	Revised to incorporate New Work Acceptance and Approval Process.
Revision	C	10/15/2004	Revised to incorporate changes made to Agency's parent document (NPR7120.5B) and to remove "non-Requirements" per Agency direction.
Revision	D	9/7/2007	Revised to incorporate changes made to the Agency's parent document, NPR 7120.5. Changes include addition of key decision point reviews, separation of program authority, and technical authority.
Revision	E	7/21/2010	Changed document title from "Program/Project Planning" to "Space Flight Program/Project Planning." Revised to incorporate changes made to the Agency's parent document, NPR 7120.5 through the NASA Interim Directive (NID) NM 7120-81. The NID is part of a realignment of governing documents within NASA designed to increase accountability and general clarity in the flow down of both programmatic and institutional requirements. [On 4/11/11, at the request of the OPRD, administrative changes were made at P.3 Authority to add NPR 7120.7 and NPR 7120.8 citations in 1.1, at P.4 to update title of MWI 7120.6, at Appendix A to add "NM" acronym, and throughout edited acronyms and terms for consistency.]
Revision	F	12/20/2012	Changed document title from "Space Flight Program/Project Planning" to "MSFC Engineering and Program/Project Management Requirements." Revised (major rewrite) to incorporate changes made to NPR 7120.5 in revision E, and to expand the scope to cover additional Agency directives (i.e. NPR 7120.6, NPR 7120.7/NID 7120.99, NPR 7120.8, NPR 7120.9, NPR 7120.10, NPR 7123.1/NID 7120-69, and NPR 7150.2). Includes changes to establish MSFC derived requirements for space flight program/projects (primarily in chapters 6 – 22). Changed to new 2012 MPR template format. Also includes various minor editorial changes throughout the document.
Revision	G	8/26/2014	Rearranged content to group common processes and requirements at beginning of document. Project categorization, risk classification, and governance moved to Chapter 3. Requirements for lessons learned, technical standards, and software engineering moved to become new Chapter 4 (track changes is not used for the text that moved, but track changes is used for any changes made to the text after it was moved). Add new requirements for space flight projects (5.10.2, 5.10.3, 22.2) to reflect requirements for which programs/projects have joint responsibility with Mission Directorate, added responsibilities for System Safety Manager, and requirements for System Safety Technical Plan, updated Chapter 6 to reflect that independent cost modeling can be provided by OSAC or other sources. Updated Chapter 14 to remove requirements that were redundantly covered by the required product tables in Chapter 5. Added responsibilities of Chief Knowledge Officer and updated Chapter 4.1 to include appointment of Chief Knowledge Officer and description of knowledge management activities per NPD 7120.6. Replaced references to NPR 7120.6 with NPD 7120.6. Added new requirements to section 4.3 to reflect program/project requirements for software release (per NPR

			2210.1) and software independent verification and validation (per NID 7150-1), added new Chapters (24-27) and responsibilities to flow down Research & Technology Program/Project Management requirements from NPR 7120.8. Added new Chapter 28, and appendices I and J to define Center governance process for activities under a program/project outside of MSFC. Added appendix L to include Technology Readiness Level tables from NPR 7123.1. Updated Tables 5.12-5 and 5.13-1 to require program/project plan baseline at SRR (red text used in table to show this change). Updated formatting of all tables and figures throughout (without changing content) to improve appearance and readability (track changes not used for table formatting changes). Numerous minor changes to update references to other documents, clarify existing requirements, and other minor editorial changes.
Change	1	7/17/2015	On 7/17/15, at the request of the OPRD, an administrative change was made to reflect current document number and/or title for MPR 2190.1, NPR 1441.1, and NRRS 1441.1. Added a reference to MPR 1600.1 in tables in chapter 5. Removed the reference to NID 7150-1 (which was cancelled) and replaced with reference to NPR 7150.2. Removed the reference to ED10-OWI-005 (which was cancelled) and replaced with reference to NASA-NTSP-001. Added ED-OWI-004 to reference documents list in Appendix E. Added information to maturity tables in chapter 5 to reflect existing Agency requirement for preliminary EOMP at CDR. Corrected an error in Appendix H and Appendix F to reflect the new project plan maturity requirement which was changed in revision G to be baseline at SRR. Updated Appendix H to reflect new Agency terminology, Knowledge Management Plan. Added information to notes to reference STD/MA-PRP, the Project Plan Template, the PPMAC charter, software IV&V responsibilities, and the Agency project listing on the NEN, for additional clarification. Updated the tables in Appendix C as necessary to reflect the administrative change number indicator (i.e. C-1), updated document references, and clarifications as described above.
Revision	H	10/20/2016	Deleted various requirements and supporting text in chapter 4.2 to eliminate redundancy and overlap with newly established standards development process for the NASA Technical Standards Program. Added new requirements and supporting text in section 4.3 to establish software metric and training plans for organizations with in-house software development activities, to meet new requirements in NPR 7150.2. Replaced all references to MPR 7150.1 with NPR 7150.2 due to the cancellation of MPR 7150.1. Added text within a note at 4.3.1 to point to the NASA Engineering Network webpage location for various references, aids, and compliance matrices associated with NPR 7150.2. Added new requirements and supporting text in section 4.4 to address the integration of requirements from the Agency level Directives owned by the Office of Safety Mission Assurance, and associated requirements in MSFC documentation. Deleted all references to IPAO (which has been dissolved by Agency) and added guidance/expectations in 5.5 to align with new Agency model for how the Independent Assessments will be done by Mission Directorates with support from the Centers. Added notes for the Threat Summary and Project Protection Plan products in chapter 5, to align with recent Agency changes in the Space Asset Protection Program. Deleted all references to NPR 7120.9 which was cancelled. Removed requirement for PDLM plan, and replaced with guidance to include product data in normal program/project and CM/DM planning. Converted requirements for PDLM plan content and data/process architecture to guidance in Chapter 23. Revised wording in Chapter 28 to simplify and streamline requirements for Mission Type 4 and 5 activities.

			Updated the titles of NPR 8580.1, MPR 8070.1, MPR 8500.1, and QDQA031. Removed references to NASA-STD-0005 which was cancelled, and replaced it with SAE/EIA 649, and SAE/EIA 649-2 configuration management standards. Added NF 1739 to Applicable Documents and Forms section. Editorial corrections made in Appendix L, TRL levels. Various other editorial corrections. Updated to reflect new title and threshold value for NF 1739, NASA Projects Capitalization Determination Form. Added note at 4.3.6 to explain that software technical authority for Class F is held at HQ. Added a note at section 23.6.g to reference the metadata requirements and guidance in MPR 1440.2. Numerous minor editorial changes and corrections to address administrative comments.
Change	1	5/2/2017	On 5/2/17, at the request of the OPRD, administrative changes were made to change number of MSFC Technical Authority Implementation Plan to align with recent numbering change, delete reference to RS01-OI-006 which is no longer an active document, and minor editorial changes to correct page numbering in Table of Contents and correct references in Chapter 28.

TABLE OF CONTENTS

PREFACE
P.1 Purpose 8
P.2 Applicability 8
P.3 Authority 9
P.4 Applicable Documents and Forms 9
P.5 Measurement/Verification 10
P.6 Cancellation 10

CHAPTER 1. Responsibilities 11
1.1 Center Director (or Designee) 11
1.2 Director, MSFC Engineering Directorate (or Designee) 12
1.3 Director, MSFC Safety & Mission Assurance Directorate (or Designee) 12
1.4 MSFC Chief Information Officer 13
1.5 Program/Project Manager 13
1.6 Implementing Chief Engineer (or Designee) 15
1.7 Chief Safety & Mission Assurance Officer 16
1.8 Manager, NASA Technical Standards Program 17
1.9 MSFC Representative to the NASA Engineering Standards Panel 17
1.10 MSFC Personnel/Discipline Experts from Engineering Directorate, Safety & Mission Assurance, and MSFC Office of Chief Information Officer (as Applicable) 17
1.11 System Safety Manager 17
1.12 MSFC Chief Knowledge Officer 17
CHAPTER 2. MSFC Engineering and Program/Project Management Requirements Flow Down 19
CHAPTER 3. MSFC Assessment of Compliance and Governance 21
CHAPTER 4. Common Center Processes for all Programs/Projects 27
4.1 Knowledge Management and Infusion of Lessons Learned 27
4.2 Technical Standards 29
4.2.1 Selection and User of Technical Standards 29
4.2.2 Development of Technical Standards 30
4.3 Software Engineering 32
4.4 Office of Safety and Mission Assurance Requirements 36
CHAPTER 5. Space Flight Program/Project Life-Cycle Requirements 38
5.1 Program and Project Life-Cycles 38
5.2 Systems Engineering Processes 38
5.3 Center Resources 38
5.4 Adjustments for External and Internal Impacts 39
5.5 Independent Assessments 39
5.6 Determining Readiness for Life-Cycle Review 43
5.7 Briefing the Results of Life-Cycle Review 43
5.8 Assessing Readiness for Next Phase 43

5.9 Documenting Key Decision Point Results with Decision Memorandum 43
5.10 Contents of Decision Memorandum.....44
5.11 Approved Decision Memorandum 44
5.12 Program Formulation & Implementation 45
5.13 Project Formulation & Implementation 53
CHAPTER 6. Design to Cost.....59
CHAPTER 7. Requirements, Compliance, and Verification.....62
CHAPTER 8. Work Breakdown Structure 63
CHAPTER 9. Heritage Hardware and Software.....64
CHAPTER 10. Acquisition and Make-or-Buy 65
CHAPTER 11. Government Insight and Oversight.....67
CHAPTER 12. Technical Baseline Control.....70
CHAPTER 13. Task Agreements 71
CHAPTER 14. Systems Engineering and Integration 72
CHAPTER 15. Safety and Mission Assurance.....74
CHAPTER 16. Risk Management 76
CHAPTER 17. Margin and Resource Management 78
CHAPTER 18. Trade Studies 81
CHAPTER 19. New Technology Management.....82
CHAPTER 20. Models and Simulations 83
CHAPTER 21. Reviews.....85
CHAPTER 22. Earned Value Management.....87
CHAPTER 23. Managing Product Data Throughout the Life-Cycle 88
CHAPTER 24. General Research and Technology Program/Project Management Requirements.....92
CHAPTER 25. Research and Technology Program Life-Cycle Requirements 94
25.1 Research and Technology Program Life-Cycle 94
25.2 Reviews 95
25.3 Governance.....95
25.4 Research and Technology Program Pre-Formulation 96
25.5 Research and Technology Program Formulation.....97
25.6 Research and Technology Program Reviews During Formulation.....100
25.7 Research and Technology Program Implementation 101
25.8 Cross-Program Research Management 102
CHAPTER 26. Technology Development Project Life-Cycle Requirements.....105
26.1 Technology Development Project Life-Cycle.....105
26.2 Reviews 105
26.3 Governance.....106
26.4 Technology Development Project Pre-Formulation.....108
26.5 Technology Development Project Formulation 108
26.6 Technology Development Project Reviews During Formulation 113
26.7 Technology Development Project Implementation.....115
26.8 Technology Development Project Transition/Closure 116
26.9 Technology Development Project Evaluation.....117
26.10 Requirements Flow Down for Technology Development Project Elements118

CHAPTER 27. Research and Technology Portfolio Project Life-Cycle Requirements.....119
27.1 Research and Technology Portfolio Project Life-Cycle.....119
27.2 Reviews 120
27.3 Governance.....120
27.4 Research and Technology Portfolio Project Pre-Formulation 124
27.5 Research and Technology Portfolio Project Formulation 124
27.6 Research and Technology Portfolio Project Reviews during Formulation.128
27.7 Research and Technology Portfolio Project Implementation.....129
27.8 Research and Technology Portfolio Project Transition/Closure.....131
27.9 Requirements Flow Down for R&T Portfolio Project Elements 131
CHAPTER 28. Mission Type 4 and 5 Activities.....132
CHAPTER 29. MSFC Information Technology and Institutional Infrastructure Program and Project Management Requirements.....134
APPENDICES
Appendix A. Definitions.....135
Appendix B. Acronyms 145
Appendix C. Compliance Matrix Template.....153
C.1 Space Flight Program/Project Compliance Matrix Template 153
C.2 Research and Technology Program/Project Compliance Matrix Template....167
C.3 Mission Type 4 and 5 Activities Compliance Matrix Template 176
Appendix D. Records.....178
Appendix E. References.....179
Appendix F. Space Flight Program and Project Life-Cycles.....184
Appendix G. Life-Cycle Review Objectives and Expected Maturity States for Programs and Projects 188
Appendix H. MSFC Compliance Matrix 191
Appendix I. Activity Agreement Template 220
Appendix J. Activity Plan Templates 222
Appendix K. Reserved.....227
Appendix L. Technology Readiness Levels 228

PREFACE

P.1 PURPOSE

To establish the Center management procedural requirements for programs, projects, and activities to implement the provisions of Agency requirements in NPD 7120.4, NPR 7120.5, NPD 7120.6, NPR 7120.7 (NID 7120.99), NPR 7120.8, NPR 7120.10, NPR 7123.1, and NPR 7150.2.

P.2 APPLICABILITY

a. This MPR applies to Center personnel, programs, projects, and activities, including contractors and resident agencies to the extent specified in their respective contracts or agreements. ("Contractors," for purposes of this paragraph, include contractors, grantees, Cooperative Agreement recipients, Space Act Agreement partners, or other agreement parties.)

b. This MPR applies to the Michoud Assembly Facility.

c. This MPR applies the following: 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."

d. This MPR applies the following: all document citations are assumed to be the latest version unless otherwise noted.

e. This MPR applies to all Center organizations that manage space flight programs, projects, and the MSFC-managed, subordinate activities that fall under them (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, and ground systems that are in direct support of space flight operations). Specific requirements are flowed down by the program or project to the activities under them to the extent necessary for the program or project to ensure compliance and mission success.

f. This MPR applies to reimbursable space flight program/projects performed for non-NASA sponsors.

g. This MPR applies to research and technology development that is not funded by space flight programs and projects, as well as information technology (IT) and institutional infrastructure programs and projects.

h. This MPR applies to knowledge management and lessons learned (LL), technical standards, and software engineering, regardless of the program or project supported.

i. This MPR applies to activities managed by MSFC, which come under a program or project managed outside of MSFC, as indicated in the applicable chapters.

Note: See Chapter 2 for more specific applicability information.

P.3 AUTHORITY

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

b. NPD 7120.6, "Knowledge Policy on Programs and Projects"

c. NPR 7120.5, "NASA Space Flight Program and Project Management Requirements"

d. NPR 7120.7 and NID 7120.99, "NASA Information Technology and Institutional Infrastructure Program and Project Management Requirements"

e. NPR 7120.8, "NASA Research and Technology Program and Project Management Requirements"

f. NPR 7120.10, "Technical Standards for NASA Programs and Projects"

g. NPR 7123.1, "NASA Systems Engineering Processes and Requirements"

h. NPR 7150.2, "NASA Software Engineering Requirements"

P.4 APPLICABLE DOCUMENTS AND FORMS

a. NPR 1441.1, "NASA Records Management Program Requirements"

b. NRRS 1441.1, "NASA Record Retention Schedules"

c. NPR 2210.1, "Release of NASA Software"

d. MPR 1280.10, "Marshall Quality Management System"

e. MPR 1440.2, "MSFC Records Management Program"

f. MPR 7120.4, "MSFC Center Management Council (CMC) Process"

g. MPR 7123.1, "MSFC Systems Engineering Processes and Requirements"

h. NASA-STD-7009, "Standard For Models and Simulations"

i. NF 1739, "NASA Projects Capitalization Determination Form (CDF)"

P.5 MEASUREMENT/VERIFICATION

a. MSFC programs/projects submit a compliance matrix (showing their compliance to the program/project requirements of this MPR) to the MSFC Chief Engineer's Office. The MSFC Chief Engineer's Office assesses and concurs with the program's/project's compliance matrix. The program/project then submits the matrix to the Agency Office of Chief Engineer (OCE). This process is described in Chapter 3 of this MPR.

b. All of the requirements in this MPR are subject to verification through established audit processes (e.g., internal and external Quality Management System (QMS) audits).

P.6 CANCELLATION

MPR 7120.1G, "Space Flight Program/Project Planning," dated August 26, 2014.

Original signed by

Todd A. May
Director

CHAPTER 1. RESPONSIBILITIES

1.1 Center Director (or Designee)

1.1.1 Recommends program managers (see 5.1.1).

1.1.2 Recommends Category 1 Project Managers (see 5.1.1).

1.1.3 Provides recommendations and findings at Key Decision Points (KDPs) (see 5.8).

1.1.4 Certifies readiness to proceed past project KDPs (see 5.8).

1.1.5 Establishes, develops, and maintains the institutional capabilities (see 5.3.1).

1.1.6 Provides human and other resources (see 5.3.1).

1.1.7 Approves Project Formulation Agreements (FA) (see 5.13.8).

1.1.8 Concurs on Program Plans (see 5.12.4).

1.1.9 Approves Project Plans (see 5.13.3).

1.1.10 Validates launch readiness (see 21.2.1).

1.1.11 As part of the Center Management Council (CMC):

1.1.11.1 Assesses program and project technical, schedule, and cost performance (see 5.3, 21.2 and MPR 7120.4).

1.1.12 Communicates program and project technical performance and risks to Mission Directorate and Agency management (see 5.8).

1.1.13 Supports annual budget submissions, (see 5.3.3).

1.1.14 Is the overall Engineering and Safety and Mission Assurance (SMA) Technical Authority for programs/projects.

Note: This responsibility is delegated from the OCE, and Office of Safety & Mission Assurance (OSMA). Reference MCP 8070.2, (MSFC) Technical Authority Implementation Plan. MSFC recognizes the Health and Medical Technical Authority (HMTA) function managed through the Office of the Chief Health and Medical Officer (OCHMO) at NASA Headquarters (HQ). Responsibility for HMTA for Human Spaceflight programs has been delegated by the NASA CHMO to the Johnson Space Center (JSC) Chief Medical Officer who appoints an HMTA Delegate. Therefore, for issues related to HMTA requirements, MSFC will work either through the HMTA office

at JSC, or directly with OCHMO at HQ, as appropriate. 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, HMTA Implementation, and are further described in MCP 8070.2.

1.1.15 Assists in determination of management model for insight and oversight (see 11.1.2).

Note: Chapter 11 discusses government insight and oversight in more detail.

1.1.16 (With Program/Project Manager) categorizes projects and activities (see 3.7).

1.1.17 (With Program/Project Manager) classifies payload projects for risk and approves deviations from risk guidelines (see 3.8 and 3.9).

1.2 <u>Director, MSFC Engineering Directorate</u> (or Designee)

1.2.1 Reports on the use of Voluntary Consensus Standards (VCS) to NASA OCE (see Chapter 4.2).

1.2.2 Authorizes Engineering Directorate employees to develop VCS or participate in other VCS bodies' activities (see Chapter 4.2).

1.2.3 Resolves issues for engineering technical standards (see Chapter 4.2).

1.2.4 Provides concurrence with NASA Technical Standards (Engineering) (see Chapter 4.2).

1.2.5 Assigns MSFC's representative to the NASA Engineering Standards Panel (NESP) (see 4.2.1.1 i.).

1.2.6 Concurs with the compliance matrix and waiver/deviation requests (i.e., tailoring) for requirements involving program/project execution in this MPR.

1.2.7 Approves the Technical Review and Systems Engineering Applicability Assessment results for Mission Type (MT) 4 and 5 activities.

1.2.8 Approves the Systems Engineering Applicability Assessment results and concurs with the MPR 7123.1 Compliance Matrix for Research & Technology (R&T) programs and projects.

1.3 <u>Director, MSFC Safety & Mission Assurance Directorate</u> (or Designee)

1.3.1 Authorizes SMA employees to develop VCS or participate in other VCS bodies' activities (see Chapter 4.2).

1.3.2 Ensures review of NASA Technical Standards (OSMA) (see Chapter 4.2).

1.3.3 Performs the SMA analyses and works with Engineering to identify derived requirements, risk mitigations, inspections and hazard controls for in-house activities (see Chapter 15).

1.3.4 Implements assurance functions for critical in-house activities, to assure that products and services are compliant with applicable requirements (see Chapter 15).

1.3.5 Defines the assurance functions (via the insight and oversight processes) for prime-contracted activities, to assure that products and services are compliant with applicable requirements (see Chapter 15).

1.3.6 Concurs with the System Safety Technical Plan (SSTP) for Category 1 programs/projects (see Chapter 15).

1.4 MSFC Chief Information Officer

1.4.1 Provides product data management (DM) tools/applications (see 23.1).

1.4.2 Authorizes Office of the Chief Information Officer (OCIO) employees to develop VCS or participate in other VCS bodies' activities (see Chapter 4.2).

1.4.3 Ensures review of NASA Technical Standards OCIO (see Chapter 4.2).

1.5 Program/Project Manager (for Space Flight Programs/Projects)

1.5.1 Prior to KDPs, presents to the CMC on the program/project's readiness to proceed to the next phase (see 5.12.1, 5.13.1 and MPR 7120.4).

1.5.2 During formulation phase, presents a request for Center resources to the CMC at KDPs, (see 5.3.1).

1.5.3 During implementation phase, presents a request for Center resource requirements to the CMC at KDPs, (see 5.3.1).

1.5.4 (Program Manager) Implements transition of the program from formulation to implementation, (see 5.9).

1.5.4.1 (Project Manager) Implements transition of the project from formulation to implementation, (see 5.9).

1.5.5 Provides recommendations and findings at KDPs (see 5.8).

1.5.6 Meets the formulation and implementation phase requirements and prepares formulation and implementation products (see Chapter 5).

1.5.7 (Program Manager) Supports the Mission Directorate (MD) Associate Administrator (AA) (MDAA) in developing and updating the Program Commitment Agreement (PCA) (see 5.12.3).

1.5.8 Prepares the Program/Project Plan (see 5.12.4 and 5.13.3).

1.5.8.1 Obtains program/project plan concurrence from appropriate Center offices (see 5.12.5).

1.5.9 Develops, baselines, and maintains products and control plans (see Tables 5.12-1, 5.12-2, 5.12-3, 5.12-4, 5.12-5, 5.12-6, 5.13-1 and 5.13-2, as applicable, depending on program/project type).

1.5.10 Conducts life-cycle reviews (LCRs) (see 5.2 and Chapter 21).

1.5.11 Develops and implements systems engineering requirements (see 5.12.8 and 5.13.6).

1.5.12 Decomposes top-level requirements into implementable requirements (see 5.12.8, 5.13.6, and MPR 7123.1).

1.5.13 Provides routine status of cost, schedule, risk, and technical performance to appropriate governance bodies (see 21.2 and MPR 7120.4).

1.5.14 Supports development of agreements with international and other government agencies (see 5.12.11 and 5.13.10).

1.5.15 Submits requests for deviations and waivers to Agency requirements (see 3.3.1).

1.5.16 (Program/Project Manager, or designee) Approves the list of the program's/project's long-lead items (see 10.4.1).

1.5.17 (Program Manager) Approves project plans (see 5.13.3).

1.5.18 (Program Manager) Conducts KDP readiness reviews (see 5.8).

1.5.19 Submits a compliance matrix to the Agency Chief Engineer's office (see 3.4).

Note: A compliance matrix template is located in Appendix C, and is also available on the MSFC Integrated Document Library (MIDL) under the Program/Project Documents link. Submittal to Agency Chief Engineer occurs after concurrence by MSFC Chief Engineer Office (see Chapter 3).

1.5.20 Reflects product DM in program/project planning; uses Center tools/applications to implement product DM, (see Chapter 23).

1.5.21 Ensures review of LL for knowledge infusion, and for applicability to current technical standards applications (see 24.7 and 25.1.6).

1.5.22 Evaluates, selects, tailors, and uses technical standards as requirements for program/project activities and contracts (see Chapter 4.2).

1.5.23 Ensures that programs, projects, and activities are compliant with all applicable requirements of the Marshall Directives System (MDS).

Note: MPR 1280.10 documents and implements the QMS for MSFC, and also provides an overview of the documentation that comprises the MDS.

1.5.24 (With Center Director) categorizes projects and activities (see 3.7).

1.5.25 (With Center Director) classifies payload projects and approves deviations from risk guidelines (see 3.8 and 3.9).

1.5.26 Program/Project Lead (for R&T Programs and Projects)

1.5.26.1 Implements the applicable common requirements related to assessment of compliance, reporting to MSFC governance bodies, knowledge management/LL, application of technical standards, software engineering, and SMA, as described in Chapters 3 and 4.

1.5.26.2 Implements the applicable requirements related to R&T Program/Project Management, as described in Chapters 24 through 27.

1.5.27 Activity Manager (for Mission Type 4 or 5 Activities)

1.5.27.1 Implements the applicable common requirements related to assessment of compliance, reporting to MSFC governance bodies, knowledge management/LL, application of technical standards, software engineering, and SMA, as described in Chapters 3 and 4.

1.5.27.2 Implements the applicable requirements related to Mission Type 4 or 5 activity management, as described in Chapter 28.

1.6 Implementing Chief Engineer (or Designee)

1.6.1 Reviews the program/project plans and signs the System Engineering Management Plans (SEMP) (see 5.12.6.4 and 5.13.4.1).

1.6.2 Reviews and concurs on program/project review plans (see 21.5).

1.6.3 Reviews the program/project compliance matrix (to MPR 7120.1) (see 3.1).

1.6.4 Concurs with the program/project's compliance matrix (see 3.2).

1.6.5 Concurs with the customization used by the program/project (see 3.6).

1.6.6 Issues guidance on the development of control plans (5.12.6.5 and 5.13.4.2).

1.6.7 Reviews design decisions at all Work Breakdown Structure (WBS) levels (see 6.6).

1.6.8 Authorizes further development of baselined design, analysis, and test in order to reduce uncertainties (see 6.11).

1.6.9 Deliberates with Program/Project Manager and Chief SMA Officer (CSO) to determine the insight/oversight model and plan (see 11.1.1).

1.6.10 Approves and issues technical documents prior to control by program/project control board (see 12.1).

1.6.11 Approves requirements and verification compliance (see 7.4 and 7.5).

1.6.12 In conjunction with the Program/Project Manager and CSO, makes a determination on risk items to be entered in the system and adjusts the likelihood and consequence levels (see 16.1.1).

1.6.13 Makes (if within designated authority), or recommends to Program/Project Managers, decisions on risk mitigation, risk acceptance, risk closure, and risk watch (see 16.4).

1.6.14 Assigns mandatory reviewing organizations from Engineering to support LCRs (see 21.6).

1.6.15 Evaluates, selects, tailors, and uses technical standards as requirements for program/project activities and contracts (see Chapter 4.2).

1.7 Chief Safety & Mission Assurance Officer

1.7.1 Reviews the program/project plans and the SEMP.

1.7.2 Reviews and concurs on program/project review plans (see 21.5).

1.7.3 Reviews the program/project compliance matrix (see 3.1).

1.7.4 Concurs with the program/project's compliance matrix (see 3.2).

1.7.5 Concurs with the customization used by the program/project (see 3.6).

1.7.6 Deliberates with Program/Project Manager and implementing Chief Engineer to determine the insight/oversight model and plan.

1.7.7 Concurs on requirements and verification compliance (see 7.4 and 7.5).

1.7.8 In conjunction with the Program/Project Manager, makes a determination on risk items to be entered in the system and adjusts the likelihood and consequence levels.

1.7.9 Recommends to Program/Project Managers, decisions on risk mitigation, risk acceptance, risk closure, and risk watch (see 16.4).

1.8 Manager, NASA Technical Standards Program

Issues authority to proceed with development/revision of technical standards and issues actions to review draft technical standards, as described in Chapter 4.2.

1.9 MSFC Representative to the NASA Engineering Standards Panel

Complies with the NESP charter and NASA policy, procedures, and processes relative to technical standards actions and activities, and prepares, coordinates, and consolidates Center responses to technical standards-related actions and activities, as described in Chapter 4.2.

1.10 MSFC Personnel/Discipline Experts from Engineering Directorate, Safety and Mission Assurance, and MSFC Office of Chief Information Officer (as Applicable)

1.10.1 Evaluates and recommends technical standards for use on programs/projects (see Chapter 4.2).

1.10.2 Participates in development of VCS, other Government standards, and NASA Technical Standards, as applicable to their particular discipline areas (see Chapter 4.2).

1.10.3 Reviews draft NASA Technical Standards for adequacy and accuracy during Agency-wide reviews (see Chapter 4.2).

1.11 System Safety Manager

Assures that appropriate technical safety requirements for NASA-unique designs and operations are included in program/project requirements and that any variances to those requirements are processed in accordance with the requirements of NPR 8715.3, ensures that system safety modeling, risk-informed decision making, and safety performance monitoring activities are integrated into systems engineering technical processes and documented in a System Safety Technical Plan, and assures that appropriate safety and risk management requirements are incorporated into program/project contract specifications.

1.12 MSFC Chief Knowledge Officer

1.12.1 Oversees the planning and execution of knowledge activities within the Center.

1.12.2 Supports the Agency Chief Knowledge Officer (CKO) in planning and implementing the Agency's knowledge system.

1.12.3 Facilitates efforts to capture and share experiences, case studies, and LL.

1.12.4 Supports Center knowledge management efforts by advocating for needed resources, promoting and influencing Center cultural change, and providing leadership and direction to achieve knowledge management goals.

1.12.5 Aligns Center knowledge management practices with Agency needs and ensures coordination with appropriate offices and authorities for compliance with NASA policy, as well as statutory and regulatory requirements.

1.12.6 Develops and maintains a Center knowledge strategy aligned with NPD 7120.6 and Center needs, and presents the strategy at the annual Agency forum. (See NPD 7120.6 for additional details on CKO responsibilities and Center knowledge strategy requirements.)

CHAPTER 2. MSFC ENGINEERING AND PROGRAM/PROJECT MANAGEMENT REQUIREMENTS FLOW DOWN

2.1 This MPR implements the Agency's requirements for MSFC engineering and program/project management per Figure 2-1. Appendix H contains a compliance matrix that shows the relationship between each Agency requirement and the corresponding MSFC requirements in this MPR, and the compliance of MSFC's implementation.

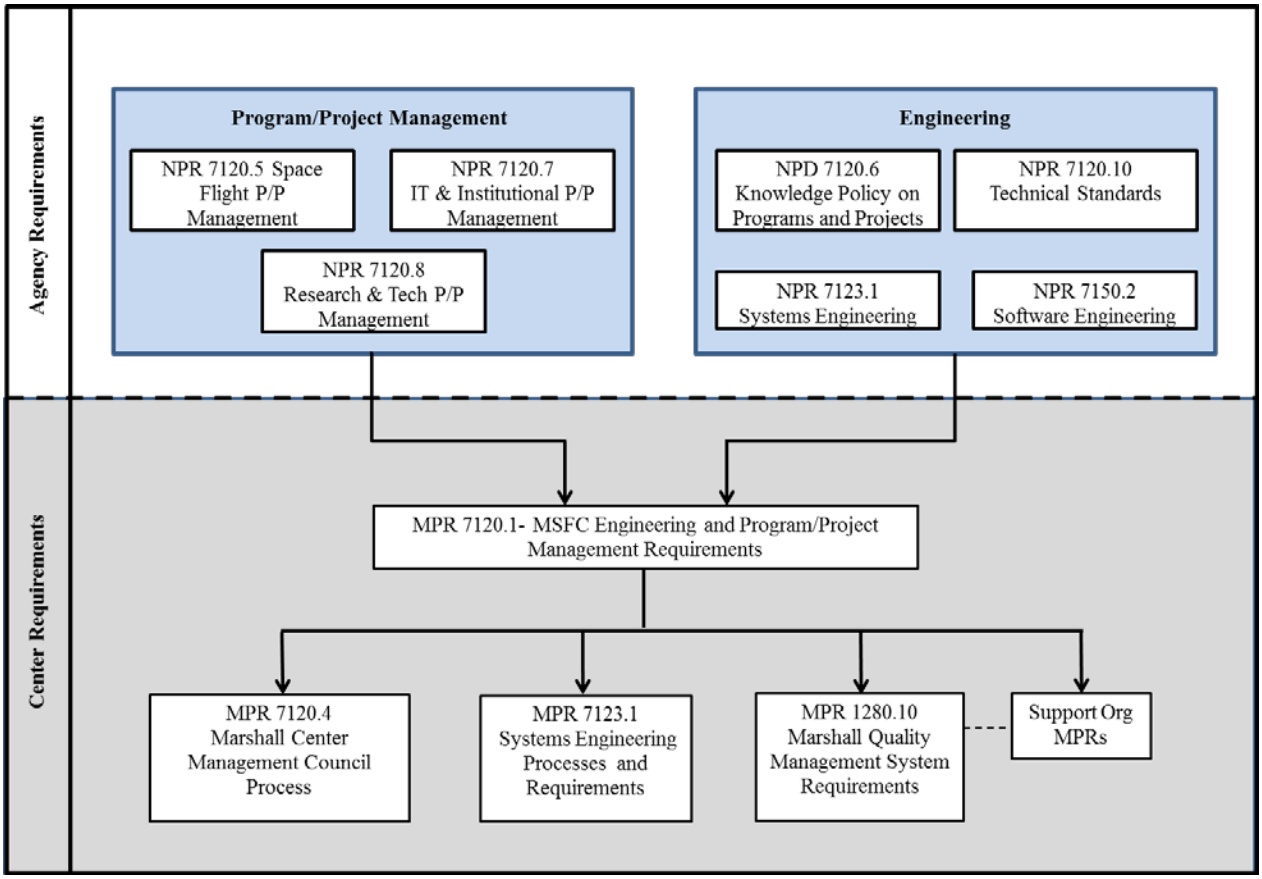


Figure 2-1 MSFC Requirements Flow Down

2.2 All MSFC programs, projects, and activities shall follow the applicable requirements as described in Table 2-1.

Applicable Requirements per Program, Project, or Activity Type	
1. All current and future MSFC-managed space flight programs and projects and the MSFC-managed, subordinate activities that fall under them, including: 1a. All MSFC spacecraft, launch vehicles, and instruments developed for space flight programs and projects, 1b. All MSFC research and TDs that are: (1) directly funded by and to be incorporated into a space flight program/project, and (2) the space flight mission's success and schedule are directly tied to the success of the research and TD, or (3) the research and TD is a large scale (i.e. life-cycle cost (LCC) greater than $250 million) development project, 1c. All MSFC critical technical facilities specifically developed, or significantly modified for space flight systems, and ground systems that are in direct support of space flight operations.	Chapters 1-23
2. All MSFC-managed research and technology programs and projects not meeting the criteria in 1. above, and the MSFC-managed, subordinate activities that fall under them.	Chapters 1-4 (common requirements) and Chapter 24-27 (specific requirements)
3. All MSFC defined Mission Type 4 and 5 activities.	Chapters 1-4 (common requirements) and Chapter 28 (specific requirements)
4. All IT and Institutional Infrastructure programs and projects not meeting the criteria in 1. above.	Chapters 1-4 (common requirements) and Chapter 29 (specific requirements)
5. All software engineering activities.	Chapter 4.3 (software engineering requirements)
6. All Center programs, projects, and activities.	IMSC-Plan-006 (technical authority and dissenting opinion processes)

Table 2-1 Applicable Requirements per Program, Project, or Activity Type

CHAPTER 3. MSFC ASSESSMENT OF COMPLIANCE AND GOVERNANCE

3.1 MSFC programs/projects/activities shall submit a compliance assessment for MPR 7120.1 to the MSFC Chief Engineer's Office.

Note: A compliance matrix template with minimum required content is found in Appendix C, and is also available on the MIDL under the Program/Project Documents link.

3.2 The MSFC Chief Engineer's Office shall assess and concur with the program's/project's/ activity's compliance assessment (see 3.4 for approval schedule).

3.3 The compliance assessment and all waiver/deviation requests (i.e., tailoring) for requirements involving program/project/activity execution in this MPR shall receive the concurrence of the Implementing Chief Engineer, the CSO, and the Program/Project/Activity Manager.

Note: Systems Engineering Office, within the MSFC Chief Engineers Office, will assist the program/project/activity and Chief Engineer with interpreting applicability of MSFC requirements, and Agency-level source requirements to the specific waiver/deviation case, identifying those Agency requirements for which waiver/deviation approval authority has been delegated to the Center-level and those for which Agency-level approval is required, and developing appropriate rationale to support approval of MSFC governance authorities.

3.3.1 The compliance assessment and all waivers and deviations shall also receive the concurrence of the Director of the MSFC Office responsible for managing the program/project/ activity and the Engineering Director. The Directors may choose to delegate their concurrence authority down to a lower level, for specific programs, projects, or activities, provided that the compliance assessment does not include any Agency-level waivers/deviations.

Note: The concurrence of the Director of the responsible office and the Engineering Director is typically obtained by briefing the information at the monthly program reviews and to the Engineering Management Council (EMC), but may be obtained through other means.

3.3.2 For those programs, projects, and activities governed by the CMC (and those with Agency-level waiver/deviation), the compliance assessment and the waiver/deviation shall also receive the concurrence of the Associate Director, Technical, prior to review and approval by the Center Director, or designee.

Note: The approval of the Associate Director, Technical, and the Center Director, or designee, is typically obtained by briefing the information to the Program /Project Management Advisor Committee (PPMAC), and the CMC, but may be obtained through other means.

3.3.3 Approvals for waivers and deviations to requirements involving program/project/activity execution shall be documented by the approvals of the appropriate approving authorities on the FA or Program/Project Plan and the associated compliance matrix.

Note: Redundant signatures are not required in the "Approval" column of the Compliance Matrix, if the approval authority is already a required signatory on the FA or Program/Project Plan.

3.3.4 Program/Project/Activity Managers shall obtain approval for waivers and deviations to requirements involving program/project/activity execution from the appropriate Agency-level authorities, in those cases where the approval authority has been retained at the Agency-level.

Note 1: Programs and projects are required to obtain proper authorization for deviations from this MPR, other requirements documents invoked herein, and the Agency-level source requirements documents, as applicable. The Systems Engineering Office, within the MSFC Chief Engineers Office, will assist the program, project, activity, and the Associate Director, Technical, with identifying applicable Agency-level source requirements for which relief is requested, and compiling the appropriate rationale and supporting information into a standard format suitable for submission by the Associate Director, Technical to the applicable Agency-level authorities.

Note 2: Systems Engineering Office will serve as focal point for communication with OCE, and various other Headquarters Offices, with involvement from Chief Engineer, as Technical Authority for the program/project/activity. For requests for relief involving OSMA, MSFC SMA Office will serve as focal point for communication with OSMA.

3.4 The completed compliance matrix shall be attached to the FA for space flight projects and single-project programs (SPP) in Formulation, and/or to the Program Plan, or Project Plan, for programs or projects entering or in Implementation, and be submitted to OCE. The compliance assessment is approved along with the applicable agreement/planning document to which it is attached. For space flight projects and SPP, the FA/compliance assessment is approved at Mission Concept Review (MCR) and System Definition Review (SDR). For uncoupled, loosely coupled, and tightly-coupled programs, the Program Plan/compliance assessment is approved at SDR. For space flight projects, the Project Plan/compliance assessment is approved at Systems Requirements Review (SRR). For SPP, the Program Plan/compliance assessment is approved at SRR. For R&T Programs, the Program Plan/compliance assessment is approved at Formulation Review (FR). For TD Projects, the project plan/compliance assessment is approved at FR. For R&T Portfolio Projects, the project plan/compliance assessment is approved at FR. For activities, the compliance assessment is approved when the activity plan is approved by the appropriate Center governing authority.

Note: If compliance status changes, updated versions of the compliance matrix are incorporated into an FA, Program Plan, or Project Plan revision, and resubmitted to OCE. For revisions of this MPR, MSFC programs/projects/activities with an approved compliance assessment may complete a "changes only" matrix which covers all new or changed requirements, in lieu of completing the entire matrix again.

3.5 Programs/projects/activities shall identify significant customization of best practices or guidance within their planned documentation.

Note: Customization involves the adaptation of "best practices," not "requirements." Furthermore, customization does not need to be formalized in a process like waiver and deviations. Programs/projects should address in their planning those best practices or guidance where they significantly deviate from the recommendations. Program/project management best practices and guidance are located in the MSFC-HDBK-3173 and also in Appendix E of MPR 7123.1.

3.6 The implementing chief engineer shall concur with the customization used by the program/project/activity.

3.7 The Center Director and Program/Project/Activity Manager shall establish a Category/Mission Type 1, 2, 3, 4, or 5 in accordance with Table 3-1 for each MSFC project and activity.

Note 1: NASA has established three Project categories based on LCC. MSFC defines Mission Types to further subdivide the three project categories, and adds a fourth and fifth type for Center level governance of activities under a program/project managed outside of MSFC, for which MSFC has responsibility for a portion of the work managed by the outside program/project. The NASA AA will approve the final project categorization for projects falling under categories 1, 2, and 3. The Decision Authority and governing Program Management Council (PMC) for each project category/type and type 4 and 5 activities are shown in Table 3-1. For all programs, the Decision Authority is the NASA AA, and the Governing PMC is the Agency PMC. The Agency maintains a list which documents all of those efforts that are considered to be official projects at the Agency level. This listing is available on the NASA Engineering Network (NEN) at the following location: https://nen.nasa.gov/web/pm/ampl.

Note 2: Activities in support of MSFC-managed programs/projects will follow the requirements of this MPR, as a part of the MSFC-managed program/project (i.e., separate products, reviews and reporting is not required). Mission Type 4and 5 activities in support of programs/projects managed outside of MSFC are subject to requirements as flowed down to them from the parent program/project. In addition, such activities are subject to the requirements in specific chapters of this MPR (see Chapter 2).

Project and Activity Categorization/Mission Types

	Projects						Activities	
	Type 1	Type 2		Type 3			Type 4	Type 5
		2.a	2.b	3.a	3.b	3.c		
Cost Guidance (Estimated LCC)	greater than $1B	$1B - $250M	$250M - $100M	$100M - $50M	$50M - $10M	less than $10M	typically [1] greater than $1M/yr or greater than $10M LCC	typically [1] less than $1M/yr or less than $10M LCC
Priority (Criticality to Agency Strategic Plan)	Any	Any	High	Medium or low priority	Low priority	Low to very low priority	High to Agency or Center	Medium or Low
Other Factors	Significant Radioative Material							
Decision Authority	NASA Associate Administrator	NASA Mission Directorate Associate Administrator		NASA Mission Directorate Associate Administrator or Designee			Center Director or Designee	Directorate/Office Manager or Designee
Governing PMC	Agency	Mission Directorate		Mission Directorate			CMC	Monthly Program Reviews Within Directorate/Office
National Significance	Very high	High	Medium	Medium	Low	Very Low		
Risk Tolerance	Class A Risk: Very low (minimized)	Class B Risk: Low	Class C Risk: Medium	Class D Risk: High	Class D Risk: High	Class D Risk: High		
Description of the Types of Mission	Human Space Flight or very large Science/Robotic Missions	Non-Human Space Flight or Science/Robotic Missions	Small Science (Human or Non human)	Smaller Science (Human or Non human)	Science (Human or non human)	Science (Human or non human)	Efforts supporting program/projects managed outside of MSFC, that come under the purview of the CMC per the criteria defined in MPR 7120.4	Efforts supporting program/project managed outside of MSFC, that do not come under the purview of the CMC per the criteria defined in MPR 7120.4
Complexity	Very high to high	High to Medium	Medium to Low	Low	Low	Low to Very Low		
Mission Lifetime (Primary Baseline Mission)	Long (>5 years)	Medium (2-5 years)	Short (<2 years)	Short (<2 years)	Short (<2 years)	Short (<2 years)		
Launch Constraints	Critical	Medium	Few to none	Few to none	Few to none	None		
Achievement of Mission Success Criteria	All practical measures are taken to achieve minimum risk to mission success. The highest assurance standards are used.	Stringent assurance standards with only minor compromises in application to maintain a low risk to mission success.	Medium or significant risk of not achieving mission success is permitted. Minimal assurance standards are permitted.	Significant risk of not achieving mission success is permitted. Minimal assurance standards are permitted.	Significant risk of not achieving mission success is permitted. Minimal assurance standards are permitted.	Significant risk of not achieving mission success is permitted. Minimal assurance standards are permitted.		
Examples	HST, Chandra, Cassini, JIMO, JWST, MPCV, SLS, ISS	MER, MRO, Discovery payloads, ISS Facility Class payloads, Attached ISS payloads	ESSP, Explorer payloads, MIDES, ISS complex sub rack payloads, PA-1, ARES 1-X, MEDLI, CLARREO, SAGE III, Calipso, ISERV	SPARTAN, GAS Can, technology demonstrators, simple ISS, express middeck and sub rack payloads, SMEX, MISSE-X, EV-2	IRVE-2, IRVE-3, HiFIRE, HyBoLT, ALHAT Earth Venture I, FASTSAT	DAWNAir, InFlame, Research, technology demonstrations, HEROES, SWORDS Payloads, Nanosails	ADDITIVE Manufacturing in Space	MSFC activities in support of a request from program/project managed outside of MSFC. Subject to requesting organization's requirements.

Notes: 1. The criteria for Type 4 and 5 activities is as defined in MPR 7120.4 and MPR 7120.1. In addition, any specific activity may be elevated to the CMC level, or delegated down to the Directorate/Office level. For all "Activities" please refer to Chapter 28 in MPR 7120.1.

Table 3-1 Project and Activity Categorization

3.8 The Center Director and Program/Project Manager shall establish a Risk Classification for each MSFC payload project according to Table 3-2.

Note: Risk classification is negotiated in the formulation phase during the development of the Program Plan and becomes formal when Plan is signed. NASA has established four project risk classifications based on factors such as cost, priority, national significance, complexity, and lifetime (NPR 8705.4).

3.9 The Center Director and Program/Project Manager shall approve any deviations from the guidelines in Appendix B of NPR 8705.4 for the established risk classification, for each MSFC payload project.

3.10 All Center programs, projects, and Mission Type 4 activities shall be reviewed by the MSFC CMC, in accordance with MPR 7120.4, unless the governance has been specifically delegated down to the Directorate/Office level.

Note: Significant issues are elevated to Center Director (as determined by the Direct Report).

3.10.1 For MSFC managed programs and projects with significant involvement of another Center, and Type 4 activities which come under a program/project at another Center, the CMC may choose to conduct the review as an Integrated CMC (ICMC) meeting, with participation from each Center with significant contributions to the overall effort.

Note: The ICMC is chaired by the Center with responsibility for the overall management of the parent program/project. Project management requirements are flowed down to subordinate activities in accordance with the Center level documentation of the parent program/project. See Chapter 28.

Payload Risk Classification				
Characterization	**Class A**	**Class B**	**Class C**	**Class D**
Priority (Criticality to Agency Stategic Plan) and Acceptable Risk Level	High priority, very low (minimized) risk	High priority, low risk	Medium priority, medium risk	Low priority, high risk
National Significance	Very high	High	Medium	Low to medium
Complexity	Very high to high	High to medium	Medium to low	Medium to low
Mission Lifetime	Long (> 5 yrs)	Medium (2-5 yrs)	Short (< 2 yrs)	Short (< 2 years)
Cost	High priority, very low (minimized) risk	High to medium	Medium to low	Low
Launch constraints	Critical	Medium (2-5 yrs)	Few	Few to none
Alternative or Re-flight Opportunities	No alternatives or re-flight opportunities	Few or no alternaties or re-flight opportunities	Some or few alternatives or re-flight opportunities	Significant alternatives or re-flight opportunities
Achievement of Mission Success Criteria	All pratical measures are taken to achieve minimum risk to mission success. The highest assurance standards are used.	Strigent assurance standards with only minor compromises in application to maintain a low risk to mission success.	Medium risk of not achieving misison success may be acceptable. Reduced assurance standards are permitted.	Medium or significant risk of not achieving mission success is permitted. Minimal assurance standards are permitted.

Table 3-2 Payload Risk Classification

CHAPTER 4. COMMON CENTER PROCESSES FOR ALL PROGRAMS/PROJECTS

4.1 KNOWLEDGE MANAGEMENT AND INFUSION OF LESSONS LEARNED

In accordance with NPD 7120.6, the Center Director has appointed a CKO for MSFC. This function is performed by the Associate Director, Technical. The MSFC CKO utilizes the Center Lessons Learned Committee (LLC), as needed, to coordinate and integrate knowledge management activities across the various program/project and institutional offices at MSFC.

Note: Observations that originate in LL collection processes are processed into implementable actions (see Figure 4-1). This approach infuses observations into the Center's operational activities by changing policy and procedural documentation, guidelines, best practices, program planning and execution, training, and employee awareness.

4.1.1 Individuals or groups shall identify discrete, actionable observations that may have application to future projects.

Note: These observations will be documented during a knowledge capture workshop or a project or discipline LL activity, or the LL Information System (LLIS) Form. LL or Knowledge Capture documents containing LL may be uploaded to the NASA LLIS by the originator or by the Center Data Manager (CDM).

4.1.2 The MSFC Distilling Team, led by the CDM for LL, shall clarify and integrate the observations into consistent, clear, and actionable MSFC LL.

Note: The Distilling Team may contact the originator for clarification or additional detail to ensure consistency and completeness of the observation description and recommended action.

4.1.2.1 The Distilling Team shall coordinate review of MSFC LL for export control, patent, legal, and public affairs, as warranted.

4.1.2.2 The Distilling Team shall maintain tracking of LL references, team minutes, and metrics.

4.1.3 The PPMAC shall serve as the Center LLC.

4.1.3.1 The chair of the LLC shall ensure adequate committee representation from across Center organizations.

4.1.3.2 The LLC shall review the MSFC LL recommendations from the MSFC Distilling Team to determine which items warrant changes to existing Center policies, practices, or programs or input into existing Center corrective action processes.

4.1.3.3 The LLC shall concur upon which MSFC LL are suitable and complete for HQ Data Manager (HDM) review and/or documentation as a NASA LL published on the NEN LLIS.

4.1.4 If the MSFC lesson learned is to be published on the NEN LLIS, the CDM shall ensure that the lesson learned is complete, formatted, vetted, and ready for HDM review and publishing.

4.1.5 The Office of Primary Responsibility (OPR) shall incorporate directed actions into MSFC policy and procedural documentation, best practices, or through existing corrective action and training systems.

4.1.6 The CDM, if directed by the LLC, shall ensure the MSFC LL is documented as a NASA LL in the LLIS.

4.1.7 Program/project/activity managers shall ensure review of LL (referred by LLC) for knowledge infusion throughout the program/project life-cycle.

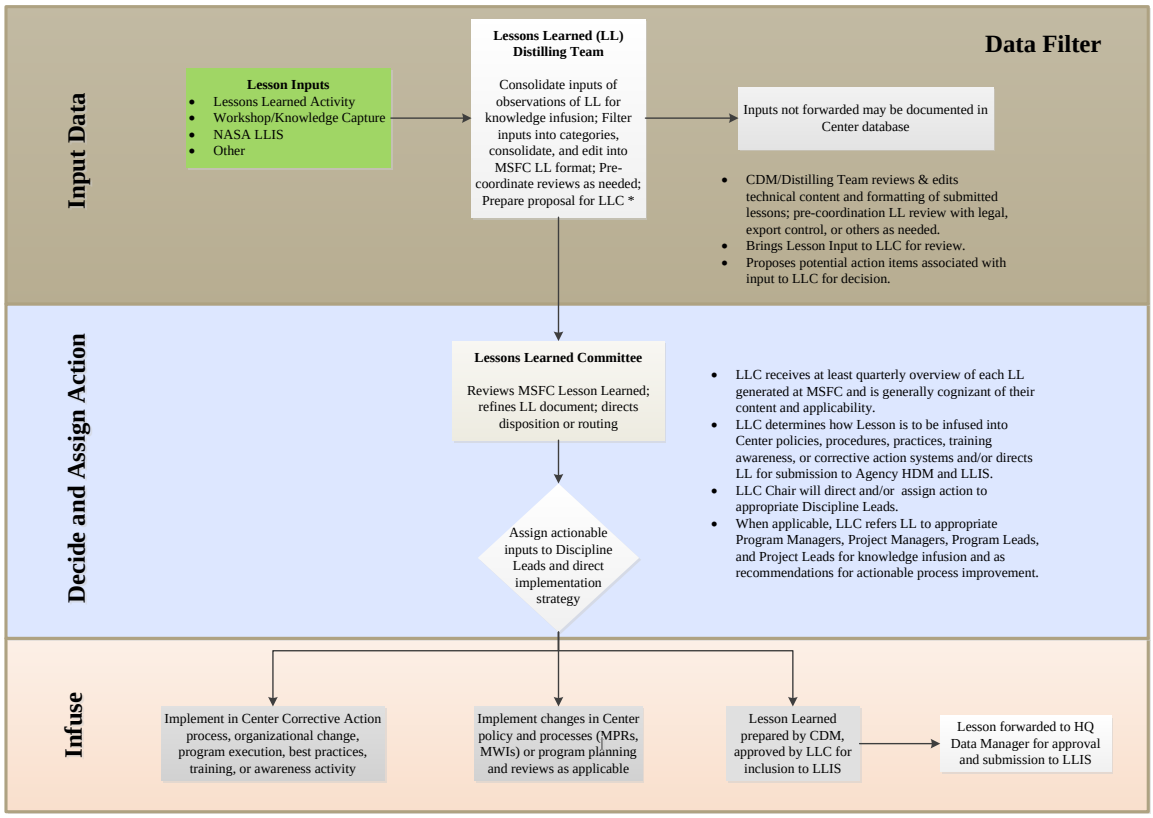


Figure 4-1 MSFC Lessons Learned Process

4.2 TECHNICAL STANDARDS

Technical standards are developed to capture and document new technological developments, current best practices, unique NASA and/or MSFC needs, significant LL associated with human-rated flight and high-risk evolutions, and to establish a level of control over practices and processes that have been identified, such as problem areas or areas contributing to past incidents, near misses, failures, or reduced mission capability, consolidating this knowledge for NASA and MSFC.

Note 1: This chapter contains the Center requirements for the selection and use of technical standards as program/project requirements, and also for MSFC's role in the development of VCS, other Government standards, and NASA Technical Standards. MPR 8070.1 contains the Center requirements for developing Center-level technical standards and standard Data Requirements Description/Document (DRDs) by the appropriate offices and discipline experts at MSFC. MC-06 documents the charter of the MSFC Technical Standards Document Control Board.

Note 2: The NASA Preferred Technical Standards Program Plan (from the NASA Office of the Chief Engineer) established MSFC as the Lead Center for managing the NASA Technical Standard Program's functions, and the plan for and management of the NASA Technical Standards Program, its functions, projects, and activities. The program is implemented by this MPR and NASA-NTSP-1, which is available on the NASA Technical Standards System (NTSS) webpage at https://standards.nasa.gov.

4.2.1 Selection and Use of Technical Standards

4.2.1.1 Programs/projects/activities, in conjunction with the appropriate Technical Authority, shall select technical standards for use as program/project and contract requirements, giving preference to outcome-based, performance standards (as opposed to prescriptive, process-based design standards), according to the following order of priority:

(a.) Standards imposed by legal requirements/regulations.
(b.) Mandatory NASA Technical Standards (i.e., those imposed by NASA directives).
(c.) VCS, domestic and international.
(d.) Other Government (Non-NASA) Standards.
(e.) Other NASA Technical Standards (i.e., those not imposed by NASA directives).
(f.) MSFC Technical Standards.

Note: Technical standard selection is based on currency and applicability to the particular program/project requirements and should include selection of those standards considered necessary to promote mission success and engineering excellence. Current versions should be selected, except when justified as impractical or incompatible with program/project requirements. Where previous/obsolete versions or multiple versions have applicability, clearly identify the intended use of each version (e.g., on a Master List, or in a project plan, memorandum, task agreement, or contract).

a. MSFC personnel/discipline experts from Engineering Directorate, SMA, and/or OCIO shall evaluate and recommend for selection and (where necessary) tailoring, those technical standards pertaining to their particular discipline area, for use as program/project/activity and contract requirements.

4.2.1.2 Programs/projects/activities, in conjunction with the appropriate Technical Authority, shall evaluate those standards listed as "NASA-endorsed technical standards" for use as program/project and contract requirements.

Note: "NASA-endorsed technical standards" is a "pick list" intended to promote commonality in use across NASA and includes VCS, and other Government standards, as well as NASA Technical Standards. This list is accessible at https://standards.nasa.gov.

4.2.1.3 Use of alternate standards shall be invoked through the program/project/activity technical requirements documents at the discretion of the implementing chief engineer and/or CSO.

Note: The NASA OCE flows down authority to approve substitution of industry, contractor, etc., design and construction standards in place of NASA standards to the implementing chief engineer responsible for the end item in question.

4.2.1.4 When tailoring requirements in technical standards, programs/projects/activities shall document the changes with traceability to the original requirements, and obtain approval from the appropriate Technical Authority.

Note: The NASA OCE has delegated the authority to approve waivers/deviation to requirements in engineering technical standards to the Center Director. MCP 8070.2 further delegates this authority to the implementing chief engineer for the program/project.

4.2.1.5 Programs/projects/activities shall identify, assess, and document the impact of changes to technical standards being used as program/project and contract requirements.

Note: The notification system at https://standards.nasa.gov may be utilized.

4.2.1.6 Program/project/activities managers shall ensure review of LL (referred by LLC) for applicability to current technical standards applications (see 4.1).

4.2.2 Development of Technical Standards

4.2.2.1 Participation in VCS Bodies' Activities as a NASA Representative

a. When the need is identified by NASA to participate in development/revision of a VCS or other VCS bodies' activities, MSFC personnel/discipline experts may propose participation

through their organizational management to the Directorate/Office level, with notification to the MSFC representative to the NESP.

b. The applicable Director (or designee) for Engineering, SMA, or OCIO shall authorize, by memorandum, MSFC personnel/discipline experts to participate in developing VCS (including conversion of NASA technical standards to VCS) or participate in other VCS bodies' activities, where appropriate and compatible with NASA's mission, authorities, and budget resources.

c. Upon authorization, MSFC personnel/discipline experts shall follow the procedures for VCS development and participation in VCS bodies' activities in NPR 7120.10 and, for engineering-related proposals, the processes in NASA-NTSP-1.

d. The MSFC Director, Engineering Directorate, (or designated personnel) shall respond to the call for information (from NASA OCE) for NASA's annual report on the use of VCS and Center participation in VCS bodies' activities.

4.2.2.2 Development and maintenance of NASA Technical Standards (Engineering)

a. NPR 7120.10 requires NASA Technical Standards (Engineering) to be developed and maintained in accordance with the direction provided by the NASA Chief Engineer. This direction is provided in the document NASA-NTSP-1, which is available on the NTSS at https://standards.nasa.gov.

b. The Director, MSFC Engineering Directorate (or designee) shall assign by memorandum MSFC's representative to the NESP to perform functions related to development of NASA Technical Standards (Engineering) as described in NASA-NTSP-1, Appendix A, Charter, NESP.

c. MSFC engineering discipline experts shall identify the need for development or maintenance of NASA Technical Standards (Engineering) through their organizational management to the Director, MSFC Engineering Directorate.

d. During Agency-wide review, MSFC engineering discipline experts shall technically review for adequacy and accuracy and provide concurrence or comments for new, and revisions to, existing NASA Technical Standards (Engineering)

> *Note: MSFC NESP member issues Center-wide Action Item Tracking System (CAITS) action. The information contained in CAITS does not constitute the official record of this review. The official record is maintained by the NASA Technical Standards Program (NTSP) Office.*

4.2.2.3 Development of NASA Technical Standards (OSMA)

a. NPR 7120.10 requires NASA Technical Standards (OSMA) to be developed in accordance with the direction provided by the NASA Chief, SMA. This direction is provided in the

document HQOWI 1410-GA002, which is available at http://nodis3.gsfc.nasa.gov/hq_Lib/hq_Doclist.cfm .

b. During Agency-wide review, the Director, MSFC SMA Directorate, or designated personnel, shall ensure that NASA Technical Standards (OSMA) are reviewed by the appropriate MSFC offices and disciplines with comments returned to the NASA OSMA.

Note: Refer to the work instruction referenced above (4.2.2.3 a.) for additional detailed requirements for OSMA standards.

4.2.2.4 Development of NASA Technical Standards (OCIO)

a. NPR 7120.10 requires NASA Technical Standards (OCIO) to be developed in accordance with the direction provided by the NASA Chief Information Officer (CIO) at http://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPD&c=2800&s=1 .

b. During Agency-wide review, the Director, MSFC OCIO, or designated personnel, shall ensure that NASA Technical Standards OCIO are reviewed by the appropriate MSFC offices and disciplines with comments returned to the NASA OCIO.

4.3. SOFTWARE ENGINEERING

Note 1: For the purpose of implementing software engineering requirements in this MPR, section 4.3, Commercial off the shelf (COTS) devices containing an integrated processor dedicated to performing a limited set of functions are excluded from the definition of computer systems and their operating software. The performance requirements of such devices are specified and controlled through the FAR during acquisition, through calibration requirements specified in other procedural requirements, and through metrology practices implemented in procedural requirements and organizational instructions. Examples include, but are not limited to: digital multimeters, electronic torque wrenches, oscilloscopes, data loggers, board testers, digital cameras, and digital thermometers.

Note 2: For the purpose of implementing the software development activity requirements in this MPR, section 4.3, any scripts that are developed for one-time only use, or limited use, internal to the developing organization, are excluded from the definition of software development activities. Any training or metric tracking and reporting for the usage of such scripts will be determined at the discretion of the developing organization.

4.3.1 All MSFC software development, maintenance, retirement, operations, management, acquisition, and assurance activities shall comply with requirements in NPR 7150.2.

Note: The software engineering requirements in NPR 7150.2, and this MPR, section 4.3, are not applicable to software development, maintenance, operations, management, acquisition, and assurance activities started before September 27, 2004 (i.e., existing

systems and subsystems. including any maintenance to products whose initial development started before September 27, 2004. The NASA Engineering Network, Software Engineering Community has the following references and aids: NASA Software Engineering Handbook, Software Classification Tool, Safety Critical Assessment Tool, and Compliance Matrices by Class. Compliance Matrices are located in software document repository at: https://nen.nasa.gov/web/software/documents.

4.3.2 The MSFC representative to the Agency Software Working Group shall develop, and maintain, the MSFC-PLAN-3204. The individual appointed as MSFC's representative to the Software Working Group may be found at the following webpage: https://nen.nasa.gov/web/software/contacts.

Note: The recommended practices and guidelines for the content of a Center Software Engineering Improvement Plan are defined in NASA-HDBK-2203, NASA Software Engineering Handbook.

4.3.3 MSFC organizations responsible for software development, maintenance, retirement, operations, management, acquisition, or assurance activities shall establish, document, execute, and maintain their software processes.

4.3.4 MSFC organizations that have software development activities will contribute applicable software engineering process assets to the NASA Process Asset Library (PAL), via the MSFC representative to the Agency Software Working Group.

Note; The NASA PAL is located on the NEN Web site. It contains examples of software best practices, templates, processes, advanced methods, and tools, which are made available to the NASA software community to continuously improve software engineering capabilities across the Agency. Applicability of assets for the PAL will be determined by the software developing organization based on the potential for the asset to be reutilized in other applications.

4.3.5 MSFC organizations that have software development activities with NPR 7150.2 software classifications of A, B, or C, shall maintain and implement an organization software training plan to advance the organization's in-house software engineering capability and as a reference for its organizational support contractors, as requested.

Note: The recommended practices and guidelines for the content of software training plans are defined in NASA-HDBK-2203. Organizations that develop only class D or E software may utilize the normal employee career development planning process, along with the annual training needs survey, as described in MPR 3410.1, to address software training needs and goals. For all software classes, the MSFC organizational management will have authority to determine the priority and selection of training activities within existing resource limitations.

4.3.6 The Center Director has designated Software Technical Authorities (SwTA). The SwTA(s) for Class A through E are identified in the MSFC Technical Authority Implementation Plan, *MCP 8070.2*. The SwTA(s) for Class G and H are designated by memorandum. The designation information may be found at https://explornet.msfc.nasa.gov/docs/DOC-19449.

Note: The SwTA *implementation responsibilities for Class F software is at the NASA Headquarters OCIO level.*

4.3.6.1 The designated SwTA(s) for Classes A through E (non-business and non-IT infrastructure systems) shall have approval authority for waivers, deviations, and exceptions for requirements in NPR 7150.2 that can be waived at the Center level, and for requirements in this MPR, section 4.3.

4.3.6.2 The designated SwTA(s) for Classes G and H (business and IT-infrastructure systems) shall have approval authority for waivers, deviations, and exceptions for requirements in NPR 7150.2 that can be waived at the Center level, and for requirements in this MPR, section 4.3.

4.3.6.3 The SwTA(s) should be a software engineering expert and shall comply with the Technical Authority roles and responsibilities as documented in the MSFC Technical Authority Implementation Plan, *MCP 8070.2*.

Note: The SwTA for technical software (Class A-E) that is a program/project deliverable item, is the applicable Chief Engineer for that program/project, and tailoring of requirements in this MPR, section 4.3, is typically approved and documented through the normal program/project/activity established configuration control board process. The SwTA for technical software that is not a program/project deliverable item (e.g. basic engineering design, development, and analysis tools, and engineering/research facility operations), is the Lead Discipline Engineer (LDE) for that organization, and tailoring for requirements in this MPR, section 4.3, is typically approved and documented through the organization's internal processes such as a memorandum of record, or an organizational issuance.

4.3.7 The Center Director has appointed and supports the Center's Software Release Authority (SRA) in accordance with NPR 2210.1. The individuals who have been appointed as SRA and alternate SRA for MSFC are listed on the following webpage: *https://nen.nasa.gov/web/sra/contacts* .

4.3.8 Programs/projects/activities releasing software shall follow the requirements in NPR 2210.1.

Note: NPR 2210.1 addresses the release of software created by or for NASA to external entities for commercial, industrial, educational, and other Governmental purposes, with appropriate restrictions on the use and redistribution of the software. The responsibilities of programs/projects are summarized in section 1.8 of NPR 2210.1.

4.3.9 The MSFC representative to the Agency Software Working Group has been designated to provide the Agency Chief Engineer with information to support the creation of the Software Inventory.

4.3.10 Programs/projects/activities requesting relief from requirements in NPR 7150.2 for which the approval authority has been retained at the Agency-level, shall obtain concurrence of the Associate Director, Technical, prior to requesting approval from the Agency-level authorities.

Note: The approval of the Associate Director, Technical, is typically obtained by briefing the information to the PPMAC, but may be obtained through other means.

4.3.11 MSFC organizations that have software development activities with NPR 7150.2 software classifications of A, B, or C, shall periodically report on the status of their software engineering discipline, as applied to their projects, to the MSFC representative to the Agency Software Working Group, as requested by the Agency OCE.

Note: The MSFC representative to the Agency Software Working Group may also request status information for software with classification of D, as needed, to support requests by the Agency OCE.

4.3.11.1 The MSFC representative to the Agency Software Working Group will integrate these responses and provide to the OCE and other required Technical Authorities, as requested.

4.3.12 MSFC organizations that have software development activities with NPR 7150.2 software classifications of A, B, C or D, shall develop and maintain a list of all such program/project software development activities that contains, at a minimum:
a. Project/program name (or “multiprogram”)
b. Software Computer Software Configuration Item (CSCI) name(s)
c. Safety Critical Software (Yes or No)
d. NPR 7150.2 Software Classification
e. For software classifications of A, B, and C, total software lines of code (SLOC) projected and/or actual, as appropriate.

4.3.12.1 Each organization will provide this list to MSFC representative to the Agency Software Working Group on an annual basis.

4.3.12.2 When multiple MSFC organizations contribute to the development of a software product, the responsibility for reporting of data related to a particular (CSCI) will belong to the organization that is responsible for producing the corresponding Software Development Plan for that particular CSCI.

4.3.13 MSFC organizations that have software development activities with NPR 7150.2 software classifications of A, B, or C, regardless of “safety criticality”, and those with classification of D that are designated as "safety critical," shall develop and maintain a software measurement repository that includes the following data, at a minimum:

a. Software development tracking data (e.g., Schedule Status, plan vs. actual)
b. Software functionality achieved data (e.g. Software Release Implementation Status, plan vs. actual)
c. Software quality data (e.g. Post Release Defects)
d. Software development effort and cost data (e.g. Staffing work year equivalent/full-time equivalent, plan vs. actual).

4.3.13.1 Each organization shall utilize measurement data from this repository to monitor software engineering capability, to improve software quality, and to track the status of software engineering improvement activities.

4.3.14 MSFC organizations that have software development activities with NPR 7150.2 software classifications of A, B, or C, shall develop and maintain (annually) a software cost repository that contains planned vs. actual major milestones dates for each software development program/project activity.

4.3.14.1 Each organization will provide this data to MSFC representative to the Agency Software Working Group, as requested.

4.3.15 At MSFC, the expected content for software documents and records is defined in the standard Data Requirements Descriptions (DRDs), which are available in the MSFC Data Requirements Management System that can be accessed in the MSFC Integrated Document Library.

4.4. OFFICE OF SAFETY AND MISSION ASSURANCE REQUIREMENTS

4.4.1 The MSFC SMA Directorate maintains a requirement trace matrix that includes all the requirements from the Agency Directives owned by OSMA at Headquarters, and the corresponding requirements from MSFC documents. The information is segregated on separate worksheets for those requirements that are the responsibility of the program/project/activity team to implement on each program/project/activity. This matrix is available on the MIDL under the Program/Project Documents, Templates link. http://midl.msfc.nasa.gov/templates.html

> *Note: The following requirements apply to those programs/projects/activities performed at MSFC, for which SMA concurrence authority has not been delegated to the CSO. When SMA concurrence authority is delegated to the CSO, the higher level approvals are not required.*

4.4.2 Program/Project/Activity Manager and CSO utilize the OSMA requirements trace matrix to assess the OSMA requirements and their applicability, and ensure that the applicable requirements are implemented on their project, or relief is properly requested and approved.

4.4.3 For those programs/projects/activities governed at the Directorate (or higher) level, the OSMA applicability assessment shall receive the concurrence of the Director, SMA Directorate.

The SMA Director may choose to delegate concurrence authority down to a lower level, for specific programs/projects/activities.

4.4.4 For requests for relief from OSMA requirements involving program/project/activity execution, for which the approval authority is retained at the Agency or Center Director level, the Program/Project/Activity Manager shall obtain concurrence of the SMA Director, prior to requesting approval from the higher-level authorities.

> *Note: The concurrence of the SMA Director is typically obtained by briefing the information to the Safety Mission Assurance Council (SMAC), but may be obtained through other means.*

4.4.5 For those programs/projects/activities governed by the CMC, Program/Project/Activity Managers shall report a summary of OSMA applicability assessment to the Associate Director, Technical for concurrence.

4.4.6 For requests for relief from Agency requirements involving program/project/activity execution, for which the approval authority has been retained at the Agency-level, the Program/Project/Activity Managers shall obtain concurrence of the Associate Director, Technical, prior to requesting approval from the Agency-level authorities.

4.4.7 For requests for relief from Agency requirements involving program/project/activity execution, for which the approval authority is the MSFC Center Director, the Program/Project/Activity Managers shall obtain concurrence of the Associate Director, Technical, prior to approval of the Center Director, or designee.

> *Note: The approval of the Associate Director, Technical, and the Center Director, or designee, is typically obtained by briefing the information to the PPMAC, and the CMC, but may be obtained through other means.*

CHAPTER 5. SPACE FLIGHT PROGRAM/PROJECT LIFE-CYCLE REQUIREMENTS

5.1 Program and Project Life-Cycles

Programs and projects for which MSFC has management responsibility shall follow the appropriate NASA life-cycle as shown in Appendix F. Uncoupled and loosely coupled (UCLC) programs follow the life-cycle shown in Figure F-1. Tightly coupled (TC) programs follow the life-cycle shown in Figure F-2, SPP follow the life-cycle shown in Figure F-3, and projects follow the life-cycle shown in Figure F-4.

Note: See Chapter 21 for more information on LCRs and participation by Standing Review Board (SRB).

5.1.1 During program/project formulation the Center Director shall recommend program managers and Category 1 Project Managers to the MDAA and appoint Category 2 and 3 Project Managers and Mission Type 4 Activity Managers (reference Table 3-1).

Note: Project Manager Certification process is implemented through the PPMAC which is chartered to serve as the Center's Program/Project Manager Certification Review Panel.

5.2 Systems Engineering Processes

Programs/projects for which MSFC has management responsibility shall follow the MSFC Systems Engineering processes as documented in MPR 7123.1 with respect to the 17 system engineering processes, the development of control plans in accordance with specified Data Requirement Description/Documents (DRDs), and the conduct of LCRs.

Note: The output products and control plans associated with the 17 processes are specified in applicable DRDs that are structured to indicate the Center policy and the option to accept a contractor's document that meets or exceeds the DRD intent.

5.3 Center Resources

Program/project managers shall present requests for Center resource requirements to the CMC at KDPs (during formulation and implementation), commensurate with program/project parameters defined in the Formulation Authorization Document (FAD) and Program/Project Plans.

5.3.1 Center Director (or designee) shall provide human and other resources to execute the FAD and the Program/Project plan and establish, develop, and maintain the institutional capabilities (processes and procedures, human capital, facilities, aircraft, and infrastructure) required for the execution of programs/projects.

5.3.2 Center Director (or designee) shall support annual program and project budget submissions, and validate Center inputs.

5.4 Adjustments for External and Internal Impacts

As programs, projects, and activities are implemented, they will be impacted by external forces (budget modifications, schedule and/or requirements changes) and internal situations (technical challenges or new requirements). When this occurs, programs, projects, and activities shall revisit the formulation phase to ensure program/project/activity planning is consistent with schedule commitments and resource availability.

5.4.1 PCAs, Program/Project Plans, and other planning data shall be modified as needed by programs, projects, and activities when impacted by external forces (as described in 5.4).

5.4.2 Programs and Category 1 and 2 projects shall be re-baselined if the estimated development cost exceeds the Agency Baseline Commitment (ABC) development cost by 30 percent or more, the NASA AA determines that events external to the Agency make a re-baseline appropriate; or the NASA AA determines that the program or project scope defined in the ABC has been changed or the TC program or project has been interrupted.

> *Note: "Development cost" includes all project costs from authorization to Implementation through operational readiness at the end of Phase D. When an ABC is rebaselined, the Decision Authority will direct that a Rebaseline Review be conducted by the SRB or as determined by the Decision Authority.*

5.5 Independent Assessments

The SRB or IRT shall be convened by the Convening Authorities shown in Table 5.5-1.

Convening Authorities for Standing Review Board or Independent Review Team							
	IA Type	Decision Authority (DA)		Technical Authority			NASA Chief Financial Officer [1]
		NASA AA	MDAA [2]	NASA CE [1]	Center Director[3]	Associate Director, Technical[3]	
Programs, MT1 Projects (LCC>$1B, Class A)	SRB	Approve	Approve	Concur	Approve	Concur	Concur
MT2.a Projects ($1B>LCC>$250M, Class B)	SRB		Approve	Concur	Approve	Concur	Concur
MT2.b Projects (LLC<$250M, Class C)	IRT[4]		Approve	Concur	Approve	Concur	Concur
MT3.a -3.c Projects (LCC<$250M, Class D)	IRT[4]		Approve		Approve	Concur	

[1] Concurrence is obtained via coordination with designated MD Chief Engineer and MD embedded OCFO point of contact.

[2] If MDAA has delegated the DA function to a lower level, then the delegated DA will serve as the Convening Authority.

[3] The Center Director/Associate Director, Technical may choose to delegate convening authority down to a lower level, for specific programs or projects, on a case-by-case basis.

[4] IRT's are convened only at the discretion of the MDAA and CD/ADT. When no IRT is convened, an independent review is ensured through participation of independent reviewers, as well as Engineering/SMA Technical Authorities and line management within the standard project review team and review board structure, per MPR 7120.1 and MSFC-HDBK-3173.

Table 5.5-1 Convening Authorities for SRB/IRT

5.5.1 For MSFC-managed programs, and projects with a LCC greater than $250 million, the Center Director, in conjunction with the Associate Director, Technical, will appoint a Review Manager to assist the Mission Directorate with convening and conducting the SRB per the NASA SRB Handbook. SRBs are typically Agency level reviews with membership from outside (as well as within) MSFC.

> *Note: For projects with LCC greater than $250 million, the Mission Directorate (with Center support) is responsible for convening and conducting the SRB including selecting and vetting the Chair and membership for conflicts of interest and producing the Terms of Reference (ToR) as described in the SRB Handbook. The convening authorities may also choose to impose an SRB for projects with LCC less than $250 million. The MSFC Review Manager will assist and facilitate the process, in support of the Mission Directorate. A template for the ToR is available in the NASA SRB Handbook which is available on NASA Online Directives Information System (NODIS) under the "Other Policy Documents" section, OCE tab.*

5.5.1.1 The SRB chair should be a civil servant from within the Agency's senior leadership, and should be independent of MSFC.

5.5.1.2 The SRB Chair/Review Manager will coordinate SRB membership, and the Terms of Reference, with the OCE and Office of Chief Financial Officer (OCFO) personnel embedded in the Mission Directorates. SRB membership is selected with assistance from the OCE for technical members, and from OCFO for programmatic analytical (cost, schedule, risk and Earned Value Management (EVM)) expertise. Personnel with the pre-requisite expertise performing in-

line programmatic work in other projects or mission areas will be selected to provide SRB support. The OCFO will be instrumental in brokering the stewardship of these programmatic analysis capabilities working with the MDs and the Centers, and also provide qualified personnel to serve on the SRBs, as needed.

5.5.1.3 The cost of travel and labor for personnel supporting SRB work will be paid by the Mission Directorate.

5.5.2 For MSFC-managed projects with a LCC of $250 million or less, the Associate Director, Technical, may appoint a Review Manager to facilitate the process of convening and conducting the Independent Review Team (IRT), if determined necessary by the MDAA, Center Director, or Associate Director, Technical. IRTs are typically Center level reviews with membership that is primarily from within MSFC.

5.5.2.1 The IRT chair should be a civil servant from within MSFC's senior workforce, and should be independent of the project under review.

5.5.2.2 The IRT Chair/Review Manager will coordinate IRT membership, and the Terms of Reference, with the MSFC Chief Engineers Office and MSFC OCFO and Office of Strategic Analysis and Communications (OSAC). IRT membership is selected with assistance from the CEO for technical members, and from OCFO and OSAC for programmatic analytical (cost, schedule, risk and EVM) expertise. Personnel with the pre-requisite expertise performing in-line programmatic work in other projects or mission areas will be selected to provide IRT support.

5.5.2.3 The cost of labor for personnel supporting IRT work will be paid by the project.

5.5.3 The following general guidance and expectations apply when convening SRBs and IRTs.

5.5.3.1 When selecting SRB/IRT members, priority should be given to civil service personnel, but contractor consultants may be utilized when their expertise is needed.

5.5.3.2 SRB/IRT members should be technical and programmatic experts who have relevant and current experience, and are independent of (not in the chain of command of) the program or project under review; and have no stake or involvement in the design, build, or operation of the work being reviewed.

5.5.3.3. The SRB/IRT reporting should include cost and schedule assessments, as well as integrated risks and/or issues, concerns and observations, and is normally documented in briefings to Center governance and Decision Authority.

5.5.3.4 The PPMAC will maintain a list of MSFC personnel with the applicable experience to serve as potential candidates for the role of Review Manager and Programmatic Analysts.

5.5.3.5 All MSFC programs and projects will include the participation of independent reviewers, as well as Engineering/SMA Technical Authorities and line management within the standard

review team and review board structure, per MPR 7120.1 and MSFC-HDBK-3173. Independent assessment is a normal part of all MSFC program/project reviews, regardless of whether or not an SRB or IRT is convened.

5.5.3.6 The Review Manager will ensure that the SRB/IRT Chair and the SRB/IRT members are properly vetted for conflicts of interest (personal, organizational, and positional) per the process documented in section 3.2 of the NASA SRB Handbook.

5.5.3.7 The Review Manager (in conjunction with the SRB/IRT Chair) will produce the ToR which documents the vetting of SRB/IRT membership for conflicts of interest and establishes the expectations for how the SRB/IRT will conduct the actual independent reviews.

5.5.3.8 The Review Manager will provide the ToR to the Associate Director, Technical, for concurrence, and to the Center Director, or designee, for approval, prior to approval of the other Convening Authorities.

5.5.4 When a candidate is to be nominated to serve as SRB or IRT Chair for a program/project assigned to MSFC, the MSFC responsible organization (of the potential nominee) shall provide a formal document (thru their organization chain of command with appropriate signatures), to the Review Manager, which provides the following information about the nominee:

5.5.4.1 Person's name/organization

5.5.4.2 Current work assignment

5.5.4.3 Rationale/data that demonstrates independence/objectivity.

a. Lack of any conflict of interest

b. No past association with the program/project

c. No personal, organizational, or positional conflicts of interest

d. Office of Government Ethics (OGE) 450 form that is currently on file, up-to-date, and reviewed by MSFC Chief Counsel, for a personal, organizational, or positional conflict of interest for civil servants

e. Appropriate clearance (if applicable)

Note: See Appendix C of the SRB Handbook for more details on conflict of interest vetting.

5.5.4.4 Rationale of past experience that qualifies the nominee for this task.

a. Past experience with significant similar reviews (as reviewer, leader, or chairperson)

b. Experience in the leadership of a team(s) managing the schedule and content of work.

5.5.4.5 Commitment for the duration of the program/project review cycle.

5.6 Determining Readiness for Life-Cycle Review

The Center Director (or designee), the Program/Project Manager and the SRB (or IRT) chair shall assess the readiness to conduct a LCR (typically 30-90 days prior to the start of the LCR) by reviewing the entrance data package and reporting the results to the decision authority.

> *Note: The Review Manager, or equivalent, documents the requirements for the portion of the LCR conducted by the SRB in the ToR, for which there is a template in the NASA SRB Handbook.*

5.7 Briefing the Results of Life-Cycle Review

The results of each LCR shall be briefed by the SRB (or IRT) and the Program/Project Manager to the appropriate management council per Table 3-1.

5.8 Assessing Readiness for Next Phase

After the final LCR in a given life-cycle phase, the Center Director and the Program Manager (for projects in their program) shall assess the readiness of a program or project to progress to the next phase of the life-cycle (per the LCR objectives and expected maturity states in Appendix G), and provide their assessments and recommendations to the MDAA to support the Decision Authority‘s determination at the KDP.

5.8.1 For MSFC-managed activities that are not required to have an SRB or an IRT, the activity manager and the MSFC CMC or the Director of the Directorate/Office (for those activities that do not report to the MSFC CMC) shall assess the readiness of that activity to progress to the next phase at the KDP review.

5.9 Documenting Key Decision Point Results with Decision Memorandum

The results of the KDPs shall be documented in a decision memorandum that describes whether the program/project is approved to enter the next phase of the life-cycle and the constraints and parameters within which the Agency, the program manager, and the project manager will operate, as well as, any plan changes that can be made without additional approval and any actions resulting from the KDP.

> *Note: The NASA Space Flight Program and Project Management Handbook provides an example of the decision memorandum which illustrates the level and type of information to be documented.*

5.10 Contents of Decision Memorandum

The decision memorandum shall include a total LCC (documented in the form of a target range during formulation, and in the form of an estimated number during implementation) and schedule estimate, which includes the Unallocated Future Expenses (UFE) or cost margin, and schedule margin that is managed above the program/project.

Note: The total Agency LCC estimate (documented in the project's decision memorandum for Implementation at KDP C, for tightly-coupled programs at KDP I) becomes the ABC. The ABC is the baseline against which the Agency's performance is measured during the Implementation Phase. For projects with a LCC of $250 million or more, this forms the basis for the Agency's external commitment to the Office of Management and Budget and Congress.

5.10.1 In addition, the decision memorandum shall also include a management agreement which establishes the parameters and authority for which the Program/Project Manager has control and is accountable to manage within.

Note: The management agreement addresses the cost and schedule (including the UFE or cost margin and schedule margin controlled by the program/project) along with the associated confidence levels, if applicable. It can be viewed as a contract between the Agency and the program or project manager. Significant divergences are documented by changing the Decision Memorandum.

5.10.2 The Program/Project Manager shall coordinate with the MDAA to obtain the NASA AA's approval for all ABCs for tightly-coupled and SPP (regardless of life-cycle cost) 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.

5.10.3 For tightly-coupled and SPP (regardless of life-cycle cost) and projects with an estimated life-cycle cost greater than $250 million, Program/Project Managers shall coordinate with the MDAA to ensure that appropriate justification is documented in the Decision Memorandum, whenever the program/project is funded at less than an equivalent of a 70 percent Joint Confidence Level (JCL).

5.11 Approved Decision Memorandum

The approved decision memorandum shall be attached to the Program Plan (if a program), the Project Plan, or the project FA as appropriate.

Note: The decision memorandum summarizes and records the decisions of the Decision Authority at the KDP. The expectation is to have the decision memorandum signed at the conclusion of the governing PMC KDP meeting. To support the KDP decision process, a draft decision memorandum is submitted to the Decision Authority along with other

appropriate supporting material, as described in the NASA Space Flight Program and Project Management Handbook.

5.12 Program Formulation & Implementation

5.12.1 CMC content for KDP presentations shall be documented per MPR 7120.4.

5.12.2 Requirements for program products are as follows:

5.12.2.1 The Program Manager shall work with the MDAA and the Decision Authority to develop and approve the Program's FAD in accordance with NPR 7120.5, Appendix E, to include the approved cost and schedule margins.

5.12.2.2 Uncoupled and loosely-coupled program products shall be as documented in Table 5.12-1.

5.12.2.3 Tightly-coupled program products shall be as documented in Table 5.12-3.

5.12.2.4 SPP products shall be as documented in Table 5.12-5.

5.12.3 The PCA shall be developed and updated in accordance with NPR 7120.5, Appendix D.

5.12.4 The program plan shall be developed, updated, and approved in accordance with NPR 7120.5, Appendix G.

5.12.5 Program plan concurrence shall be obtained from the SMA Directorate, Engineering Directorate, Office of Procurement, Office of the Chief Financial Officer, and other affected direct report offices.

5.12.6 Requirements for program control plans are as follows. Unless otherwise required, the control plans may be separate plans or included as sections in the program plan.

5.12.6.1 UCLC program control plans shall be as documented in Table 5.12-2

5.12.6.2 Tightly-coupled program control plans shall be as documented in Table 5.12-4.

5.12.6.3 SPP control plans shall be as documented in Table 5.12-6.

5.12.6.4 Implementing Chief Engineer shall review the program plan and sign the SEMP.

5.12.6.5 Implementing Chief Engineer shall issue guidance (as needed) on the development of control plans.

Note: Control plan "how to" information is located in the MSFC-HDBK-317, as well as, QD-QE-017, MGM 8040.1, MGM 7120.3, MWI 7120.6, and Chapter 23 of this

document. Plans without "how to" documentation are to be developed in accordance with guidance issued by the program/project's implementing chief engineer. Expected content for the development of a SEMP is described in MPR 7123.1, Chapter 2.2.10, and Chapter 3.

5.12.7 Content for routine performance reports to the CMC shall be in accordance with MPR 7120.4.

5.12.8 Programs shall determine and document an approach that maximizes the use of the International System of Units (commonly known as the System Internationale (SI)).

Note: The approach is to be documented in the Program Plan no later than the SDR.

5.12.9 The Program Manager shall support content development of agreements with international and other government agencies.

5.12.10 The following terms and definitions are used in Tables 5.12-1 through 5.12-6. "Initial" is applied to data that are continuously developed and updated as the program or project matures. "Final" is applied to data that are expected to exist in this final form, e.g., minutes and final reports. "Summary" (SUM) is applied to data that synthesize the results of work accomplished. "Plan" is applied to data that capture work that is planned to be performed in the following phases. "Preliminary" (Prel) 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 data 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. "Baseline" (B/L) indicates putting the data under configuration control so that changes can be tracked, approved, and communicated to the team and any relevant stakeholders. The expectation on data 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 data that will eventually become part of the Program or Project Plan indicates that the data has the concurrence of stakeholders and is under configuration control. "Update" (Upd) is applied to data that are expected to evolve as the formulation and implementation processes evolve. Only expected updates are indicated. However, any data may be updated, as needed. Updates to baselined data require the same formal approval process as the original baseline.

UC/LC PRODUCTS (per NPR 7120.5, App I)	Formulation		Implementation
	KDP I [1]		KDP II - n
	SRR	SDR	PIR
1. Formulation Authorization Documentation (FAD) [2]	B/L		
2. Program Commitment Agreement (PCA)	Prelim	B/L	
3. Program Plan	Prelim	B/L	Upd
3a. Mission Directorate requirements & constraints	B/L	Upd	
3b. Traceability of program-level requirements on projects to the Agency strategic goals & MD requirements and constraints	Prelim	B/L	
3c. Documentation of driving ground rules & assumptions on the program	Prelim	B/L	
4. Interagency and International Agreements	Prelim	B/L	
5. Acquisition Strategy Meeting Minutes		Final	
6. Risk mitigation plans & resources for significant risks	Initial	Upd	Upd
7. Documented cost & schedule baselines	Prelim	B/L	Upd
8. Documentation of BOE (cost & schedule)	Prelim	B/L	Upd
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 next life cycle phase		Plan	Plan

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

[2] To include aproved cost and schedule margins.

Table 5.12-1 UCLC Program Milestone Products

UC/LC Program Plan - Control Plans[1] (defined in NPR 7120.5, App G)	Formulation		Implementation
		KDP I[2]	KDP II - n
	SRR	SDR	PIR
1. Technical, Schedule, and Cost Control Plan [3]	Prelim	B/L	
2. SMA Plan	Prelim	B/L	
3. Risk Management Plan	Prelim	B/L	
4. Acquisition Plan	Prelim	B/L	
5. Technology Development Plan	Prelim	B/L	
6. SEMP	Prelim	B/L	
7. Review Plan [4]	B/L	Upd	
8. Environmental Management Plan		B/L	
9. CM Plan [5]	Prelim	B/L	
10. Security Plan [6]		B/L	
11. Threat Summary [7]		B/L	Upd Annually
12. Export Control Plan [8]		B/L	
13. Technology Transfer Control Plan [9]		B/L	
14. Education Plan		B/L	
15. Communication Plan		B/L	
16. Lessons Learned Plan	Prelim	B/L	

[1] 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.

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

[3] To include approved cost and schedule margins.

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

[5] CM includes both H/W and S/W. Software products are defined by NPR 7150.2. S/W & H/W CM may be preliminary at SRR and updated at SDR.

[6] Refer to MPR 1600.1 for programs/projects to notify MSFC Protective Services Office and ensure funding for any infrastructure that may require designation as NASA Critical Infrastructure.

[7] Contact Systems Engineering Office in MSFC Chief Engineer Office for additional information on applicability and approval requirements which are determined on a case-by-case basis for each program/project.

[8] Refer to MPR 2190.1 and the export control plan template on the Marshall Integrated Document Library (under Program/Project Specific Documentation section).

[9] Refer to NPR 2190.1 for additional details.

Table 5.12-2 UCLC Program Plan-Control Plans

TC PRODUCTS (per NPR 7120.5, App I)	Formulation			Implementation				
		KDP 0	KDP I		KDP II		KDP III	KDP n
	SRR	SDR	PDR	CDR	SIR	ORR	MRR/FRR	DR
1. Formulation Authorization Documentation (FAD) [1]	B/L							
2 Program Commitment Agreement (PCA)		Prelim	B/L					
3. Program Plan	Prelim	B/L	Upd	Upd	Upd	Upd	Upd	Upd
3a. Mission Directorate requirements & constraints	B/L	Upd	Upd					
3b. Traceability of program-level requirements on projects to the Agency strategic goals & MD requirements and constraints	Prelim	B/L	Upd					
3c. Documentation of driving ground rules & assumptions on the program	Prelim	B/L	Upd	Upd	Upd			
4. Interagency and International Agreements	Prelim	B/L	Upd					
5. ASM Minutes		Final						
6. Risk mitigation plans & resources for significant risks	Initial	Upd	Upd	Upd	Upd	Upd	Upd	Upd
7. Documented cost & schedule baselines	Prelim	Prelim	B/L	Upd	Upd	Upd	Upd	Upd
8. Documentation of BOE (cost & schedule)	Prelim	Prelim	B/L	Upd	Upd	Upd	Upd	Upd
9. Confidence level & supporting documentation		Prelim cost confidence level & prelim schedule confidence level	Joint cost and schedule confidence level (JCL)					
10. Shared infrastructure[2], staffing, and scarce material requirements & plans	Initial	Upd	Upd	Upd				
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] To include approved cost and schedule margins.

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

Table 5.12-3 TC Program Milestone Products

TC Program Plan - Control Plans (defined in NPR 7120.5, App G)	Formulation			Implementation				
		KDP 0	KDP 1		KDP II		KDP III	KDP n
	SRR	SDR	PDR	CDR	SIR	ORR	MRR/ FRR	DR
1. Technical, Schedule, and Cost Control Plan [1]	Prelim	B/L	Upd					
2. SMA Plan	Prelim	B/L	Upd	Upd			Upd (SMSR)	
3. Risk Management Plan	Prelim	B/L	Upd					
4. Acquisition Plan	Prelim Strategy	B/L	Upd					
5. Technology Development Plan	Prelim	B/L	Upd					
6. SEMP	Prelim	B/L						
7. V&V Plan		Prelim	B/L	Upd	Upd			
8. IT Plan	Prelim	B/L	Upd					
9. Review Plan [2]	B/L	Upd	Upd					
10. Mission Operations Plan					Prelim	B/L	Upd	
11. Environmental Management Plan		Prelim	B/L	Upd				
12. Integrated Logistics Support Plan		Prelim	B/L	Upd				
13. Science Data Management Plan			Prelim			B/L	Upd	
14. CM Plan [3]	Prelim	B/L	Upd					
15. Security Plan [4]		Prelim	B/L					
16. Threat Summary [5]		Prelim	B/L	Upd	Upd	Upd	Upd Annually	
17. Export Control Plan [6]		Prelim	B/L	Upd				
18. Technology Transfer Control Plan [7]		Prelim	B/L	Upd				
19. Education Plan		Prelim	B/L	Upd		Upd		
20. Communication Plan		Prelim	B/L	Upd		Upd		
21. Lessons Learned Plan	Prelim	B/L	Upd					

[1] To include approved cost and schedule margins.

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

[3] CM includes both H/W and S/W. Software products are defined by NPR 7150.2. S/W & H/W may be preliminary at SRR and upated at SDR.

[4] Refer to MPR 1600.1 for programs/projects to notify MSFC Protective Services Office and ensure funding for any infrastructure that may require designation as NASA Critical Infrastructure.

[5] Contact Systems Engineering Office in MSFC Chief Engineer Office for additional information on applicability and approval requirements which are determined on a case-by-case basis for each program/project.

[6] Refer to MPR 2190.1 and the export control plan template on the Marshall Integrated Document Library (under Program/Project Specific Documentation section).

[7] Refer to NPR 2190.1 for additional details.

Table 5.12-4 TC Program Plan-Control Plans

SPP Products (per NPR 7120.5, App I)	Pre Phase A	Phase A		Phase B	Phase C		Phase D		Phase E	Phase F
	KDP A		KDP B	KDP C		KDP D		KDP E	KDP F	
	MCR	SRR	SDR/MDR	PDR	CDR	SIR	ORR	MRR/FRR	DR	DRR
Headquarters and Program Products [1]										
1. Formulation Authorization Documentation (FAD) [3]	B/L									
2. Program Commitment Agreement (PCA)			Prelim	B/L						
3. Traceability of Agency strategic goals and Mission Directorate requirements and constraints to program/project-level requirements and constraints.	Prelim	B/L	Upd	Upd						
4. Documentation of driving mission, technical, and programmatic ground rules and assumptions	Prelim	Prelim	B/L	Upd	Upd	Upd				
5. Partnerships and Inter-agency and international agreements	Prelim	Upd	B/L U.S. partnerships & agreements	B/L international agreements						
6. ASM minutes		Final								
7. NEPA compliance documentation per 8580.1				Final document. per NPR 8580.1						
8. Mishap preparedness and contingency plan				Prelim		Upd		B/L (SMSR)	Upd	Upd
Project Technical Products [2]										
1. Concept documentation	Approve	Upd	Upd	Upd						
2. Mission, spacecraft, ground, and payload architectures	Prelim mission & spacecraft arch	B/L mission & spacecraft arch; prelim ground & payload arch. Classify payloads by risk per NPR 8705.4	Upd mission & spacecraft arch, B/L ground & payload arch	Upd mission, spacecraft, ground and payload arch						
3. Project level, system, and subsystem requirements	Prelim project-level	B/L project-level & system-level	Upd project-level & system-level; Prelim subsystem	Upd project-level & system-level; B/L subsystem						
4. Design documentation			Prelim	B/L Preliminary Design	B/L Detailed Design	Upd		Baseline As-built hardware and software		
5. Ops Concept	Prelim	Prelim	Prelim	B/L						
6. Technology readiness assessment documentation	Initial	Upd	Upd	Upd	Upd					
7. Engineering development assessment documentation	Initial	Upd	Upd	Upd						
8. Heritage assessment documentation	Initial	Upd	Upd	Upd						
9. Safety data packages				Prelim	B/L	Upd	Upd	Upd		
10. ELV Payload Safety Process Deliverables				Prelim	Prelim	B/L				
11. V&V Report							Prelim	B/L		
12. Operations handbook						Prelim	B/L	Upd		
13. Orbital Debris Assessment per NPR 8715.6	Prelim assessment			Prelim design ODAR	Detailed design ODAR			Final ODAR (SMSR)		
14. End of Mission Plans (EOMP) per NPR 8715.6/NASA-STD 8719.14, App B					Prelim			B/L EOMP (SMSR)	Upd EOMP annually	Upd EOMP
15. Mission Report										Final

Table 5.12-5 SPP Milestone Products

SPP Products (per NPR 7120.5, App I) (contd)	Pre Phase A	Phase A		Phase B	Phase C		Phase D		Phase E	Phase F
	KDP A	KDP B		KDP C	KDP D		KDP E		KDP F	
	MCR	SRR	SDR/MDR	PDR	CDR	SIR	ORR	MRR/FRR	DR	DRR
Project Management, Planning, and Control Products										
1. FA [3]	B/L for Phase A; Prelim for Phase B		B/L for Phase B							
2. Program Plan [4]	Prelim	B/L								
3. Project Plan [4]	Prelim	B/L								
4. Plans for work to be accomplished during next implementation life cycle phase				B/L for Phase C		B/L for Phase D		B/L for Phase E	B/L for Phase F	
5. Documentation of performance against FA or against plans for work to be accomplished during implementation phase, including performance against baselines and status/closure of formal actions from previous KDP		Summary	Summary	Summary	Summary	Summary	Summary	Summary	Summary	
6. Project baselines			Prelim	B/L	Upd	Upd	Upd	Upd		
6a. Top technical, cost, schedule, and safety risks, risk mitigation plans and associated resources	Initial	Upd	Upd	Upd	Upd	Upd	Upd	Upd	Upd	Upd
6b. Staffing rqmnts and plans	Initial	Upd	Upd	Upd	Upd		Upd			
6c. Infrastructure rqmnts & plans, business case analysis for infrastructure; Capitalization Determination Form (NF 1739), per NPR 9250.1	Initial	Upd	Upd (B/L for NF 1739, section A)	Upd (B/L for NF 1739, section B)	Upd					
6d. Schedule	Risk informed at project level with prelim Phase D completion ranges	Risk informed at system level with prelim Phase E completion ranges	Risk informed at subsystem level with prelim Phase D completion ranges. Prelim IMS	Risk informed and cost- or resource-loaded. Baseline IMS	Update IMS	Update IMS	Update IMS			
6e. Cost estimate (risk informed or schedule-adjusted depending on phase)	Prelimi Range estimate	Upd	Risk-informed schedule-adjusted range est	Risk-informed & schedule-adjusted baseline	Upd	Upd	Upd	Upd	Upd	Upd
6f. BOE (cost & schedule)	Initial (for range)	Upd (for range)	Upd (for range)	Upd for cost and schedule estimate	Upd	Upd	Upd	Upd	Upd	Upd
6g. Confidence level(s) & supporting documentation			Prelim cost confidence level & prelim schedule confidence level	Joint cost and schedule confidence level (JCL)						
6h. External cost & schedule commitments			Prelim for ranges	B/L						
6i. Cost Analysis Data Requirement (CADRe)			Prelim	B/L	Upd			Upd	Upd	
7. Decommissioning/Disposal Plan									B/L	Upd 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] To include approved cost and schedule margins.

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

Table 5.12-5 SPP Milestone Products (continued)

SPP Program/Project Plan - Control Plans (defined in NPR 7120.5, App G & H)	Pre Phase A	Phase A		Phase B	Phase C		Phase D		Phase E
	KDP A		KDP B	KDP C		KDP D		KDP E	KDP F
	MCR	SRR	SDR/MDR	PDR	CDR	SIR	ORR	MRR/FRR	DR
1. Technical, Schedule, and Cost Control Plan [1]	Approach for managing schedule & cost during Phase A [3]	Prelim	B/L	Upd					
2. SMA Plan		B/L	Upd	Upd	Upd			Upd (SMSR)	Upd
3. Risk Management Plan	Approach for managing risks during Phase A [3]	B/L	Upd	Upd					
4. Acquisition Plan	Prelim Strategy	B/L	Upd	Upd					
5. Technology Development Plan (may be part of Formulation Agreement)	B/L	Upd	Upd	Upd					
6. SEMP	Prelim	B/L	Upd	Upd					
7. IT Plan		Prelim	B/L	Upd					
8. S/W Management Plan		Prelim	B/L	Upd					
9. V&V Plan	Prelim Approach [2]		Prelim	B/L	Upd	Upd			
10. Review Plan	Prelim	B/L	Upd	Upd					
11. Mission Ops Plan						Prelim	B/L	Upd	
12. Environmental Mgmt Plan			B/L						
13. Integrated Logistics Support Plan	Approach for managing logistics [2]	Prelim	Prelim	B/L	Upd				
14. Science DM Plan				Prelim			B/L	Upd	
15. Integration Plan	Prelim Approach [2]		Prelim	B/L	Upd				
16. Threat Summary [4]			Prelim	B/L	Upd	Upd	Upd	Upd Annually	
17. CM Plan[5]		B/L	Upd	Upd					
18. Security Plan [6]			Prelim	B/L					Upd Annually
19. Project Protection Plan [4]			Prelim	B/L	Upd	Upd	Upd	Upd	Upd Annually
20. Export Control Plan [7]			Prelim	B/L	Upd				
21. Technology Transfer Control Plan [8]			Prelim	B/L	Upd				
22. Lessons Learned Plan	Approach for managing during Phase A [2]		Prelim	B/L	Upd				
23. Human Rating Certification Pkg	Prelim Approach [2]	Initial	Upd	Upd	Upd		Upd	Approve Certification	
24. Planetary Protection Plan			Plantary protection certification (if required)	B/L					
25. Nuclear Safety Launch Approval Plan			B/L (mission has nuclear materials)						
26. Range Safety Risk Mgt Process Documentation				Prelim	Prelim	B/L			
27. DM Plan		B/L	Upd	Upd					
28. Quality Plan		Prelim	Prelim	B/L	Upd				
29. Education Plan			Prelim	B/L	Upd		Upd		
30. Communication Plan			Prelim	B/L	Upd		Upd		

[1] To include approved cost and schedule margins.
[2] Not the Plan, but documentation of considerations that might impact cost & schedule baselines. May be documented in MCR briefing pkg.
[3] Not the plan, but documentation of high-level process. May be documented in MCR briefing pkg.
[4] Contact Systems Engineering Office in MSFC Chief Engineer Office for additional information on applicability and approval requirements which are determined on a case-by-case
[5] CM includes both H/W and S/W. Software products are defined by NPR 7150.2. S/W & H/W CM Plans may be preliminary at SRR and baselined with the SRR.
[6] Refer to MPR 1600.1 for programs/projects to notify MSFC Protective Services Office and ensure funding for any infrastructure that may require designation as NASA Critcal Infrastructure.
[7] Refer to MPR 2190.1 and the export control plan template on the Marshall Integrated Document Library (under Program/Project Specific Documentation section).
[8] Refer to NPR 2190.1 for additional details.

Table 5.12-6 SPP Project Plan-Control Plans

5.13 Project Formulation & Implementation

5.13.1 CMC content for KDP presentation shall be in accordance with MPR 7120.4.

5.13.2 Project products shall be as documented in Table 5.13-1.

5.13.2.1 The Project Manager shall work with the MDAA and the Decision Authority to develop and approve the Project's FAD in accordance with NPR 7120.5, Appendix E, to include the approved cost and schedule margins.

5.13.3 Project plan preparation and approval shall be in accordance with NPR 7120.5, Appendix H.

Note: STD/MA-PRP and the associated project plan template (available on the MIDL) contain additional MSFC specific content that integrates the MSFC specific processes and directives applicable to project planning.

5.13.4 Project control plans shall be as documented in Table 5.13-2. Unless otherwise required, the control plans may be separate plans or included as sections in the project plan.

5.13.4.1 Implementing Chief Engineer shall review the project plan and sign the SEMP.

5.13.4.2 Implementing Chief Engineer shall issue guidance (as needed) on the development of control plans.

Note: Control plan "how to" information is located in the MSFC-HDBK-3173, as well as,QD-QE-017, MGM 8040.1, MGM 7120.3, MWI 7120.6, and Chapter 23. Plans without "how to" documentation are to be developed in accordance with guidance issued by the program/project's implementing chief engineer. Expected content for the development of a SEMP is described in MPR 7123.1, Chapter 2.2.10 and Chapter 3.

5.13.5 Content for routine performance reports to the CMC shall be in accordance with MPR 7120.4.

5.13.6 FA preparation and approval shall be in accordance with NPR 7120.5, Appendix F.

5.13.7 Projects shall determine and document an approach that maximizes the use of SI.

Note: The approach is to be documented in the Project Plan no later than the SDR.

5.13.8 The Project Manager shall support content development of agreements with international and other government agencies.

5.13.9 The following terms and definitions are used in Tables 5.13-1and 5.13-2. "Initial" is applied to data that are continuously developed and updated as the program or project matures. "Final" is applied to data that are expected to exist in this final form, e.g., minutes and final reports. "Summary" (SUM) is applied to data that synthesize the results of work accomplished. "Plan" is applied to data that capture work that is planned to be performed in the following phases. "Preliminary" (Prel) 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 data

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. "Baseline" (B/L) indicates putting the data under configuration control so that changes can be tracked, approved, and communicated to the team and any relevant stakeholders. The expectation on data 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 data that will eventually become part of the Program or Project Plan indicates that the data has the concurrence of stakeholders and is under configuration control. "Update" (UPD) is applied to data that are expected to evolve as the formulation and implementation processes evolve. Only expected updates are indicated. However, any data may be updated, as needed. Updates to baselined data require the same formal approval process as the original baseline.

Project Products (per NPR 7120.5, App I)	Pre Phase A	Phase A		Phase B	Phase C		Phase D		Phase E	Phase F
	KDP A		KDP B	KDP C		KDP D		KDP E	KDP F	
	MCR	SRR	SDR/MDR	PDR	CDR	SIR	ORR	MRR/FRR	DR	DRR
Headquarters and Program Products [1]										
1. FAD [3]	B/L									
2. Program Plan	B/L									
2a. Applicable Agency strategic goals	B/L	Upd	Upd							
2b. Documentation of program-level requirements and constraints on the project (from Program Plan) and stakeholder expectations, including mission objectives/goals and mission success criteria	Prelim	B/L	Upd	Upd						
2c. Documentation of driving mission, technical, and programmatic ground rules and assumptions	Prelim	Prelim	B/L	Upd	Upd	Upd				
3. Partnerships and Inter-agency and international agreements	Prelim	Upd	B/L U.S. partnerships & agreements	B/L international agreements						
4. ASM minutes		Final								
5. NEPA compliance documentation (see NPR 8580.1)				Final document. per NPR 8580.1						
6. Mishap preparedness and contingency plan (see NPR 8621.1)				Prelim		Upd		B/L (SMSR)	Upd	Upd
Project Technical Products [2]										
1. Concept documentation	Approve	Upd	Upd	Upd						
2. Mission, spacecraft, ground, and payload architectures	Prelim mission & spacecraft arch	B/L mission & spacecraft arch; prelim ground & payload arch. Classify payloads by risk per NPR 8705.4	Upd mission & spacecraft arch, B/L ground & payload arch	Upd mission, spacecraft, ground and payload arch						
3. Project level, system, and subsystem requirements	Prelim project-level	B/L project-level & system-level	Upd project-level & system-level; Prelim subsystem	Upd project-level & system-level; B/L subsystem						
4. Design documentation			Prelim	B/L Preliminary Design	B/L Detailed Design	Upd		Baseline As-built hardware and software		
5. Ops Concept	Prelim	Prelim	Prelim	B/L						
6. Technology readiness assessment documentation	Initial	Upd	Upd	Upd	Upd					
7. Engineering development assessment documentation	Initial	Upd	Upd	Upd						
8. Heritage assessment documentation	Initial	Upd	Upd	Upd						
9. Safety data packages				Prelim	B/L	Upd	Upd	Upd		
10. ELV Payload Safety Process Deliverables				Prelim	Prelim	B/L				
11. V&V Report							Prelim	B/L		
12. Operations handbook						Prelim	B/L	Upd		
13. Orbital Debris Assessment per NPR 8715.6	Prelim assessment			Prelim design ODAR	Detailed design ODAR			Final ODAR (SMSR)		
14. End of Mission Plans (EOMP) per NPR 8715.6/NASA-STD 8719.14, App B					Prelim			B/L EOMP (SMSR)	Upd EOMP annually	Upd EOMP
15. Mission Report										Final

Table 5.13-1 Project Milestone Products

Project Milestone Products (per NPR 7120.5, App I) (contd)	Pre Phase A	Phase A		Phase B	Phase C		Phase D		Phase E	Phase F
	KDP A	KDP B		KDP C	KDP D		KDP E		KDP F	
	MCR	SRR	SDR/MDR	PDR	CDR	SIR	ORR	MRR/FRR	DR	DRR
Project Management, Planning, and Control Products										
1. FA [3]	B/L for Phase A; Prelim for Phase B		B/L for Phase B							
2. Project Plan	Prelim	B/L								
3. Plans for work to be accomplished during next implementation life cycle phase				B/L for Phase C		B/L for Phase D		B/L for Phase E	B/L for Phase F	
4. Documentation of performance against FA or against plans for work to be accomplished during implementation phase, including performance against baselines and status/closure of formal actions from previous KDP		Summary	Summary	Summary	Summary	Summary	Summary	Summary	Summary	
5. Project baselines			Prelim	B/L	Upd	Upd	Upd	Upd		
5a. Top technical, cost, schedule, and safety risks, risk mitigation plans and associated resources	Initial	Upd	Upd	Upd	Upd	Upd	Upd	Upd	Upd	Upd
5b. Staffing rqmnts and plans	Initial	Upd	Upd	Upd	Upd		Upd			
5c. Infrastructure rqmnts & plans, business case analysis for infrastructure; Capitalization Determination Form (NF 1739), per NPR 9250.1	Initial	Upd	Upd (B/L for NF 1739, section A)	Upd (B/L for NF 1739, section B	Upd					
5d. Schedule	Risk informed at project level with prelim Phase D completion ranges	Risk informed at system level with prelim Phase E completion ranges	Risk informed at subsystem level with prelim Phase D completion ranges. Prelim IMS	Risk informed and cost- or resource-loaded. Baseline IMS	Update IMS	Update IMS	Update IMS			
5e. Cost estimate (risk informed or schedule-adjusted depending on phase)	Prelimi Range estimate	Upd	Risk-informed schedule-adjusted range est	Risk-informed & schedule-adjusted baseline	Upd	Upd	Upd	Upd	Upd	Upd
5f. BOE (cost & schedule)	Initial (for range)	Upd (for range)	Upd (for range)	Upd for cost and schedule estimate	Upd	Upd	Upd	Upd	Upd	Upd
5g. Confidence level(s) & supporting documentation			Prelim cost confidence level & prelim schedule confidence level	Joint cost and schedule confidence level (JCL)						
5h. External cost & schedule commitments			Prelim for ranges	B/L						
5i. Cost Analysis Data Requirement (CADRe)			Prelim	B/L	Upd			Upd	Upd	
6. Decommissioning/Disposal Plan									B/L	Upd 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] To include approved cost and schedule margins.

Table 5.13-1 Project Milestone Products (continued)

Project Plan - Control Plans (defined in NPR 7120.5, App H)	Pre Phase A	Phase A		Phase B	Phase C		Phase D		Phase E
	KDP A		KDP B	KDP C		KDP D		KDP E	KDP F
	MCR	SRR	SDR/MDR	PDR	CDR	SIR	ORR	MRR/FRR	DR
1. Technical, Schedule, and Cost Control Plan [1]	Approach for managing schedule & cost during Phase A [3]	Prelim	B/L	Upd					
2. SMA Plan		B/L	Upd	Upd	Upd			Upd (SMSR)	Upd
3. Risk Management Plan	Approach for managing risks during Phase A [3]	B/L	Upd	Upd					
4. Acquisition Plan	Prelim Strategy	B/L	Upd	Upd					
5. Technology Development Plan (may be part of Formulation Agreement)	B/L	Upd	Upd	Upd					
6. SEMP	Prelim	B/L	Upd	Upd					
7. IT Plan		Prelim	B/L	Upd					
8. SW Management Plan		Prelim	B/L	Upd					
9. V&V Plan	Prelim Approach [2]		Prelim	B/L	Upd	Upd			
10. Review Plan	Prelim	B/L	Upd	Upd					
11. Mission Ops Plan						Prelim	B/L	Upd	
12. Environmental Mgt Plan			B/L						
13. Integrated Logistics Support Plan	Approach for managing logistics [2]	Prelim	Prelim	B/L	Upd				
14. Science DM Plan				Prelim			B/L	Upd	
15. Integration Plan	Prelim Approach [2]		Prelim	B/L	Upd				
16. CM Plan [4]		B/L	Upd	Upd					
17. Security Plan [5]			Prelim	B/L					Upd annually
18. Project Protection Plan [6]			Prelim	B/L	Upd	Upd	Upd	Upd	Upd annually
19. Export Control Plan [7]			Prelim	B/L	Upd				
20. Technology Transfer Control Plan [8]			Prelim	B/L	Upd				
21. Lessons Learned Plan	Approach for managing during Phase A [3]		Prelim	B/L	Upd				
22. Human Rating Certification Pkg	Prelim Approach [2]	Initial	Upd	Upd	Upd		Upd	Approve Certification	
23. Planetary Protection Plan			Plantary protection certification (if required)	B/L					
24. Nuclear Safety Launch Approval Plan			B/L (mission has nuclear materials)						
25. Range Safety Risk Mgt Process Documentation				Prelim	Prelim	B/L			
26. DM Plan		B/L	Upd	Upd					
27. Quality Plan		Prelim	Prelim	B/L	Upd				
28. Education Plan			Prelim	B/L	Upd		Upd		
29. Communication Plan			Prelim	B/L	Upd		Upd		

[1] To include approved cost and schedule margins

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

[3] Not the plan, but documentation of high-level process. May be documented in MCR briefing pkg.

[4] CM includes both H/W and S/W. Software products are defined by NPR 7150.2. S/W & H/W CM Plans may be preliminary at SRR and baselined with the SRR.

[5] Refer to MPR 1600.1 for programs/projects to notify MSFC Protective Services Office and ensure funding for any infrastructure that may require designation as NASA Critcal Infrastructure.

[6] Contact Systems Engineering Office in MSFC Chief Engineer Office for additional information on applicability and approval requirements which are determined on a case-by-case basis for each program/project.

[7] Refer to MPR 2190.1 and the export control plan template on the Marshall Integrated Document Library (under Program/Project Specific Documentation section).

[8] Refer to NPR 2190.1 for additional details.

Table 5.13-2 Project Plan – Control Plans

CHAPTER 6. DESIGN TO COST

6.1 Programs/projects shall manage and design to full LCC constraints.

6.2 As part of seeking authority to proceed, programs/projects, with the involvement of independent cost modeling, shall establish cost predictions and receive cost constraints from NASA sponsors.

Note: The requirement for independent cost modeling may be accomplished by utilizing the MSFC OSAC cost modeling experts.

6.3 Upon establishing feasible cost baselines, programs and projects shall manage to cost constraints and report margin status monthly to the Center Director via the CMC.

6.4 If the cost predictions exceed the cost constraints (including cost margins) following Authority to Proceed (ATP), MSFC Engineering shall develop programmatic decision options for the Program/Project Manager that bring the program/project within cost constraints, with independent cost modeling to determine the probable magnitude of the overrun and the cost savings associated with de-scope options.

Note 1: The requirement for independent cost modeling may be accomplished by utilizing the MSFC OSAC cost modeling experts.

Note 2: If the program or project finds no options to meet cost constraints, the issue is elevated to the Center Director.

6.5 Programs/projects shall allocate costs at all levels of the system decomposition.

6.6 The implementing chief engineer shall be responsible for reviewing design decisions at all WBS levels and assessing impacts using applicable criteria such as that included in 18.2, a-f.

Note: Estimates of these impacts are included in any decision package presented to the Chief Engineer's Control Board (CECB) or Project Configuration Control Board (CCB) for decision.

6.7 If a design is predicted to exceed a cost allocation, the responsible designer shall prepare a decision package with options to meet allocations.

6.8 Programs/projects shall identify the major cost drivers and perform a risk assessment on the cost drivers.

Note: The program/project manager, program/project implementing chief engineer, and program/project CSO have the authority to make the decision on risk mitigation (see Chapter 16).

6.9 Cost prediction models shall be developed or approved with the involvement of independent cost modeling, and be continually updated as the design and operations planning matures.

Note: The requirement for independent cost modeling may be accomplished by utilizing the MSFC OSAC cost modeling experts.

6.10 Designers (in-house or contracted) shall submit their designs for baselining (at system level through the piece part level) when the design is predicted to meet cost (recurring and non-recurring) estimates within acceptable levels of risk and its requirements are within the programmatic constraints, per Chapter 12.

Note: Designers, at all levels of the design and development process, both in-house and/or contracted, are to be strictly held to configuration management (CM) and control processes and procedures. The CM will ensure that configuration is properly communicated throughout the organization, and that any changes are properly vetted for technical, schedule, and cost implications.

6.11 After the design has become part of the technical baseline, continued design work shall be limited to one or more of the following cases:

a. Designer requests funds to explore new designs to improve margins of cost, performance, schedule, and risk where the expected return is greater than the investment.

b. Further development of design details is authorized by the program/project implementing chief engineer leading to final design definition and documentation.

c. Further analysis/test of the design is authorized by the implementing chief engineer in order to reduce uncertainties in predicted performance within discipline standard practice.

d. Design changes are authorized to resolve issues or mitigate risk as documented in Chapter 16.

6.12 Tightly-coupled programs, SPP, and projects with estimated LCC greater than $250 million shall develop cost and schedule estimates by KDP 0/KDP B using probabilistic analyses to provide a level of confidence that cost and schedule will be within a specified range.

Note: The estimates are to be based upon identified resources by fiscal year. A JCL analysis is not required at KDP 0/KDP B, but may be used in lieu of separate analysis at the program/project manger's decision.

6.13 By KDP I/KDP C, tightly-coupled programs, SPP, and projects with estimated LCC greater than $250 million shall develop a JCL analysis, based on the program/project's resource-loaded (i.e., cost-loaded) schedule and approved risks.

6.14 By KDP I/KDP C, TC programs, SPP, and projects with LCC greater than $250 million shall generate a schedule-based JCL analysis (which includes approved risks)that meets the Decision Authority's approved JCL (70%, unless otherwise stated in the FAD).

Note: Loosely-coupled and uncoupled programs are not required to develop program cost and schedule confidence levels.

6.15 Loosely-coupled and uncoupled programs shall provide analysis of the program's risk at each project's KDP B and KDP C or when a project's ABC is re-baselined.

Note: The ABC, or the program or project's LCC estimate including other parameters, is documented in the project's Decision Memorandum for Implementation (KDP C, or KDP I for tightly-coupled programs). Loosely-coupled and uncoupled programs are not required to develop a JCL analysis.

CHAPTER 7. REQUIREMENTS, COMPLIANCE, AND VERIFICATION

Program/project governing documents include the allocated direction from the MD sponsor, Center requirements, and those established by the program/project itself. The program/project requirements documents fall into three categories: Technical requirements, programmatic control documentation, and design documentation. For any given program/project, each of these requirements types is considered equally binding.

7.1 Programs/projects shall develop technical requirements, program/project control documentation, and design documentation during formulation and implementation.

7.2 Technical requirements and contractual documentation, where the contractor provides evidence of compliance, shall be documented using verifiable "shall" statements.

> *Note: Project control documentation, such as Project Plans and procedures, may contain "shall" statements; however, they do not require a verification report. These may be subject to audit.*

7.3 Technical & design requirements' compliance reporting information shall be documented and presented to the CECB (or program/project CCB) for approval.

> *Note: The information required for verification planning and compliance reporting is specified in the applicable DRDs identified in MPR 7123.1. STD/SE-VVC specifies the requirements for performing an assessment of compliance of verification reports against requirements.*

7.4 The CECB (or program/project CCB) shall approve the verification compliance data packages.

7.5 Verification compliance data packages shall contain waivers for any non-compliant baselined technical/design requirement, including the technical rationale and a risk assessment for the non-compliance.

7.6 Program/project and Center requirements compliance shall be subject to review at regular status and milestone reviews for each project.

CHAPTER 8. WORK BREAKDOWN STRUCTURE

8.1 During program/project formulation, each program/project shall develop a preliminary WBS and accompanying dictionary.

8.2 During program/project implementation, each program/project shall develop a final WBS and accompanying dictionary.

8.3 Programs/projects shall ensure the WBS and WBS dictionary are developed in accordance with the templates for the standard Level 2 element names and content descriptions found in NPR 7120.5, Appendices G and H. The NASA WBS Handbook contains additional guidance which programs/projects may use to establish the WBS and accompanying dictionary.

> *Note: NASA/SP-2010-3404 is available at https://nen.nasa.gov/web/pm/evm, under the Document Repository folder, in the EVM Reference Guides sub-folder.*

8.4 Programs/projects shall develop the WBS and WBS dictionary to the level necessary to implement and verify the work.

8.5 Each program's/project's WBS and WBS dictionary shall be approved by OSAC, for structure and completeness at WBS level 2, and by the MSFC OCFO at WBS level 1, for assignment of WBS numbers.

> *Note: Any conflicts will be resolved at the MSFC CMC, and by implementing NASA/SP-2010-3404.*

CHAPTER 9. HERITAGE HARDWARE AND SOFTWARE

9.1 During formulation, programs/projects shall perform a complete review of all heritage hardware or software considered for use in an application or architecture different from its original design.

Note: This review by subject matter experts includes, but is not limited to, the differences in qualification levels, testing, verifications/validations, past deviations and waivers, certifications, etc.

9.2 During program/project formulation, programs/projects shall perform a cost-versus-benefit analysis prior to baselining any heritage designs, hardware, software or ground support equipment in any new application or architecture.

Note: This analysis should include engineering, risks, and LCC. Programs/projects should consider the acceptance of programmatic risk by developing new designs only if the cost/benefit analysis clearly favors such an approach over use of heritage designs.

CHAPTER 10. ACQUISITION AND MAKE-OR-BUY

10.1 In order to maintain Center technical expertise and core capabilities, programs/projects shall evaluate (and consider using) Center technical capabilities to perform in-house and in-line work (such as analytical tasks or hardware/software design and delivery).

10.2 Programs/projects shall document "make-or-buy" decision analyses at all WBS levels when the expected value of the product or service is expected to exceed $5 million.

Note: An Analysis of Alternatives methodology should be used, to compare cost versus effectiveness at satisfying mission requirements, while also maintaining critical skills and capabilities to enhance the Center's long term competitiveness, for the various "make-or-buy" decisions.

10.2.1 The "make-or-buy" analyses shall identify the planned in-house work along with the planned acquisitions (including the relative breakout of labor and scope responsibilities for each), and include a statement describing benefits to the Center, and a justification for any out-of-house work that could be performed in-house.

10.2.2 The decision of in-house and contracted work shall be reflected in the program/project's SEMP, and conveyed to the contractor (through the Request for Proposal (RFP)), to include the scope of responsibilities for the NASA portion of the technical work.

10.2.3 The resulting contractor SEMP (produced by the contractor in response to the RFP) shall acknowledge and define the working relationships and interfaces for the contractor side of the interface.

10.3 Programs/projects shall prepare both a preliminary and a final acquisition plan per NPR 7120.5, Appendices G and H.

Note: The final plan identifies the major/critical procurements that will utilize the Acquisition Risk Management (ARM) process for identification of potential issues needing special attention. The program/project acquisition team obtains input from MSFC organizations in areas of SMA, health, environmental protection, IT, export control, and security.

10.4 Early in formulation, programs/projects shall prepare a list of long lead items to be procured in Phase B.

10.4.1 The Program/Project Manager (or designee) shall approve the list of the program's/project's long-lead items to be procured in Phase B.

10.5 Early in the acquisition planning process, programs/projects shall inform industry and other partners of possible science, technology, and engineering opportunities.

10.6 Programs/projects shall prepare procurement requirements packages.

Note: These packages should include, as applicable, statement of work (SOW), delivery schedule or period of performance, specification(s), expectations for Government insight/oversight, and planned oversight of the contract Data Requirements List (DRL).

10.7 Programs/projects shall flow relevant MSFC requirements to contractors through the contracting process, and negotiate any known deviations prior to contract execution.

10.8 Procurement documents involving common buys of flight hardware shall be reviewed by all necessary program/project managers and SMA managers prior to RFP issuance.

10.9 In-house procurements of flight, critical ground systems, and other critical item products and services shall be from approved sources.

Note: Flight includes all designated flight items as well as flight-like items with the potential for upgrade to flight status. QD-QA-031 contains the Center process for approving suppliers.

CHAPTER 11. GOVERNMENT INSIGHT AND OVERSIGHT

Insight is the Government's access to a supplier's practices, processes, and products for the purpose of understanding and assessing their sufficiency. Oversight is the Government's formal review and documentation of concurrence/non-concurrence with a supplier's products/activities. Program/Project Managers determine an insight/oversight model based on a myriad of factors including crew safety, mission success criteria, hardware criticality, cost, schedule, and all categories of risk.

11.1 Programs/projects shall establish a management model for insight and oversight (refer to Table 11.1-1 for definition of standard penetration levels).

Standard Penetration Levels for Insight and Oversight
Level 0 - No Penetration
• Accept performing organization's tasks at face value (based on assessment that no penetration is required) • Contractor develops and implements verification plan
Level 1 - Low Penetration
• Participate in reviews and Technical Interchange Meetings and assessonly the data presented • Perform periodic audits on pre-defined process(es) • Chair board or serve as board member, or RID writer, at a formal review • Participate in resolution and closure of issues • Review verification plan and its implementation
Level 2 - Intermediate Penetration
• Includes low penetration with addition of: • Daily or weekly involvement to identify and resolve issues • Review verification plan, its implementation, and selected verification closure data
Level 3 - In-depth Penetration

• Includes intermediate penetration with addition of:
  • Methodical review of details
  • Independent models to check and compare vendor data, as required
• Review verification plan, implementation, and concur in all verification closure data

Level 4 - Total Penetration
• Perform a complete and independent evaluation of each task • Independent review of all verification documentation (including closure data) and witness verification testing

Table 11.1-1 Standard Penetration Levels for Insight and Oversight

11.1.1 The program/project management team, including program/project manager, implementing chief engineer, and CSO shall hold deliberations to determine the insight/oversight model and plan.

11.1.2 The Center Director shall assist in determination of the insight level for the program/project management model for insight and oversight.

Note: These deliberations will also aid the program/project management team in contract negotiations. Examples of past models are: (1) Traditional where there is heavy Government involvement in most aspects of a project; (2) Core Team where subject matter experts are assigned to key roles and direct the efforts of a support team (the core team becomes the primary interface with suppliers); and (3) Hybrid where the Government and a supplier are in a partnership and produce products jointly, with clearly outlined accountability and responsibility.

11.2 In the solicitations (i.e., RFPs), programs/projects shall provide clear written expectations on how the Government will conduct insight and oversight on the supplier's design and products, including sufficient detail of the approach to insight and oversight in order for the supplier to perform an assessment on safety, cost, schedule, and technical risks.

Note: Programs/projects will use this information to determine the Government's extent and depth of insight and oversight activities.

11.3 Prior to contractor negotiations, the program/project, Engineering and SMA shall conduct a risk assessment of the selected supplier based on proposal input and NASA experience.

Note: This risk assessment will be used as a basis for the initial insight model and plan.

11.4 Programs/projects shall include contractual language in the SOW that enables contractor-to-NASA interaction and includes access by the Government to the supplier's tools, documents, standards, processes, and procedures.

Note: Program/project, Engineering, and SMA management should maximize the use and accessibility of supplier's (primes and subs) native format data. The programs/projects management model will include how the insight and oversight team will engage the supplier and how the teams will interact and make decisions.

11.5 Throughout the program/project life-cycle, the program/project management team shall routinely assess the effectiveness of the insight and oversight management model(s).

Note: The program/project may utilize multiple "insight teams" that ultimately report to the Program/Project Manager via the implementing chief engineer or CSO. These insight teams can be formed for a system, subsystem, or component level depending on the nature and risk of the design. (For example, a liquid rocket engine project may deploy an insight team for high risk components such as new turbo machinery.)

11.6 The program/project management team shall assign insight and oversight leadership responsibilities.

Note: Programs/projects require that Government insight and oversight leaders and their supplier counterparts hold initial and periodic joint roles and responsibility meetings with their teams to ensure understanding of the intent and details of the formal DRDs.

11.7 Task Agreements for the Government's insight/oversight scope of work shall be developed in accordance with Chapter 13.

CHAPTER 12. TECHNICAL BASELINE CONTROL

12.1 Prior to the control by a control board structure, the implementing chief engineer shall initially approve and issue technical documents.

12.2 Subsequently, the technical documents shall be formally controlled through a program/project control board structure.

Note: For requirements 12.1 and 12.2, the objective is to place the documentation under the implementing chief engineer's change control for use prior to formal baselining.

12.3 Prior to baselining, Engineering shall maintain version control and track the applicability of draft versions of technical documentation used by the various technical disciplines.

Note: For example, Engineering must track which draft analysis applies to what version of the draft design.

CHAPTER 13. TASK AGREEMENTS

A task agreement describes the scope of work for products or services to be delivered by the Government, including the costs, required schedule, ground-rules and assumptions.

13.1 Program/Project Managers shall specify the format and content required in the program/project's task agreements.

13.2 Programs/Projects shall document formal agreements between Program/Project Managers and the product or service provider organizations using task agreements.

13.3 Task agreements shall be baselined by program/project control boards.

13.4 All proposed changes to task agreements involving revisions to cost, schedule, deliverables, workforce levels, or any other substantive modification, shall be processed through the program/project control board for review of impacts and final approval.

13.5 Resource requirements from task agreements shall be included in the Center resource planning activity.

13.6 MSFC support tasks not identified in task agreements shall be negotiated through the Center resource planning activity.

CHAPTER 14. SYSTEMS ENGINEERING AND INTEGRATION

Systems Engineering and Integration (SE&I) is performed at each level of the program/project architecture (system, subsystem, or component, etc.). The Engineering product and service provider team implements the SE&I processes to establish concepts, requirements, and interfaces, analyze design solutions, integrate solutions, and verify/validate products.

14.1 SE&I shall be implemented by Engineering and function as a unique discipline with membership on the CECB, if a separate CECB is established by the program/project.

14.1.1 For those projects that do not establish a separate CECB, the SE&I function is covered by the implementing Chief Engineer's participation on the program/project CCB.

14.2 SE&I shall evaluate all project decision or change packages for cross-discipline and cross-hardware impacts.

14.3 As part of the CM process, SE&I shall ensure that all affected organizations have evaluated the change package for impacts with respect to their discipline responsibility.

> *Note: Engineering and SMA discipline organizations are examples of organizations that review/evaluate a change package. The decision package includes potential impacts to other disciplines or impacts across hardware or software interfaces.*

14.4 SE&I system design responsibility shall include functional analysis, design synthesis, and interface design where the functional and physical interface crosses Engineering organizational design responsibility, such as propellant tank-to-feed system.

> *Note: Interfaces within the same design organization will not require an Interface Control Document (ICD).*

14.5 In cases where system interfaces cross element responsibilities, such as Engine-to-Stage, SE&I shall develop and control the interface definition and design through Interface Requirement Documents and ICDs.

14.6 ICDs shall contain the authoritative interface design basis for all requirements verification activities that involve the interface.

14.7 The LDE shall be responsible for the technical adequacy and verification of each program/project-level technical requirement within his/her discipline area.

14.8 The LDE shall ensure that the requirement and its verification compliance are approved by all affected Engineering and SMA disciplines and the program/project implementing chief engineer.

14.9 MSFC programs/projects shall document the CM and DM implementation approaches for each control board in the Program/Project Plan or a stand-alone plan.

14.10 Programs/projects execute SE&I using MSFC processes as documented in MPR 7123.1 and associated handbooks, guidance, and best practices documentation.

CHAPTER 15. SAFETY AND MISSION ASSURANCE

To assure safety and mission success, risks are identified and mitigated throughout the Program's life-cycle, beginning at concept development and continuing through disposal or decommissioning. SMA provides critical in-line and assurance services across the disciplines of systems safety, probabilistic risk assessment, reliability, maintainability, quality engineering, quality assurance, software safety, software reliability, software assurance, and industrial safety. In addition to the SMA discipline support and development of SMA analyses, SMA will support the Program/Project Manager on the development of applicable SMA programmatic and technical requirements, the development of Safety, Reliability, and Quality Plans (or one inclusive SMA Plan), and the mishap planning activities. NPD 8700.1 contains requirements for programs/projects (in conjunction with SMA) to establish the SMA requirements for the program/project, to work with SMA to execute SMA activities within the program/project and to ensure SMA approval or concurrence in program/project risk acceptance decisions.

15.1 For in-house activities, programs/projects shall ensure that SMA performs the SMA assurance analyses.

> *Note: These analyses include, but are not limited to, Hazard Analysis, Failure Modes and Effects Analysis/Critical Items List, and Probabilistic Risk Assessment.*

15.2 For in-house activities, Engineering shall work with SMA to identify the derived requirements, risk mitigations, inspections and hazard controls to be incorporated into verification plans and work authorizing documents used in manufacturing, assembly, and tests.

15.3 Programs/projects shall ensure that a CSO is named by SMA.

> *Note: The CSO serves as the SMA Technical Authority and SMA community's primary interface to the Programmatic Authority (program/project Manager) and Engineering Technical Authority (implementing chief engineer) and as the functional leader of all assurance activities for a program/project. Reference MCP 8070.2 for further information on Technical Authority.*

15.4 Programs/projects shall ensure that the CSO is represented on program/project decision-making boards and any other forums or processes which may be associated with risk acceptance.

15.5 For critical in-house activities, programs/projects shall ensure that the SMA assurance functions are implemented so that products and services are compliant with applicable requirements.

15.6 For prime-contracted activities, programs/projects shall ensure that SMA defined assurance functions (via the insight and oversight processes) are performed to assure that products and services are compliant with applicable requirements.

Note: SMA insight/oversight may require establishment of resident management offices at prime contractor/key supplier facilities.

15.7 For Category 1 projects/programs, the System Safety Technical Plan shall have the concurrence of the cognizant SMA managers. Concurrence may be obtained by presenting the plan to the SMAC.

CHAPTER 16. RISK MANAGEMENT

The Risk Management process consists of the following: identification of risk contributors, analyses to estimate probability and consequences, planning of risk mitigation, tracking to performance measures, controlling risk through adjustments to plans and control measures, communication of Risk Management activity, and documentation throughout the process. Risk Management includes two complementary processes: Risk Informed Decision Making (RIDM) and Continuous Risk Management (CRM). Both of these are essential to the management of MSFC's assets and programs. MWI 7120.6 contains requirements for programs/projects to develop a risk management process that includes RIDM and CRM, document it in a Risk Management Plan, and designate a Risk Manager to facilitate the implementation of the risk management process.

Note: Refer to MPR 7123.1 for additional information pertaining to technical risk management requirements and MSFC-HDBK-3173 for technical risk management guidance.

16.1 Risk shall be evaluated on a 5x5 matrix of likelihood and consequence.

16.1.1 The Program/Project Manager, the implementing Chief Engineer, and the CSO, shall have the authority to make the determination on risk items to be entered in the system and to adjust the likelihood and consequence levels.

16.2 Programs/Projects shall assign a risk owner for each risk item for as long as the risk item remains open.

Note: A risk owner assists the program/project management team by facilitating the necessary tasks that will enable the risk disposition. The responsibilities include monitoring and assessing any changes that may increase the likelihood or consequence of the risk and reporting to the program/project implementing chief engineer. The risk originator is not necessarily the responsible person assigned to track and mitigate the risk.

16.3 A risk owner shall present the following information (in addition to the 5x5 assessment) to the CECB and/or Project CCB: the tasks, funding, and schedule required to mitigate the risk and the impacts of not mitigating (technical, cost, schedule, safety).

Note: Depending on the program/project, the program/project management team may choose to hold periodic risk reviews as a part of the CECB or program/project CCB or to have a separate risk review meeting. In all cases, proper documentation of decisions is required as a part of the risk management process.

16.4 Program/Project implementing chief engineer shall make a decision (if within the designated level of authority) or a recommendation to the Program/Project Manager to: (1) mitigate the risk; (2) accept the risk; (3) watch the risk; (4) research the risk; or (5) close the risk.

Note: When a risk item has a potential impact that is broader than the scope (and/or authority) of the program/project, the risk should be elevated to the next level of management for disposition. For example, a project risk that has a potential impact to the program should be elevated to the program for disposition. Dissenting opinions on risk decisions may be processed through the dissenting opinion process for resolution.

16.4.1 If risk mitigation requires adding scope to the project, the project's cost, schedule and technical baseline, as well as project margins/UFE shall be updated to reflect this mitigation.

16.5 Programs/Projects shall present top risk item(s) to the CMC as determined by the Program/Project Manager.

CHAPTER 17. MARGIN AND RESOURCE MANAGEMENT

Cost, schedule, and design margins are established as risk mitigation resources against future technical performance requirements. Programs and projects maintain programmatic and technical margins in order to provide an ability to accommodate the inevitable variances from planned outcomes. Resources are to be managed to meet performance requirements within cost/ affordability, schedule, and risk boundaries. Scope margin is one of the resources available to the program/project for risk mitigation (i.e., cost-performance-risk trade space). Scope margin, like other margins can be traded against risk, except that movement within this space requires sponsor approval.

17.1 Programs/Projects shall develop sponsor or program de-scope plans, which are included in the preliminary and final versions of the Program/Project Plan.

Note: Programs/Projects present the de-scope plans at Mission Definition Review (MDR) SDR and Preliminary Design Review (PDR).

17.2 Programs/Projects shall report to the sponsor any shortfall against the Agency requirements baseline established at the time of KDP-C and identify option(s), with associated impacts, by which the baseline performance could be re-established through margin reduction.

17.3 Programs/Projects shall determine, track, and actively manage technical, cost and schedule margins throughout the life-cycle of the program/project.

Note: Reference MPR 7123.1 for additional details on technical performance margins.

17.4 Programs/Projects shall assess and report margins periodically and at major milestone reviews.

17.5 Programs/Projects shall develop margin corrective action and mitigation plans when necessary.

17.6 The program/project manager shall provide estimates of UFE, or cost margin, to the Decision Authority.

Note: UFE is the portion of cost required to meet a specified confidence level. It includes probabilistic risks that are unknown at the time that the Decision Memorandum is agreed upon, and represent costs that are expected to be incurred but cannot yet be allocated to a specific WBS sub-element of a program or project's plan. The term "reserves" is obsolete.

17.7 The program/project manager shall control that portion of the UFE, or cost margin, assigned to the program/project by the Decision Authority in the Decision Memorandum.

17.8 During program/project formulation and implementation, programs/projects shall document the planned cost and schedule margin at life-cycle key milestones.

17.9 Programs/Projects shall assess their planned cost and schedule margins against the standard cost and schedule margins (as shown in Tables 17-1 through 17-3) and present the results to the Center Director, or designee, for approval, prior to life-cycle key milestones.

Note: The Center Director, or designee, may choose to approve as presented, disapprove and require rework in order to proceed, or impose any additional risk mitigation actions that are determined necessary.

Schedule Milestone	Prior to SDR	SDR	PDR	CDR	Start of System Assembly, Integration and Test (AIT)	Start of Launch Ops
Standard Cost Margins	30%	25%	20%	20%	10%	5%
Planned Cost Margins						

Table 17-1 Standard Cost Margins for Launch Vehicle Program/Projects

Schedule Milestone	Prior to SDR	SDR	PDR	CDR	Start of System AIT	Start of Launch Ops	Start of Phase E	Extended Mission
Standard Cost Margins	30%	30%	25%	20%	20%	10%	15%	5%
Planned Cost Margins								

Table 17-2 Standard Cost Margins for Flight Systems/Spacecraft/Instrument/Experiment Programs/Projects

Notes for Tables 17-1 and 17-2:
1. The percentages represent cost margins at each milestone based on "Cost-To-Go," not total life-cycle budget.
2. During development Cost-to-Go is the total cost from that point forward until the end of Phase D. It includes the funded schedule margin, but excludes the launch vehicle costs (for Flight Systems/Spacecraft/Instrument/Experiment). During Phase E, Cost-to-Go is the total operations costs from that point forward.
3. Cost margins more than those specified may be appropriate in certain cases. For example, where development of low Technology Readiness Level (TRL) enabling technology is necessary, or where de-scope options represent significant mission degradation, or where the other margins
(schedule or technical) used to manage risk are at the lower limits of their acceptable ranges.
4. Developments, if any, deferred to phase E, require appropriate cost margins separate from that identified in Table 17-2 for mission operations.
*5. Cost Margin = (Unencumbered UFE/Estimated Cost-to-Go) * 100%*
6. Total Budget Remaining = Estimated Cost-to-Go + Unencumbered UFE
7. Total Budget at PDR/KDP C is required to meet 70% Confidence levels forecast (see NPR 7120.5, 2.4.4).

Schedule Milestone	Start of Implementation to CDR	CDR to start of System AIT	Start of system AIT to turn over to Launch Ops	Start of Launch Ops to Launch
Standard Schedule Margin Rate	1 month/year	2 months/year	2.5 months/year	1 week/month (2.8 months/year)
Planned Schedule Margin Rate				

Table 17-3 Standard Schedule Margins for all Programs/Projects

Notes for Table 17-3:
1. Schedule margins less than those specified may be appropriate in certain cases. For example, developments with a high degree of directly relevant heritage hardware/software, or where the impact of missing the delivery milestone is tolerable. The specified schedule margins assume impacts resulting from launch delay and late instrument/payload delivery are significant.
2. Schedule margins greater than those specified may be appropriate in certain cases. For example, where the development of low TRL enabling technology is in series with delivery, or where cryogenic system testing is required before delivery.
3. Schedule Margin = No planned activities, but funded schedule
4. Total Schedule = Planned activities + Schedule Margin
5. Schedule Margin Rate = Schedule Margin/(Planned Activity + Schedule Margin)

CHAPTER 18. TRADE STUDIES

18.1 Program/project budgets shall include adequate resources to perform design trades as an integral part of the system design process.

18.2 As the system design matures, all design decisions shall be assessed for impacts, as a minimum, using the following Figures of Merit (FOM):

a. Cost (Design, Development, Test & Evaluation and Operations)

b. Safety

c. System performance (as determined by requirements or resource allocations)

d. Development schedule

e. Operations timeline

f. Risk

18.3 The design organization that has lead or insight responsibility for the specific design shall ensure that FOM impacts are identified by working with the necessary disciplines.

18.4 When a trade study is identified, a trade recommendation package shall be developed by a trade study team.

18.5 All impacted Engineering and SMA organizations, shall assess trade recommendation packages prior to presentation to the CECB or Project CCB.

18.6 The trade study team shall present the trade recommendation package to the CECB or Project CCB for decision.

18.7 The trade decision shall be documented in the technical baseline and considered final unless otherwise directed by the CECB or Project CCB.

18.8 Proposed re-opening or initiation of trade studies shall require approval by the CECB or Project CCB and be justified in a decision package.

18.9 Acceptable justification to reopen a trade study shall be based on one of the following criteria:

a. The existing design has been found not to meet, or has a significant risk of not meeting, its requirements.

b. The requirements have changed.

CHAPTER 19. NEW TECHNOLOGY MANAGEMENT

The use of unproven technologies in development programs introduces additional risk due to the potential for the technology not to perform as expected as it matures to a relevant demonstration. TD is distinct from engineering development on a program/project in that the capability is sufficiently unproven to require special attention, and is distinguished from engineering by the nature and degree of risk remaining to be retired prior to flight.

19.1 The scope of this section includes the following capabilities that are considered to be TD:

a. Any design option that has not been flight qualified or has evidence of questionable flight performance.

b. Any flight qualified option that is being deployed in an environment or manner with no relevant successful flight history.

19.2 Programs/projects shall determine when new technology is sufficiently mature so that it no longer requires special consideration as a technology subject to the requirements of this section.

> *Note: The Government's risk analysis/assessment of new technology considers demonstrated reliability of existing/similar designs, Technology Readiness level (TRL), past performance, and current experience.*

19.3 New technologies shall not be used unless the benefit is assessed to be worth the risk over mature technology solutions.

19.4 New technology management shall be integrated with the program/project risk management and trade study requirements.

19.5 As part of risk identification, the program/project shall identify any new technologies that are required in the initial system technical baseline configuration.

19.6 As the configuration matures throughout the development process, all design decisions shall be assessed for any additional risk that is introduced into the system, including technology maturation/integration risks.

19.7 Agency New Technology requirements shall be addressed by reporting the risks and mitigation activities driven by maturing new technologies.

CHAPTER 20. MODELS AND SIMULATIONS

The phrase "Models and Simulations (M&S)," as used in this chapter, refers to Computational models and simulations. Computational M&S used to support MSFC decision-making organizations and processes will be assessed to determine acceptability for the specific use and subsequent credibility of the produced results. The extent of these assessments are to be determined by the criticality of the results, the risk of using incorrect results, the degree to which the results influence a decision, and/or the availability of resources to execute the assessment activities. The formality of documentation is based on the degree of risk associated with use of the M&S. The extent of supporting evidence required is correlated to the level of risk associated with use of the M&S results. M&S relates to the input data and databases that underlie the M&S, the environments in which the M&S are contained, and to federations of M&S created for specific purposes.

20.1 M&S Producers and Users shall jointly categorize M&S.

Note: Level of categorization is based on the criticality or degree of risk associated with the use of the M&S. The extent of acceptability and credibility assessments will correlate with the level of categorization.

20.1.1 Categorization shall be consistent with software classifications as described in NPR 7150.2, Appendix D.

20.1.2 M&S required to perform qualification of flight software or flight equipment, or used to make a decision (the consequence of which impacts human safety or program/project-defined mission success criteria if the decision proves incorrect, and whose degree of influence in the decision is moderate, significant, or controlling, per NASA-STD-7009 Appendix A.2), shall be classified as Critical M&S.

Note: The implementing chief engineer makes the decision on classification of M&S as Critical for a particular program/project usage. The implementing chief engineer is the primary User for all decisions related to the usage of Critical M&S on a particular program/project.

20.2 M&S Producers and Users shall jointly define M&S acceptability criteria for intended use.

20.2.1 At a minimum, M&S shall comply with requirements indicated in NPR 7150.2, Appendix C, for the categorization assigned in 20.1.1.

20.3 M&S Producers and Users shall jointly determine credibility criteria of M&S results.

20.3.1 Critical M&S shall comply with NASA-STD-7009.

20.4 M&S Producers and Users shall jointly determine CM and DM requirements for M&S and M&S results.

20.5 M&S Producers shall provide indicated developmental and/or operational artifacts for accreditation and/or credibility assessments.

20.6 M&S Users shall assess/approve acceptability for use of M&S for the intended use.

20.6.1 Critical M&S shall be formally accredited for their intended use.

Note: Refer to VJ-NASA08-RP005.

20.7 M&S Users shall assess/approve adequacy of M&S results for credibility.

CHAPTER 21. REVIEWS

21.1 Programs/projects implement the technical review requirements contained in MPR 7123.1 and the following additional requirements.

21.1.1 The reviews shall include cost, schedule, risk, and technical data.

21.1.2 For all MSFC programs and for projects with LCC greater than $250 million, the MSFC Program/Project Manager shall include SRB participation in the following reviews; SRR, SDR/MDR, PDR, CDR, System Integration Review (SIR), Operations Readiness Review (ORR), and Program Implementation Review (PIR).

Note: See SRB Handbook.

21.1.2.1 For MSFC projects with LCC less than $250 million, the requirement for independent assessment may be met with participation of an Independent Review Team (if determined necessary as described in section 5.5.2) or with participation of independent reviewers, Engineering/SMA technical authorities and management, as part of the normal project technical review process (as described in 5.5.3.5).

21.2 Programs/projects shall ensure adequate resources to support externally-initiated reviews, including, but not limited to, the following:

a. Program/project independent LCRs, including support to the governing PMC and Decision Authority at KDPs in the project life-cycle.

b. Audit of compliance with MSFC's applicable requirements and principles for space flight projects.

c. MSFC assessment of progress in dispositioning risks in preparation for launch.

d. MSFC assessment of project-specific significant risks.

e. MSFC oversight at key milestones in the life-cycle of project commitments to the sponsor.

21.2.1 The Center Director shall validate launch readiness for assigned programs/projects.

21.3 Programs/projects in collaboration with line organizations shall conduct periodic management reviews of in-house and contracted activities to assess technical, cost, and schedule performance.

21.4 Line organizations shall conduct peer reviews periodically as part of the design process.

21.5 The Review Plan shall be reviewed and concurred with by the MSFC Chief Engineer's Office, but the program/project Delegated Governing Authority (DGA) has final approval.

21.6 The program/project implementing chief engineer and the CSO shall assign mandatory reviewer organizations from Engineering, and SMA, as required to support LCRs.

21.7 Mandatory review organizations shall review all review items against the review entrance and success criteria that are affected by that organization's discipline responsibility.

21.8 Mandatory review organizations shall assign reviewers who were not involved in the development of the review item and did not review the item for release into the review.

21.8.1 In key areas of concern, independent reviewers shall be appointed by Engineering and SMA who are independent of the program/project advocacy chain, or from outside MSFC.

21.9 Mandatory reviewing organizations shall submit the following responses to the review:

a. A list of review items reviewed by the organization

b. Review discrepancies, if any, found by the organization

c. Concurrence sheet that the review, upon discrepancy resolution, meets each review entrance and success criterion with respect to the organizational discipline responsibility, or rationale to support a non-concurrence.

21.10 The Program/Project Manager shall establish a budget and acquisition mechanism for independent reviewers.

CHAPTER 22. EARNED VALUE MANAGEMENT

NPR 7120.5 requires programs/projects with life-cycle cost greater than $20 million to perform EVM during phase C and D (and for modifications/enhancements during phase E) with an EVM system that complies with the guidelines in American National Standards Institute (ANSI) Electronic Industries Alliance (EIA) ANSI/EIA-748.

Note 1: Use of NASA's EVM capability and processes will ensure compliance with the ANSI standard. This capability allows customization to match the individual needs of the program or project, while still meeting the ANSI/EIA-748 guidelines. NASA's EVM Capability Process documentation can be found on the Program and Project Management Community of Practice at https://nen.nasa.gov/web/pm/evm, under the Document Repository folder.

Note 2: The EVM Implementation Guide (2012 2 29), along with NASA/SP-2010-3403; and NASA/SP-2010-3404 are all available under the EVM Reference Guides sub-folder. These handbooks provide useful guidance and best practices for implementing the EVM, scheduling and WBS requirements in NPR 7120.5.

22.1 In-house design and development tasks with expected costs in excess of $20 million shall implement an EVM system that complies with the guidelines in ANSI/EIA-748.

Note: EVM provides one source of input for a Program's/Project's risk management process and supports internal replanning and reporting as necessary per MPR 7120.4. STD/MA-MSD specifies the requirements for applying EVM requirements to contracts.

22.2 For programs/projects requiring EVM (i.e. projects in phases C and D, and programs at the discretion of the MDAA, with a life-cycle cost greater than $20 million and Phase E project modifications, enhancements, or upgrades with an estimated development cost greater than $20 million), the program/project shall support the MD conducted pre-approval integrated baseline review as part of their preparations for KDP C to ensure that the program/project's work is properly linked with its cost, schedule, and risk and that the management processes are in place to conduct program/project-level EVM.

CHAPTER 23. MANAGING PRODUCT DATA THROUGHOUT THE LIFE-CYCLE

Throughout the program/project lifecycle, product data is the best indicator of the progress, status, and the achievements and failures of the product development effort. Product data includes, but is not limited to, engineering, design, test, procurement, manufacturing, operational, and logistics information. A disciplined and well-defined approach for developing and implementing a methodology to manage the product data from the early stages of product development will assure efficiency and effectiveness in data retrieval during the entire lifecycle of the program/project. Furthermore, to ensure the intended outcome, product data should be properly created, processed, accessed, managed, stored, and released throughout the entire product lifecycle. Therefore, an early and well-defined DM approach constitutes a key, contributing factor in providing efficient and effective access to the right data at the right time by the right people (i.e. project team, systems engineers, etc.) throughout the lifecycle.

23.1 The Center CIO provides tools/applications for programs/projects to use to manage their product related data. The tools currently available include the Enhanced Integrated Collaborative Environment (ICE-E) Windchill and SharePoint.

23.1.1 The ICE-E Windchill application provides engineering support services for Human Exploration and Operations Mission Directorate (HEOMD)-sponsored programs and projects. Other programs/projects interested in utilizing Windchill should contact MSFC OCIO. The services provided by Windchill include: DM, Configuration/ Change Management, Computer-Aided Design (CAD) Management and Visualization, and Collaboration Services. The ICE-E Windchill application houses data associated with the development and operations of spacecraft, launch vehicles, and launch operations. Associated data is consider to be subject to moderate security controls and constraints, for which ICE-E Windchill meets Federal requirements. ICE-E is maintained on a non-public facing network environment in the NASA Data Center at MSFC. All access requires two factor authentication of a NASA-approved identity.

23.1.2 MSFC's SharePoint Service provides a secure, cost-effective, and proven portal environment for collaboration, document management, and business process automation (i.e. workflows), within the program or project team. MSFC SharePoint is available to all MSFC programs and projects, with no charge for use. However, large capacity user sites may incur a cost based on storage and system impact.

> *Note: Contact MSFC OCIO, Agency Applications Office, for more information on these tools/applications that are currently available and for assistance with developing product DM, information architecture strategy, or other product data needs.*

23.2 The program/project may use Center provided tools, or they may use MD/Agency provided tools when such usage will save cost, satisfy stakeholder needs/objectives, or no Center tool/capability exists.

23.3 It is recommended that programs and projects should consider, and reflect within their program/project planning, the guidance contained in this chapter related to establishing a product

DM process early in the lifecycle, defining product and data architectures (DAs), and managing product definition, and other product related data.

Note: The planning should document program/project guidance for and describe the approach for developing the program/project DA and process architecture (PA) to support the product DM process. The planning should also describe how the program/project will use the Center tools/applications to establish data and process architectures while following requirements for implementation of the Security Architecture and associated ISSA.

23.3.1 It is recommended that program/project managers and their team study the generic PA and the guidance for developing a program/project specific DA, and determine how these will be used to develop the program/project approach for managing product data.

Note: Refer to MSFC-HDBK-3173 for additional guidance and generic PA.

23.4 The Program/Project Manager, should assess the planning at least annually; during concept development, design, fabrication, assembly, integration, and test, phases or, in preparation for program or project close out phase, at reviews associated with or preceding major KDPs; and, during operational phase, and at flight readiness KDPs.

23.5 The Program/Project Manager should include product data interoperability, availability, traceability, and sustainability requirements in all contracts and identify and acquire essential contractor-originated data with sufficient access and usage rights to support the full program/project life-cycle.

23.6 In the planning, the Program/Project Manager should address the following content:

a. State the specific objectives and high-level performance goals to be established for managing product data.

b. Describe the product DM strategy and approaches to achieve it.

c. Describe means to assure product data traceability, availability, adequate accessibility, and interoperability throughout the product lifecycle.

d. Summarize the specific solution(s) to be used for product DM, specifying use by product life-cycle and user community, and identifying approximate maturity levels.

e. Identify user communities and their physical locations, assignments, and primary responsibilities.

f. List any assumptions, limitations, and constraints affecting the product DM process.

g. Identify DA documents/models and summarize relevant content; identify DA requirements being imposed upon the solution elements to support data interoperability, data exchange, metadata, data traceability, data availability and accessibility, and work practices, including standardized taxonomies and ontologies.

Note: Reference MPR 1440.2 for additional requirements and guidance related to using metadata for locating and accessing records.

h. Describe process, architecture, and implementation steps including sub-processes and specific process support and the linkage to potential automated solution(s), such as, for engineering change control and release, DM, CM, requirements management with traceability to the product, and decision analysis needs, reviews, design and systems engineering, and operations/sustaining tasks. This should include monitoring of the following: performance and issues, data integrity processes, and data interoperability processes (both internally and externally to NASA).

i. Determine which tools are affordable and available, and specific applications within those tools to be used; map the tools to the user communities; and map the processes to the user communities and the tool(s); provide a single authoritative source (desirable) and access point; and a role-based search of information, providing robust search capabilities to users and integrated searches across disciplines.

j. Explain how the products contained in the WBS for the system end products, subsystems, and supporting or enabling products will be represented and how in-house and contractor data will be integrated into the different product breakdown data, such as bills of material, across the program life-cycle.

Note: Describe how product breakdown data will be used; how the approach will support multiple instances of product breakdown data being available simultaneously across product life-cycles and program/project milestones; how hardware/software elements of WBS will be linked to support program/project needs; define the WBS segment list, including design data for an assembly and/or sub-assembly such as as-designed, as-built or as-manufactured, as-manifested, as-flown, and as-disposed, beginning either at the highest level (system) or lowest level (component) to access all related data based on access privileges.

k. Include intended use of specialized data types (3-dimensional (D) CAD, 2-D CAD, models, simulations, or other specialized design tools and their proper participation in the product DM solution, describe which CAD tools will be used for what purposes, including contractors and partners, and how MSFC-STD-555 and MSFC-STD-3528 will be applied over the program's life-cycle, along with use of other internal or external standards, practices, settings, and supporting tools with responsible parties.

Note: Discuss how NASA-STD-7009 and other internal or external standards, practices, or program documents will be applied to product DM. Identify standards to be used for part identification; identify responsible parties and processes for addressing conflicts

and issues relative to CAD file naming, part identification, and reconciliation of issues arising from use of common hardware CAD files and integration of CAD files across Centers, program elements, contractors, and partners. Define policies for identifying the handling of models, simulations, and CAD designs that are proprietary, intellectual property, or designated as sensitive but unclassified. Identify the program/project data or documents that the CAD producer is to provide in addition to the CAD object to assure full product definition data such as parts lists, materials specifications, and acceptance testing specifications and where this material will be maintained.

l. Discuss existing process or modification to process for engineering release and delivery-of-items processes to support program/project needs and interoperability across Centers, program elements, contractors, and partners (as applicable); include solutions or requested modifications to provide visibility of the life-cycle, maturity, and change status of product definition data and other engineering models across the program/project life-cycle.

m. Identify the specific documents that address engineering release, change control, and CM and summarize their content, including contractor CM, as required by SAE/EIA-649, and SAE/EIA-649-2.

n. Describe which aspects of the solution will be used to manage the data and processes around close-out or buy-off of parts.

o. Identify specific documents that address product-related data, particularly product definition data, and summarize their content; define reports, analyses, data sets, models, simulations, and documents that will be generated for program management, troubleshooting, and problem resolution; define a set of authoritative requirements and data that represent the various stages of the products; describe product definition data delivery sources, processes, usage, and access rights.

Note: Concepts of operation, user scenarios, architecture models, data flow diagrams, system descriptions/specifications, and other material may be included to facilitate the understanding of the plans/solutions for product data and life-cycle management stated in the plan.

CHAPTER 24. GENERAL RESEARCH AND TECHNOLOGY PROGRAM/PROJECT MANAGEMENT REQUIREMENTS

24.1 Center Research and Technology (R&T) programs, projects, and activities will be planned and managed in accordance with the general requirements in this chapter and the applicable life-cycle requirements in Chapters 25-27.

24.2 R&T programs, projects, and activities shall be managed using Chapters 1-23 in lieu of Chapters 24-27, when:

24.2.1 The R&T is directly funded by a space flight program/project; and the space flight mission's success and schedule are directly tied to the success of the R&T, or

24.2.2 The R&T is a large scale (i.e., LCC greater than $250 million) development project.

24.3 Software engineering activities for R&T programs and projects shall be performed in accordance with NPR 7150.2,. This includes all software acquisition, development, maintenance, retirement, operations, and management of the software throughout the entire software life-cycle.

24.4 R&T programs, projects, and activities for which MSFC has management responsibility shall assess the seventeen systems engineering processes, as described in MPR 7123.1, to determine applicability of each process for their particular R&T program, project, or activity, complete the compliance matrix for those that are determined applicable, present the assessment and compliance results for approval by the Director, Engineering Directorate, and follow the requirements in MPR 7123.1 for those processes determined applicable.

Note: The Engineering Director will invoke the EMC as necessary. The processes' output DRD required by MPR 7123.1 are structured to indicate a) the Center requirements and b) the option to accept a contractor's document that meets or exceeds the DRD intent. Refer to MSFC-HDBK-3173 for detailed guidance on the seventeen systems engineering processes. The results of the EMC approved applicability assessment for the seventeen systems engineering processes are a required topic in the Formulation Review.

24.5 All R&T development efforts with TRL levels greater than 5 shall be managed as TD Projects.

Note: Refer to Appendix L for the system characteristics and criteria that define the standard TRL levels.

24.6 R&T Portfolio Projects shall be limited to TRL levels 1 through 5.

24.7 Research Practices and R&T Misconduct

24.7.1 NPR 1080.1, Requirements for the Conduct of NASA Research and Technology (R&T), provides requirements and standards for research practices which ensure the quality and acceptability (within the scientific community) of the research results.

Note: R&T misconduct means fabrication, falsification, or plagiarism in proposing, performing, or reviewing R&T, or in reporting R&T results. R&T misconduct does not include honest error or differences of opinion. For R&T that is sponsored or conducted by NASA, the accomplishing activity is responsible for compliance with NASA's R&T misconduct policy. (See NPR 1080.1, and 14 CFR, Part 1275.)

24.8 Anyone on the NASA team (including the Program and Project Leads) who receives allegations of R&T misconduct that may have occurred within or outside NASA (on NASA sponsored R&T) shall notify the NASA Inspector General and Center Management.

Note: The NASA Inspector General is responsible for R&T misconduct inquiries and investigations and for the preparation and submission of its findings and recommendations in a report to NASA. The cognizant MDAA or Mission Support Office Director (MSOD) is responsible for implementing any administrative actions that may result from adjudication of research misconduct. NASA's policies and procedures for handling these investigations are published in 14 CFR, Part 1275.

24.9 R&T Unsolicited Proposals

24.9.1 MWI 5115.1 contains the Center specific requirements for handling unsolicited proposals.

Note: Refer to 48 CFR, FAR, Subpart 15.6; Grant and Cooperative Agreement Manual (GCAM) (formerly NPR 5800.1), for additional detailed requirements and NPR 1080.1, for additional guidance on unsolicited proposals.

CHAPTER 25. Research and Technology PROGAM LIFE-CYCLE REQUIREMENTS

25.1 Research and Technology Program Life-Cycle

Research and Technology (R&T) programs for which MSFC has management responsibility shall follow the NASA life-cycle as shown in Figure 25-1.

Note: The content of Figure 3-1 is taken from NPR 7120.8 and included here for clarity/readability.

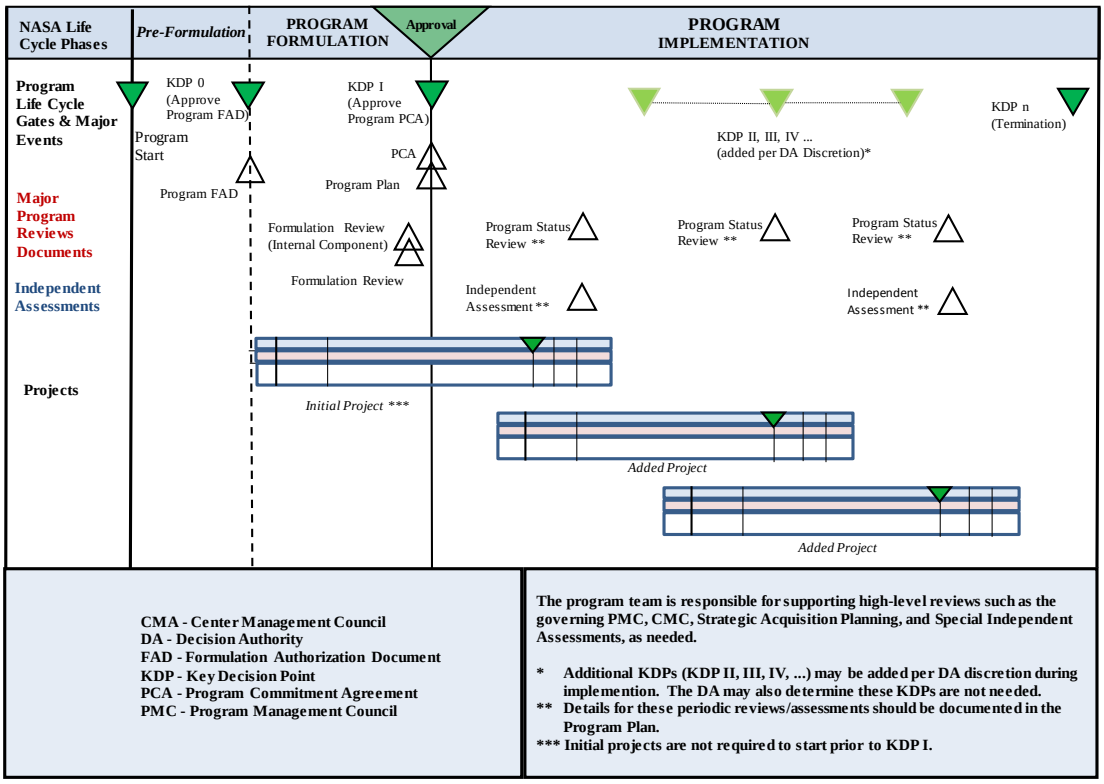


Figure 25-1 R&T Program Life-Cycle

25.1.1 The R&T Program Lead shall formulate and implement the R&T Program, including the minimum set of reviews, technical data, and planning specified in this chapter, assign TD Project Leads and R&T Portfolio Project Leads to manage their respective projects (in coordination with the applicable Center Directors), and manage any project formulation activities that are required while in the Program's Formulation Phase.

25.2 Reviews

The R&T Program Lead shall conduct reviews required by the governing PMC, the CMC, the Acquisition Strategy Planning (ASP) meeting, the Acquisition Strategy Meeting (ASM), the Procurement Strategy Meeting (PSM), and the Special Independent Assessments.

25.3 Governance

For R&T Programs, the governing PMC and the DA for each KDP shall be as defined in Table 25-1.

Note: The content of Table 25-*1 is based on content taken from NPR 7120.8 adapted here for specific applicability to MSFC.*

Authorities	**R&T Program**	**Comments**
Approving Official for Start and KDP 0	MDAA (or MSOD)	
Program Decision Authority (DA) (KDP I, II, III, ... n)	NASA Associate Administrator (AA)	While the R&T Program KDP I is the NASA AA's signature on the R&T Program Commitment Agreement (PCA), the MDAA or MSOD concurrently signs the R&T Program Plan for an R&T Program to continue into implementation. The NASA AA can delegate responsibility to the MDAA or MSO. Optional KDPs (KDP II, III, IV, ...) may be added per DA discretion during implementation. The DA may also determine these optional KDPs are not needed.
Selecting Official for Formulation	NASA AA	The NASA AA can delegate responsibility to the MDAA or MSOD for selection of the Formulation Review team.
Selecting Official for Independent Assessment Team(s)	MDAA (or MSOD)	The MDAA or MSOD can delegate responsibility for selection of independent assessment team(s). Selecting Official is responsible for development of the Term of Reference (ToR).
Governing PMC	Agency PMC	The Agency PMC can delegate oversight responsibility to the MD PMC or MSO equivalent.
Governing Document	R&T Program Plan	The R&T Program Plan is approved by the MDAA or MSOD. The MDAA, MSOD, or their delegated representative provides, in writing, a scope of the R&T Program to the Program Lead.

Table 25-1 Summary of Authorities for R&T Programs

25.3.1 R&T Programs shall produce the required technical data and planning as documented in Table 25-2.

R&T Program Technical and Planning (per NPR 7120.8 & MPR 7120.1)	Pre-Formulation	Formulation	Implementation			
	KDP 0	KDP I	KDP II	KDP III	KDP IV	KDP n
		FR	SR[2]	SR[2]	SR[2]	SR[2]
Formulation Authorization Documentation (FAD)	B/L[3]					
R&T Program Commitment Agreement (PCA)		B/L				
R&T Program Plan		B/L				
Interagency and International Agreements		B/L				
Gap Analysis (literature search)		B/L				
TOR		B/L				
Systems Engineering Applicability Assessment (EMC approval)		B/L				
Documentation (from subordinate projects) of performance against plan/baseline, including status/closure of formal actions from previous KDP.		SUM	SUM	SUM	SUM	SUM
Plans for work to be accomplished during next life cycle phase (from subordinate projects).		Plan	Plan	Plan	Plan	Plan

[1] The Cross-Program Research follows the R&T Program Milestone Technical Data and Planning, except that an R&T Program FAD, a
[2] R&T Program status reviews may be conducted as part of status reviews of subordinate projects.
[3] KDP 0 occurs when the MDAA or MSOD approves the R&T Program FAD. This approval authorizes the R&T Program to move
Black text - Agency required review/data, Red text = Agency guidance/best practice,
Green test = MSFC added required review data, Blue text = MSFC added guidance/best practice

Table 25-2 Required Technical Data and Planning for R&T Programs

Note: Table 25-2 includes data/planning required by NPR 7120.8 and those added by MSFC (shown in green). The following terms and definitions are used in Table 25-2. "Summary" (SUM) is applied to data that synthesize the results of work accomplished. "Plan" is applied to data that capture work that is planned to be performed in the following phases. "Baseline" (B/L) indicates putting the data under configuration control so that changes can be tracked, approved, and communicated to the team and any relevant stakeholders. The expectation on data 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 data that will eventually become part of the Program or Project Plan indicates that the data has the concurrence of stakeholders and is under configuration control. Updates to baselined data require the same formal approval process as the original baseline.

25.4 Research and Technology Program Pre-Formulation

25.4.1 The R&T Program Lead shall create the R&T Program FAD using the template provided in Appendix C of NPR 7120.8 as guidance.

Note: The R&T Program FAD is approved by the MDAA or MSOD with concurrence by the MSFC Center Director (or designee). The FAD may be implemented as an early version of the program plan, provided it contains all the specified information. For programs established through the Announcement of Opportunity (AO) process, the MDAA letter selecting a specific AO proposal serves as the FAD.

25.4.1.1 At a minimum, the R&T Program FAD shall:

a. Contain a statement of purpose for the proposed R&T Program and define its relationship to the Agency's vision and mission, as defined by NPD 1001.0 and its alignment with NASA and/or MSFC technology roadmaps.

b. Establish the scope of work to be accomplished to at least the project level prior to completion of the Pre-Formulation.

c. Provide initial constraints, including resources, schedule, and participating organizations within and external to NASA, including international partnerships.

d. Identify the Program Lead who will manage the Formulation effort.

e. Define the approach, resources, and reviews required to conduct R&T Program formulation and implementation.

25.5 Research and Technology Program Formulation

25.5.1 The Program Lead shall create the R&T PCA, using the template provided in Appendix D of NPR 7120.8 as guidance, and update it every two years (or as changes warrant).

Note: The R&T PCA is signed by the MDAA or MSOD and approved by the Program DA with concurrence by the MSFC Center Director.

25.5.1.1 As a minimum, an R&T PCA shall:

a. Define the broad R&T Program objectives and its relationship to the Agency's vision and mission, as defined by NPD 1001.0 and its alignment with NASA and/or MSFC technology roadmaps.

b. Summarize the technical performance metrics with goals and minimum thresholds needed to achieve the R&T Program objectives.

c. Identify the Program Lead who will manage the implementation effort.

d. Identify schedule, cost, safety, and risk factors.

e. Explain the involvement of R&T Program participants within and external to NASA, including international partnerships and a listing of the specific agreements to be concluded.

f. Specify the independent reviews that will be performed during the life-cycle of the R&T Program.

g. Define any optional KDPs (such as KDP II, III, IV) required by the Program DA during Implementation (the Program DA may determine that optional KDPs are not needed).

25.5.2 The Program Lead shall create the R&T Program Plan, using the template provided in Appendix E of NPR 7120.8 as guidance, update it every two years (or as required), and ensure it is consistent with the PCA.

Note: The R&T Program Plan is signed by the Program Lead and approved by the MDAA or MSOD with concurrence by the Center Director.

25.5.2.1 As a minimum, an R&T Program Plan shall:

a. Define the R&T Program goals and specific objectives with clear traceability to the Agency's vision and mission, as defined by NPD 1001.0 and alignment with NASA and/or MSFC technology roadmaps.

b. Identify the main customers/beneficiaries and stakeholders of the R&T Program and the stakeholder expectations and customer/beneficiary requirements/objectives.

c. Identify the projects under the R&T Program and identify whether they will be managed as TD Projects or R&T Portfolio Projects.

d. Briefly describe the architecture of the R&T Program and its major components.

e. Identify the Program Lead who will manage the implementation effort.

f. Document the R&T Program requirements/objectives, including performance requirements/ objectives, and technical success criteria, and the process by which project requirements/ objectives are verified and validated for compliance with the program requirements/objectives.

g. Provide an integrated master schedule of R&T Program activities and events covering the life of the R&T Program.

Note: NASA/SP-2010-3403 contains additional guidance and is available at s://nen.nasa.gov/web/pm/evm, under the Document Repository folder, in the EVM Reference Guides sub-folder.

h. Describe the process by which the R&T Program assures compliance with NASA policies and directives, as well as other applicable requirements.

i. Briefly describe the budget and acquisition approach to be applied at the R&T Program level toward each project.

j. Summarize the R&T Program's approach for implementing safety, mission assurance and risk management requirements and whether separate SMA and Risk Management Plans will be developed (see 25.5.3).

k. Identify the reviews that the R&T Program will conduct and the approach for the related projects, including Independent Assessments, R&T Program status reviews, and others in response to MDAA, MSOD, or governing PMC requirements.

l. Identify any optional KDPs (such as KDP II, III, IV) required by the Program DA during Implementation (the Program DA may determine that optional KDPs are not needed).

m. Identify those R&T Projects that have been designated as part of a Cross-Program Research.

n. Document the management responsibility and decision authority for those R&T projects that have been assigned to the Cross-Program Research.

Note: Further description of those R&T projects is documented in the Cross-Program Research Plan, not the R&T Program Plan.

o. Describe the process by which the R&T Program will assure project compliance with environmental requirements in accordance with NPR 8580.1 and MPR 8500.1, including results of the consultation with NASA HQ National Environmental Policy Act (NEPA) Coordinator to evaluate potential for program cost and schedule savings associated with NEPA strategies.

p. Summarize the systems engineering processes the program will utilize to develop and flow down R&T requirements/performance measures from the program to the projects, including (as a minimum) requirements definition, and verification/validation. Reference separate SEMP, if applicable.

25.5.3 If an R&T Program contains elements that include hardware used for flight (piloted or unpiloted), flight control software, wind tunnel testing, or systems that could result in potential harm to personnel or property, the Program Lead shall ensure that a SMA Plan and a Risk Management Plan exist that address the applicable hazards.

Note: In many cases, these plans are already established by Center and/or facility procedures for operations such as wind tunnel tests and flight testing and do not need to be developed by the R&T Program. These plans may be included as part of the R&T Program Plan, provided they contain the necessary information.

25.5.3.1 The SMA Plan shall identify and document program element-specific SMA roles, responsibilities, and relationships with appropriate HQ and/or Center- SMA organizations. The SMA Plan also addresses specific critical SMA disciplines, including system safety/hazard analysis per NPR 8715.3 and NPR 8705.2; quality assurance per NPD 8730.5; SMA compliance verification, audit, and reviews per NPR 8705.6; reliability and maintainability per NPD 8720.1; software safety and assurance per NASA-STD-8719.13 and NASA-STD-8739.8; parts and

material quality assurance per NPR 8735.1; contract quality assurance functions per NPR 8735.2; and other applicable NASA safety and mission success requirements.

Note: The plan should reflect the SMA role in areas such as: 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.

25.5.3.2 MWI 7120.6 contains the Center specific requirements for developing the Risk Management Plan.

25.5.3.3 Refer to NPR 8705.5 for the process and requirements for conducting probabilistic risk assessments.

25.6 Research and Technology Program Reviews During Formulation

25.6.1 Prior to KDP I, a FR shall be conducted to include the milestone technical data and planning maturity matrix requirements provided in Table 25-2.

Note: The FR has both an internal and external component. The internal component is an R&T Program review to ensure the R&T Program is ready to proceed to KDP I. The external component is an independent assessment and is performed under the direction of the selecting official identified in Table 25-1, or the selecting official may assign the IA to a separate organization. The selecting official for the FR team (see Table 25-1) is responsible for the development and approval of the ToR.

25.6.1.1 The Independent Assessment should be conducted together with the internal component as a single, integrated FR.

25.6.1.2 The FR shall consist of the following data:

a. The R&T Program Plan

b. The R&T PCA

c. SMA Plan, if required (see above)

d. Risk Management Plan, if required (see above)

e. Compliance to the environmental requirements in accordance with NPR 8580.1, and Executive Order 12114.

f. Results of the consultation with NASA HQ NEPA Coordinator to evaluate potential for program cost and schedule savings associated with NEPA strategies.

g. ToR

h. Stakeholder expectations and customer/beneficiary requirements/objectives.

i. Technical performance requirements, technical success criteria, technical performance measures, and how they will flow down from the program to the projects.

j. Process by which project requirements/objectives are verified and validated for compliance with the program requirements/objectives.

k. Results of EMC approved applicability assessment for the seventeen system engineering processes.

l. Integrated Master Schedule

m. Documentation (from subordinate projects) summarizing performance against baseline plan (for technical, schedule, and cost performance), including status/closure of formal actions from previous KDP, and plans for work to be accomplished during next life-cycle phase.

25.7 Research and Technology Program Implementation

25.7.1 During R&T Program Implementation, the Program Lead shall:

a. Update the R&T Program Plan, as appropriate.

b. Execute the R&T Program Plan.

c. Update all required interagency and international agreements, as appropriate.

d. Conduct planning, program-level systems engineering, and integration, as appropriate, to support the MD in initiating the project selection process.

e. Support the MDAA in the selection of projects, either assigned or through a competitive process.

f. Approve R&T Project FADs and TD/R&T Portfolio Project Plans.

g. Plan, prepare for, and support R&T Program status reviews, independent assessments, CMC and governing PMC reviews, as appropriate. Independent assessments will be conducted together with the Program Status Reviews, as a single integrated review. Program status reviews may be conducted as part of the status reviews of subordinate projects.

h. Provide oversight of the projects within the R&T Program and ensure that status of project performance (for technical, schedule, and cost performance) is reported periodically to the CMC in accordance with MPR 7120.4. Review documentation (from the subordinate projects)

summarizing performance against baseline plan (for technical, schedule, and cost performance), including status/closure of formal actions from previous KDP, and plans for work to be accomplished during next life-cycle phase, as well as documentation of progress towards the technical success criteria and technical performance measures (goals and minimum thresholds).

i. Review and approve annual project budget submission inputs and prepare annual R&T Program budget submissions.

j. Conduct R&T Program completion activities for each project in accordance with the project life-cycle.

k. Support any reviews, KDPs, or IAs required.

l. Perform any DA functions, as required or delegated by the DA.

25.7.2 The Program Lead shall document any optional KDPs (if determined necessary per Program DA's discretion) in the R&T PCA and R&T Program Plan.

> *Note: KDP n occurs when the Program DA authorizes an R&T Program to end. The Program DA should coordinate any recommendations of the MDAA or Mission Support Office Director (MSOD) and the Program Lead and Center Director. The decision of the Program DA to discontinue an R&T Program is documented in written form, including any recommendations relevant to existing contractual relationships, disposal of assets, manpower support, and timeframe of closure process.*

25.8 Cross-Program Research Management

The MDAA or MSOD may decide to collectively manage R&T Portfolio Projects taken from various Agency programs within the MD or MSO. This choice may be made when research is more efficiently solicited across program lines or a DA is needed who is independent from the Agency program in order to prevent the appearance of bias when a Center is competing for research activities that are under the purview of a Program Lead from that particular Center. Cross-Program Research is managed by a Research Director (typically at NASA HQ) and may be referenced elsewhere in Agency documentation as a "Research Program."

25.8.1 If the Research Director is assigned to MSFC, the MSFC Research Director shall create a Cross-Program Research Plan that encompasses all the R&T Portfolio Projects within his/her purview, using the template provided in Appendix F of NPR 7120.8 as guidance.

> *Note: The Cross-Program Research Plan is signed by the Research Director and approved by the MDAA or MSOD.*

25.8.2 As a minimum, a Cross-Program Research Plan shall:

a. Define the Cross-Program Research goals and specific objectives with clear traceability to the Agency's vision and mission, as defined by NPD 1001.0, and alignment with NASA and/or MSFC technology roadmaps.

b. Identify the main customers/beneficiaries and stakeholders of the Cross-Program research.

c. Briefly describe the management structure of the Cross-Program Research and associated Portfolio Projects.

d. Identify the Research Director who manages the Cross-Program Research.

e. Define the selection process for awarding R&T, including the Selection Official.

f. Document the Cross-Program Research requirements/objectives, including performance requirements/objectives, technical success criteria, and KPPs.

g. Provide a schedule of Cross-Program Research activities and events.

h. Describe the process by which the Cross-Program Research ensures compliance with NASA policies and directives, as well as other applicable requirements.

i. Briefly describe the budget and acquisition approach to be applied to the Cross-Program Research.

j. Define a process for determining openly competed, internally competed, and directed investments.

k. Summarize the risk management approach to be used for the Cross-Program Research.

l. Include information on the specific programs that are transferring R&T Portfolio Project management to the Research Director.

m. Describe the reviews that the Cross-Program Research will conduct, including FRs, peer reviews, and other independent assessments, in response to MDAA, MSOD, or governing PMC requirements.

n. Define any optional KDPs (such as KDP II, III, IV) required by the DA during Implementation or determine that these optional KDPs are not needed.

25.8.3 The Program Lead shall ensure the Program Plan reflects the delegation of R&T Portfolio Project management authority to the MSFC Research Director.

25.8.4 The MSFC Research Director shall ensure the Cross-Program Research Plan reflects the delegation of R&T Portfolio Project management authority from the Program Lead.

25.8.5 The MSFC Research Director shall use the R&T Program Requirements and the R&T Program Life-Cycle with changes specified in Table 25.8-1 as a guideline for managing Cross-Program Research.

Note: The content of Table 25.8-1 is taken from NPR 7120.8 and included here for clarity/readability.

Authorities	R&T Program	Cross-Program Research	Specific Exceptions for Cross-Program Research
Approving Official for Start and KDP 0	MDAA (or MSOD)	MDAA (or MSOD)	An R&T FAD is not required. KDP 0 occurs when the assignment of the Research Director is formally made.
Program Decision Authority (DA) (KDP I, II, III, ... n)	NASA Associate Administrator (AA) [1,2]	MDAA or MSOD[2]	An R&T PCA is not required. KDP I occurs when the MDAA or MSOD approves the Cross-Program Research Plan.
Selecting Official for Formulation Review Team	NASA AA [1]		A Formulation Review is not required.
Selecting Official for Independent Assessment Team(s)	MDAA or MSOD	MDAA or MSOD	
Governing PMC	Agency PMC [3]	MD PMC or MSO equivalent	
Governing Document	R&T Program Plan (NPR 7120.8, Appendix E)	Cross-Program Research Plan (NPR 7120.8, Appendix F)	

1The NASA AA can delegate responsibility to the MDAA or MSOD.
2Optional KDPs (KDP II, III, IV, etc.) may be added per DA discretion during implementation. The DA may also determine these optional KDPs are not needed.
3The Agency PMC can delegate oversight responsibility to the MD PMC or MSO equivalent.

The Program, Project, and Cross-Program Research Plans should reflect modifications due to the comments above and document the attendant rationale for the change. The MDAA or MSOD is responsible to the Program DA and Agency PMC for the entire Program regardless of any Cross-Program Research agreement. The Program Lead, and the Research Director if there is a Cross-Program Research agreement, are responsible to the MDAA or MSOD. The Research Director supports the MDAA or MSOD with any necessary reviews or requirements placed upon the program by the Program DA and Agency PMC.

Table 25.8-1 Cross-Program Research

CHAPTER 26. TECHNOLOGY DEVELOMENT PROJECT LIFE-CYLE REQUIREMENTS

26.1 Technology Development Project Life-Cycle

Technology Development (TD) projects for which MSFC has management responsibility shall follow the TD Project life-cycle as shown in Figure 26-1.

Note: The content of Figure 26-1 is based on content taken from NPR 7120.8 adapted here for specific applicability to MSFC.

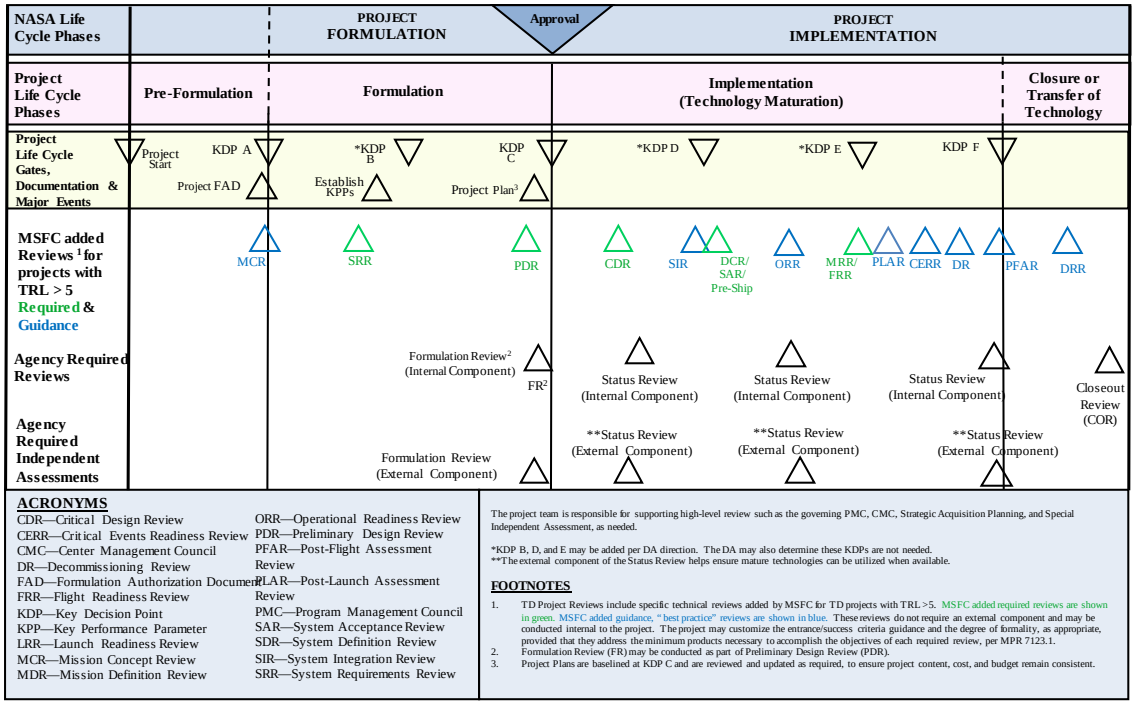


Figure 26-1 TD Project Life-Cycle

26.1.1 TD Project Lead shall formulate and implement the TD Project, including the minimum set of reviews, technical data and planning specified in this chapter.

26.2 Reviews

The TD Project Lead shall support reviews required by the governing PMC, the CMC, the ASP meeting, the ASM, the PSM, and Special Independent Assessments.

26.3 Governance

For TD Projects, the governing PMC and the DA for each KDP shall be as defined in Table 26-1.

Note: The content of Table 26-1 is based on content taken from NPR 7120.8 adapted here for specific applicability to MSFC.

Authorities	Technology Development Project	Comments
Approving Official for Start	MDAA (or MSOD)	The MDAA or MSOD can delegate responsibility to the Program Lead or Research Director.
Project Decision Authority (DA) (KDP A-F)	MDAA (or MSOD)	The MDAA or MSOD can delegate responsibility to the Program Lead or Research Director.
Selecting Official for Independent Assessment And Formulation Review Team(s)	MDAA (or MSOD)	The MDAA or MSOD can delegate responsibility to the Program Lead. Selecting Official is responsible for development of Terms of Reference (ToR).
Governing PMC	MD PMC or MSO Equivalent	
Governing Document	TD Project Plan	The TD Project Plans are approved by the Project DA with concurrence by the Program Lead and applicable Center Director(s) (CD).

Table 26-1 Summary of Authorities for TD Projects

26.3.1 TD Projects shall produce the required technical data and planning as documented in Table 26-2.

Note: Table 26-2 includes technical data, planning, and reviews required by NPR 7120.8 and those added by MSFC. MSFC added data/reviews are applicable for TRL greater than 5, and are shown in green text (required) or blue (potentially applicable review). For additional guidance on applicability see the MSFC Customization Spreadsheet (available on the MIDL under the Project Specific Documentation page). The TD Project may customize the entrance/success criteria and degree of formality of the reviews, or combine reviews; provided that they include the minimum data content necessary to accomplish the objectives of each review and satisfy the success criteria that is applicable for that particular TD project, as indicated in MPR 7123.1.

TD Technical Data and Planning (per NPR 7120.8 & MPR 7120.1)	Pre-Formulation	Formulation			Implementation									Closure/ Transfer of Technology
	KDP A	KDP B		KDP C	KDP D		KDP E			KDP F				
		MCR[2]	SRR[2]	FR/PDR[2]	CDR[2]	SIR[2]	DCR/SAR/ Pre-Ship[2]	ORR[2]	MRR/ FRR[2]	PLAR[2]	CFRR[2]	PFAR[2]	DR[2]	DRR[2]/COR
Headquarters and Program Data/Planning														
TD Project Formulation Authorization Document (FAD)	B/L													
Partnerships and inter-agency and international agreements		Preliminary	B/L (US partnerships & agreements)	B/L (international agreements)										
Environmental compliance documentation (see NPR 8580.1 and MPR 8500.1)				FINAL										
Project Technical Data[1]														
Final Report from Closeout Review														FINAL
Program Management, Planning, and Control Data														
TD Project Plan			Preliminary	B/L										
Systems Engineering Applicability Assessment (EMC approved)			B/L											
Documentation of performance against plans for work to be accomplished during next implementation phase, including performance against baselines and status/closure of formal actions from previous KDP.				Summary		Summary			Summary				Summary	
Schedule, work breakdown stucture, and allocation of resources.			Preliminary	B/L	Update	Update	Update	Update						

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

[2] For TD projects with TRL > 5

Black text - Agency required review/data, Red text = Agency guidance/best practice, Green text = MSFC added required review data, Blue text = MSFC added guidance/best practice

Table 26-2 Required Technical Data and Planning for TD Projects

Note: The following terms and definitions are used in Table 26-2. "Initial" is applied to data that are continuously developed and updated as the program or project matures. "Final" is applied to data that are expected to exist in this final form, e.g., minutes and final reports. "Summary" (SUM) is applied to data that synthesize the results of work accomplished. "Plan" is applied to data that capture work that is planned to be performed in the following phases. "Preliminary" (Prel) 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 data 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. "Baseline" (B/L) indicates putting the data under configuration control so that changes can be tracked, approved, and communicated to the team and any relevant stakeholders. The expectation on data 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 data that will eventually become part of the Program or Project Plan indicates that the data has the concurrence of stakeholders and is under configuration control. "Update" (UPD) is applied to data that are expected to evolve as the formulation and implementation processes evolve. Only expected updates are indicated. However, any data may be updated, as needed. Updates to baselined data require the same formal approval process as the original baseline.

26.4 Technology Development Project Pre-Formulation

26.4.1 The TD Project Lead shall create an R&T Project FAD, using the template provided in Appendix G of NPR 7120.8 as guidance.

Note: The R&T Project FAD is approved by the Project DA with concurrence by the Program Lead. The FAD may be implemented as an early version of the project plan, provided it contains all the specified information. For projects established through the AO process, the MDAA letter selecting a specific AO proposal serves as the FAD.

26.4.1.1 As a minimum, an R&T Project FAD shall:

a. Contain a statement of purpose for the proposed project and define its relationship to the Program's strategic goals and objectives, and its alignment with NASA and/or MSFC technology roadmaps.

b. Establish the scope of work to be accomplished.

c. Identify the TD Project Lead.

d. Identify the management process for the project.

e. Provide initial constraints, including resources, schedule and project participants within and external to NASA, including international partnerships.

f. Define the approach, resources, and reviews required to conduct project formulation and implementation.

g. Identify optional KDP B if required by the DA during Formulation or identify optional KDP B is not needed.

Note: Approval of the R&T Project FAD by the Project DA is KDP A, which initiates the Project's movement from Pre-Formulation into the Formulation phase of the life-cycle.

26.5 Technology Development Project Formulation

26.5.1 During Formulation, the TD Project Lead should develop a preliminary WBS, project schedule, and the allocation of resources to perform the project. The preliminary WBS should include an element (level 3 or lower) specifically for capital assets, when purchase of capital assets is required. The project's preliminary WBS and associated final WBS should be consistent with Appendix K of NPR 7120.8. The NASA Work Breakdown Structure Handbook and NASA Schedule Management Handbook contain additional guidance which programs/projects may use to establish the WBS, accompanying dictionary, and schedule.

Note: NASA/SP-2010-3404 and NASA/SP-2010-3403 are available at https://nen.nasa.gov/web/pm/evm, under the Document Repository folder, in the EVM Reference Guides sub-folder.

26.5.2 The TD Project Lead shall complete the Capitalization Determination Form (CDF) (NF 1739) if any NASA-owned equipment purchased on the project has an acquisition value of $500,000 or greater per item, has an estimated useful life of two years or more, and has a planned use on another project.

26.5.3 The Project Lead shall identify the customers/beneficiaries who will benefit from the TD Project. The customers/beneficiaries may include space flight projects, another R&T Program, another Government agency, the aeronautics community, or the U.S. aerospace industry.

26.5.4 The TD Project Lead shall define specific points of contacts including working groups, advisory committees, integrated product teams, technology infusion liaisons that are capable of representing the customer/beneficiary's requirements, such as technology needs, technology prioritization, key performance parameters, and technology maturity, for TD.

26.5.5 The TD Project Lead shall define customer/beneficiary requirements, objectives, credible technology needs, and key performance parameters. Credible technology needs are derived from sources such as the customer/beneficiary's mission concept studies or design reference missions (DRMs), technology roadmaps and associated system analysis, or technology gap analysis. This derivation should be consistent with the overall R&T program goals and objects, not duplicative of existing TD efforts, and include an assessment of the maturity level of each needed technology that identifies both the current TRL and a desired, target TRL goal that is acceptable to the customer/beneficiary. The derivation should also include assessment of KPPs that identify the minimum threshold performance levels necessary to meet the customer/beneficiary's mission requirements, and an assessment of any heritage elements. The initial derivation of technology needs is done at the system concept level (during formulation) and is later, iteratively refined (during implementation) down through the WBS (in conjunction with overall architectural studies and end-item system design) to provide greater granularity to the definition of needed technologies and associated technical performance requirements for key parameters. Refer to MSFC-HDBK-3173 for additional, detailed guidance and best practices, relative to TD project formulation, implementation, and evaluation. Refer to Appendix L for the system characteristics and criteria that define the standard TRL levels.

26.5.5.1 The assessment of heritage elements should consider the intended application and operational environment compared to how they were previously used.

Note: Refer to NASA/SP-2007-6105, Appendix G, for additional guidance on assessment of heritage elements being used in a different operational environment or different architecture.

26.5.6 The TD Project Lead shall ensure the customer/beneficiary is involved in these assessments and the results should be consistent with the customer/beneficiary's technology

infusion plan. Examples of customer/beneficiary involvement include working with product integration teams and technical points of contact/liaisons from NASA space flight programs/projects, the aeronautics community, other NASA-focused technology projects, and other commercial partners, to identify gaps/shortfalls in existing technologies, and to review and assess the TD project's overall TD plans and technical success criteria for compatibility with the customer/beneficiary's technology infusion plans.

26.5.7 The TD Project Lead shall ensure that appropriate analyses and studies are conducted to justify technology selections.

Note: Techniques such as Alignment Matrices, Return on Investment vs. Risk Matrices, or Technology S-curve Maps can be used to determine the best mix of technologies that will balance the project's risk posture. Formal systems analysis should be performed, when practical, to support the results. These analyses should include investment priorities for developing alternative technologies to maximize the probability of success and to enable rational allocation of resources in the event of budget fluctuation.

26.5.8 The TD Project Lead shall perform an assessment (gap analysis) of related TD activities in other NASA programs, other Government agencies, and the commercial sector to eliminate unnecessary duplication of effort. This assessment is typically based on a literature search and technical coordination/communication with points of contact in other NASA programs, other Government agencies, and the commercial sector. This assessment should include (as a minimum) a listing of identified technology needs with rationale for each, confirming that duplicative TD efforts are not currently existing in these other areas, and include consideration of any related TD efforts that were tried but failed.

26.5.9 TD Project Lead shall establish and document Key Performance Parameters (KPPs) for each task or deliverable, and ensure that they are reviewed annually by the customer/beneficiary to verify that they are still aligned with mission requirements.

26.5.10 The TD Project Lead shall create a TD Project Plan, using the template provided in Appendix H of NPR 7120.8 as guidance, and ensure it is updated (as required) and maintained consistent with the R&T Program Plan.

Note: Approval of this project from the formulation phase to implementation (KDP C) is granted by the DA's approval of the TD Project Plan.

26.5.10.1 As a minimum, a TD Project Plan shall:

a. State the specific project objectives, performance goals, and their relationship to the program objectives and goals, and their alignment with NASA and/or MSFC technology roadmaps.

b. Present a technical description of the project. Identify customer/beneficiary requirements/objectives, credible technology needs, key performance parameters necessary to meet the customer/beneficiary's mission requirements, and results of analyses/studies conducted

to justify technology selections. Also include an assessment of the maturity level of each needed technology that identifies both the current TRL and a desired, target TRL goal that is acceptable to the customer/beneficiary.

c. Document the project requirements/objectives and how they will flow down from the program to the projects, including KPPs and Independent Assessments. Describe the technical performance requirements, technical success criteria, and technical performance measures (i.e. KPPs) including the specific goals/minimum threshold values needed to achieve the program/project objectives/goals and meet the customer/beneficiary needs.

d. Document an assessment (Gap Analysis) of related TD activities, including failures experienced in the same or similar development efforts, in other NASA programs, other Government agencies, and the commercial sector to eliminate unnecessary duplication of effort. Include in the assessment (gap analysis), how the proposed approach will address the failures/LL from any related past TD efforts, and how it will reduce the risk of a repeated failure

e. Identify the TD Project Lead.

f. Define the project's management approach, resource requirements (including NASA personnel, facilities, and aircraft uses), schedule and WBS.

g. Describe the project's strategy for technology transition.

h. Summarize the project's approach for implementing safety, mission assurance and risk management requirements and whether separate SMA and Risk Management Plans will be developed (see 26.5.13).

i. Define the specific reviews that will be conducted during the performance of the project, including independent assessments.

j. Document the project's approach to implementing IT security requirements.

Note: Refer to NPR 2810.1 for additional detailed requirements.

k. Identify any optional KDPs (KDP B, D, and E) required by the DA as well as optional IAs and determine the technical data and planning required for each.

l. Summarize the systems engineering processes the project will utilize to produce the deliverable technology products (hardware and software), including (as a minimum) requirements definition, CM/control, verification/validation, and system acceptance for the deliverable technology end item. Reference separate SEMP, if applicable.

m. Describe how the project will develop the payload safety process deliverables in accordance with NPR 8715.7 for Expendable Launch Vehicle (ELV) payloads.

n. Describe how the project will implement the Orbital Debris/End of Mission Plan (EOMP) requirements specified in NPR 8715.6, if applicable.

o. Describe how the project will implement the export control requirements specified in MPR 2190.1 and NPR 2190.1.

p. Describe how the project will develop a Human Rating Certification Package (or equivalent for ISS payloads) specified in NPR 8705.2, if applicable.

q. Describe how the project will implement the nuclear safety launch approval requirements specified in NPR 8715.3, if applicable.

Note: This minimum content may be addressed within the project plan, or in a separate document, at the project's discretion.

26.5.10.2 The TD Project Lead shall ensure the applicable Center Director (or designee responsible for committing workforce and facilities) is added as a concurrence signature, to the TD Project Plan, for each Center at which the project resides.

26.5.11 For TD Projects proposing the construction of new or modification to existing NASA-owned facilities using Construction of Facilities (CoF) funding; the TD Project Lead shall complete a preliminary business case analysis.

Note: A business case guide can be located at http://www.hq.nasa.gov/office/codej/codejx/codejx.html Refer to NPD 8820.2 and NPR 8820.2 for additional details. The "business case analysis" is referred to as a "Life-Cycle Cost Analysis" in NPR 8820.2.

26.5.12 For TD Projects proposing the acquisition of new aircraft, the TD Project Lead shall coordinate with the Office of Strategic Infrastructure and prepare a business case analysis which will be approved by the MDAA and the AA for the Office of Strategic Infrastructure.

Note: Refer to NPR 7900.3 for additional details. The term "aircraft" includes both piloted and unmanned aerial vehicles.

26.5.13 If a TD Project contains elements that include hardware used for flight (piloted or unpiloted), flight control software, wind tunnel testing, or systems that could result in potential harm to personnel or property, the Project Lead shall ensure that a SMA Plan and a Risk Management Plan exist that address the applicable hazards.

Note: In many cases, these plans are already established by Center and/or facility procedures for operations such as wind tunnel tests and flight testing and do not need to be developed by the TD Project. These plans may be included as part of the TD Project Plan, provided they contain the necessary information.

26.5.13.1 The SMA Plan shall identify and document project specific SMA roles, responsibilities, and relationships with appropriate HQ and/or Center-level SMA organizations. The SMA Plan also addresses specific critical SMA disciplines, including system safety/hazard analysis per NPR 8715.3 and NPR 8705.2; quality assurance per NPD 8730.5; SMA compliance verification, audit, and reviews per NPR 8705.6; reliability and maintainability per NPD 8720.1; software safety and assurance per NASA-STD-8719.13 and NASA-STD-8739.8; parts and material quality assurance per NPR 8735.1; contract quality assurance functions per NPR 8735.2; and other applicable NASA safety and mission success requirements.

Note: The plan should reflect the SMA role in areas such as: 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.

26.5.13.2 MWI 7120.6 contains the Center specific requirements for developing the Risk Management Plan.

26.5.13.3 Refer to NPR 8705.5, Probabilistic Risk Assessment (PRA) Procedures for NASA Programs and Projects, for the process and requirements for conducting probabilistic risk assessments.

26.5.14 The TD Project Lead shall ensure that proposals and plans for subordinate activities/tasks include documentation of environmental compliance, environmental permit considerations, and NEPA evaluation.

26.6 Technology Development Project Reviews During Formulation

26.6.1 During Formulation phase, an internal MSFC System Requirements Review and Preliminary Design Review shall be conducted for TD projects with TRL greater than 5, using the guidance on entrance and success criteria, and the minimum data content required to accomplish the objectives of the review and satisfy the applicable success criteria, as described in MPR 7123.1.

Note: The SRR and PDR does not require an external component and may be conducted internal to the TD Project. The TD Project may customize the entrance/success criteria guidance and the degree of formality of the review, as appropriate; provided that they address the minimum data content necessary to accomplish the objectives of the review and satisfy the success criteria that is applicable for that particular TD project, as indicated in MPR 7123.1.

26.6.2 Prior to KDP C, a FR shall be conducted per the milestone technical data and planning maturity matrix requirements provided in Table 26-2 and minimum review content in 26.6.2.2 below. FR may be conducted as a part of Preliminary Design Review.

26.6.2.1 The Independent Assessment should be conducted together with the internal component as a single, integrated FR .

Note: The FR has both an internal and external component. The internal component is a project review to ensure the project is ready to proceed to KDP C. The external component is an independent assessment that includes the customer/beneficiary and may involve external advisory groups such as the National Research Council (NRC). The FR will assess the project's alignment with the customer/beneficiary's needs and the adequacy of the TD Project Plan to meet the specified objectives. The selecting official identified in Table 26-*1 assigns the IA to be performed by one or more organizations. The external component is accomplished concurrently with the internal component by adding independent assessors to the internal project review team. The selecting official for the FR team (see Table* 26-*1) is responsible for the development and approval of the ToR.*

26.6.12.2 The FR shall consist of the following data:

a. Summary of the data that was reviewed in the System Requirements Review and results of that review including plans to correct any deficiencies found.

b. The TD Project Plan

c. SMA Plan, if required (see above)

d. Risk Management Plan, if required (see above)

e. ToR

f. Stakeholder expectations and customer/beneficiary requirements/objectives.

g. Technical performance requirements, technical success criteria, and technical performance measures.

h. Verification/Validation Plan (i.e. process by which technologies will be verified and validated for compliance with the project requirements/objectives).

i. Results of EMC approved applicability assessment for the seventeen system engineering processes.

j. Integrated Master Schedule

k. Summary of initial overall technology maturity assessment for the project.

l. Gap Analysis of related TD activities, including failures experienced in the same or similar development efforts, in other NASA programs, other Government agencies, and the commercial sector.

m. Documentation summarizing performance against baseline plan (for technical, schedule, and cost performance), including status/closure of formal actions from previous KDP, and plans for work to be accomplished during next life-cycle phase.

26.7 Technology Development Project Implementation

26.7.1 The TD Project Lead shall establish a WBS, in accordance with Appendix K of NPR 7120.8, a project schedule with milestones for each element in the WBS, and an allocation of the project's available resources necessary to achieve each milestone. The milestones should be chosen at intervals sufficient to demonstrate steady progress towards achieving the overall KPPs for the project.

26.7.2 The TD Project Lead shall track progress against a baseline plan. The WBS, the project schedule, and the allocation of resources to milestones constitute the baseline plan for assessing technical, schedule, and cost performance

26.7.3 The TD Project Lead shall provide immediate written notice and a recovery plan to the Program Lead and MDAA or MSOD, if the implementation costs of the project are estimated to exceed the baseline cost by 15 percent or more, or if a schedule milestone is estimated to be delayed 6 months or more, for development project (or single contracts) exceeding $250 million LCC.

26.7.4 The TD Project Lead shall conduct TD Project status reviews annually to assess both progress towards the KPPs and the maturity of the technology. In addition, status reviews may be called by the MDAA, MSOD, or Program Lead at any time to determine the need to modify or end the project.

> *Note: TD Project status reviews may be conducted as part of the MPR 7123.1 defined technical reviews (see* 26.*7.6) provided that they occur at least annually.*

26.7.4.1 The TD Project Lead shall provide (to the R&T Program), documentation summarizing performance against baseline plan (for technical, schedule, and cost performance), including status/closure of formal actions from previous KDP, and plans for work to be accomplished during next life-cycle phase. This includes documentation of progress towards achieving the overall KPPs (goals and minimum thresholds) for the project.

26.7.5 The TD Project Lead shall periodically report the status of project performance to the CMC in accordance with MPR 7120.4.

26.7.6 During implementation, an internal MSFC Critical Design Review (CDR), Design Certification Review (DCR), System Acceptance Review (or Pre-Ship Review), and Flight Readiness Review (FRR) (as a minimum) shall be conducted for TD projects with TRL greater than 5, using the guidance on entrance and success criteria, and the minimum data content

required to accomplish the objectives of the review and satisfy the applicable success criteria, as described in MPR 7123.1.

Note: These reviews do not require an external component and may be conducted internal to the TD Project. The TD Project may customize the entrance/success criteria guidance and the degree of formality of these reviews, as appropriate; provided that they address the minimum data content necessary to accomplish the objectives of each review and satisfy the success criteria that is applicable for that particular TD project, as indicated in MPR 7123.1. The DCR may be combined with the System Acceptance Review (SAR). The DCR/SAR may be considered a final Pre-Ship Review at which all requirements and the as-built configuration will be verified. The FRR may be conducted as part of a larger FRR, provided that all requirements, the as-built configuration, and the system interfaces have been verified and the MSFC Center Director is briefed on the state of flight readiness prior to the larger review. For some TD Projects, other technical reviews (such as MCR, SIR, ORR, Post Launch Assessment Review (PLAR)) may be applicable, depending on specific characteristics of the technology end item under development, and its ultimate mission/flight application (such as ground-based development vs. flight mission, human vs. robotic mission, ELV vs. suborbital flight).

26.7.7 Test Readiness Reviews shall be conducted (as required) for any hazardous tests, in accordance with MWI 8715.17 and ED-OWI-004.

26.8 Technology Development Project Transition/Closure

26.8.1 The TD Project Lead shall conduct a closeout review of the project's accomplishments and/or failures, including an independent assessment of the final TRL and other maturity measures, and/or remaining issues. A final report is required for the Closeout Review.

26.8.2 The TD Project Lead shall document LL, in accordance with this MPR.

26.8.3 The TD Project Lead shall ensure that sufficient data is archived, in accordance with NPR 1441.1, so that future users can assess the technology maturity (such as TRL) and incorporate the technology into system designs.

Note: These data include the final report from the Closeout Review, engineering drawings, specifications, test reports, and any other documentation of project activities and results necessary for future researchers to understand the work performed and the results that were achieved, to include both successes and failures.

26.9 Technology Development Project Evaluation

26.9.1 The TD Project Lead shall ensure TRLs and/or other measures of technology maturity that are important to the customer/beneficiary are used in conjunction with KPPs to assess maturity throughout the project life-cycle. When a TD Project uses a measure of maturity other than TRLs, the measurement system should map back to TRLs. See the table in Appendix F for a description of each TRL level.

26.9.2 The TD Project Lead shall provide data, thru the Program Lead, to an independent group for their assessment of the project's maturity assessment.

26.9.3 The following guidance is provided to outline the process that TD Projects should use to assess technology maturity throughout the project life-cycle.

a. Define all terminology used in the TRL descriptions.

b. Provide a formal Gap Analysis of technology needs and identify the process for periodic assessment, including termination/transition of technologies and introduction of new technologies.

c. Provide a formal assessment of the TRL for each technology, and annually assess progress toward defined TRL goals. The assessment should occur at the system, subsystem, and component levels.

d. The TRL of the system is determined by the subsystem having the lowest TRL in the system, which in turn is determined by the component having the lowest TRL in the subsystem.

e. The depth of this assessment will vary greatly according to the state of the project. As the technology matures, the assessment should go into greater detail.

f. Prepare a list of Critical Technology Elements, which are essential in meeting technology requirements and have substantial risk, cost, and/or schedule associated with their development.

g. Perform an Advancement Degree of Difficulty assessment of what is required to advance the technology to the desired TRL. This is done in conjunction with the WBS and is used as the basis for the technology roadmap and cost.

h. Prepare a roadmap for each TD Project that addresses the cost, schedule, and risk associated with advancing each element to the point necessary to meet requirements in a timely manner. Identify alternate paths, decision gates, off-ramps, fallback positions, and quantifiable milestones with appropriate schedules. The roadmap outlines the overall strategy for progressing towards the KPPs, and shows how interim performance milestones will be verified through test.

i. Assess the project annually through the aggregate assessment of the individual technologies and their progress toward the stated TRL goal. The initial maturity assessment is done in the Formulation (or Pre-Formulation) phase and updated at the project status reviews.

26.10 Requirements Flow-Down for Technology Development Project Elements

26.10.1 Portions or elements of TD Projects may be accomplished at different Centers. The TD Project Lead shall flow down requirements for this work sufficiently to ensure requirements are met at the TD Project level.

CHAPTER 27. Research and Technology PORTFOLIO PROJECT LIFE-CYLE REQUIREMENTS

27.1 Research and Technology Portfolio Project Life-Cycle

R&T Portfolio projects for which MSFC has management responsibility shall follow the NASA R&T Portfolio Project life-cycles as shown in Figure 27-1 and Figure 27-2.

Note: The content of Figure 27-1and 27-2 is taken from NPR 7120.8 and included here for clarity/readability.

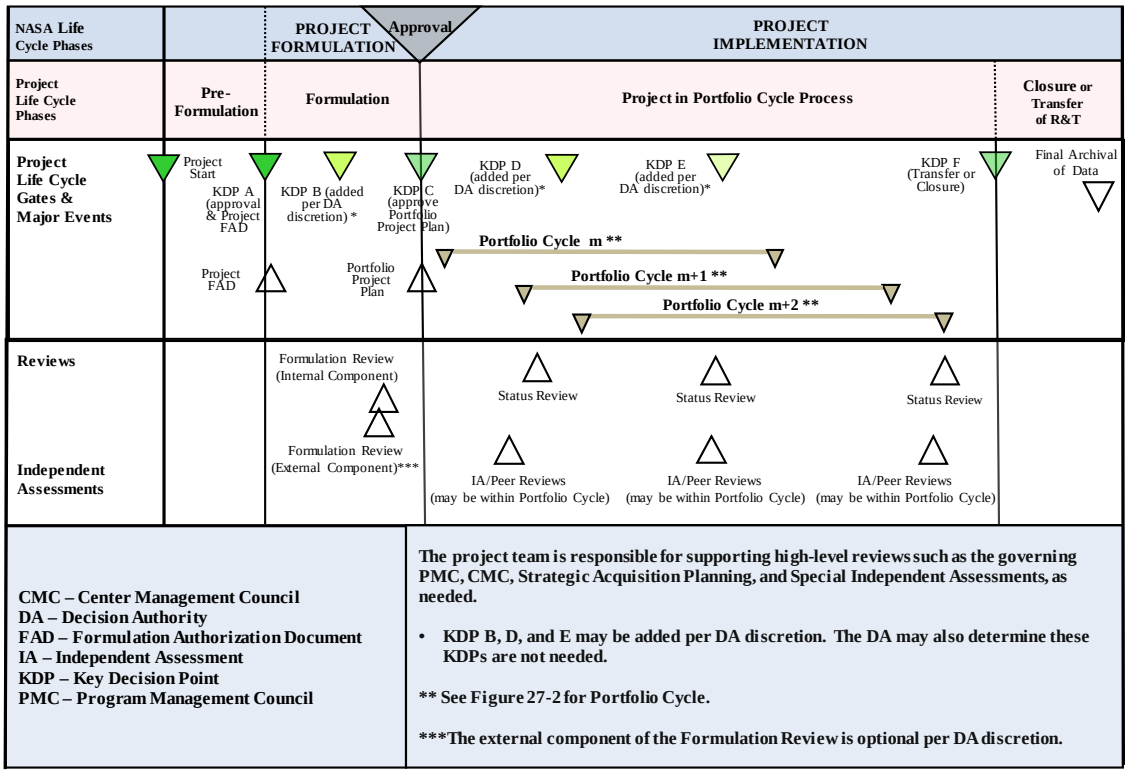


Figure 27-1 R&T Portfolio Project Life-Cycle

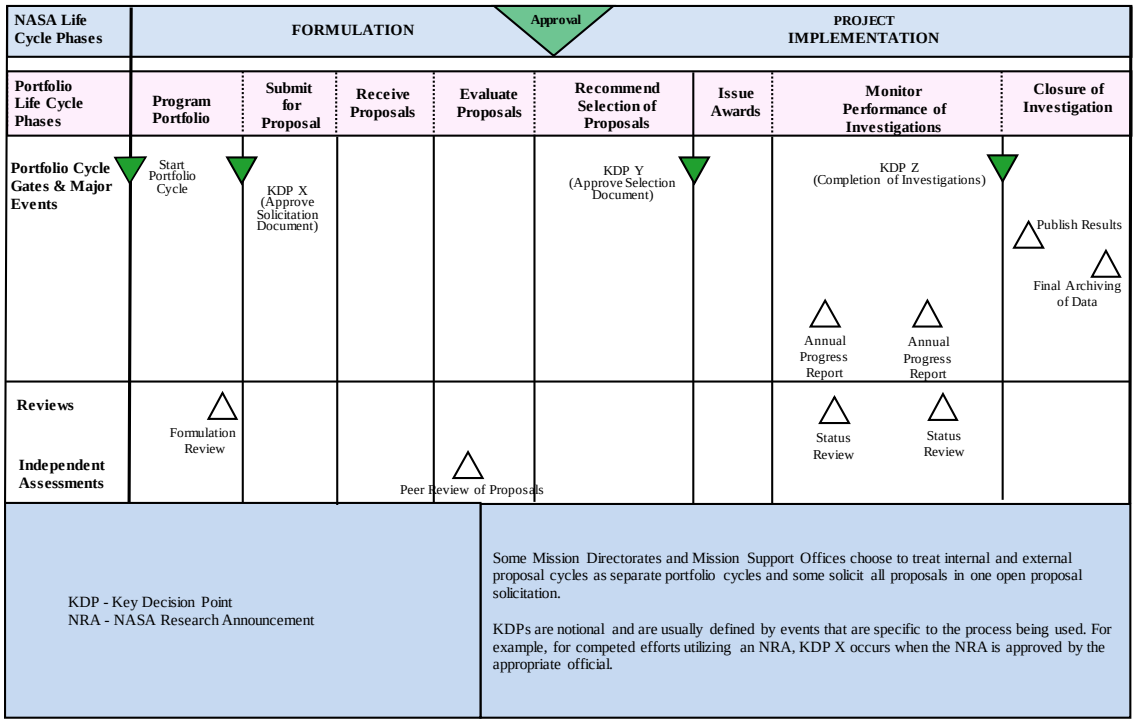


Figure 27-2 Portfolio Cycle

27.1.1 R&T Portfolio Project Lead shall formulate and implement the R&T Portfolio Project, including the minimum set of reviews, technical data, and planning specified in this chapter.

27.2 Reviews

The R&T Portfolio Project Lead shall support reviews required by the governing PMC, the CMC, the ASP meeting, the ASM, the PSM, and Special Independent Assessments.

27.3 Governance

For R&T Portfolio Projects, the governing PMC and the DA for each KDP shall be as defined in Table 27-1 and Table 27-2.

Note: The content of Table 27-1 and 27-2 is based on content taken from NPR 7120.8 adapted here for specific applicability to MSFC.

Summary of Authorities for R&T Portfolio Projects		
Authorities	**R&T Portfolio Project**	**Comments**
Approving Official for Start	MDAA (or MSOD)	The MDAA or MSOD can delegate responsibility to the Program Lead or Research Director.
Project Decision Authority (DA) (KDP A-F)	MDAA (or MSOD)	The MDAA or MSOD can delegate responsibility to the Program Lead or Research Director.
Selecting Official for Independent Assessment and Formulation Review Team(s)	MDAA (or MSOD)	The MDAA or MSOD can delegate responsibility to the Program Lead or Research Director. Selecting Official is responsible for development of Terms of Reference (ToR).
Governing PMC	MD PMC or MSO equivalent	
Governing Document	R&T Portfolio Project Plan	The R&T Portfolio Project Plans are approved by the Project DA with concurrence by the Program Lead/Research Director and applicable Center Director(s) (CD)

Table 27-1 Summary of Authorities for R&T Portfolio Projects

R&T Portfolio Project Management Structure		
	Program Lead Led	**Research Director Led (Cross-Program Research)**
Manager	R&T Portfolio Project Lead	R&T Portfolio Project Lead
Approving Official for Start	MDAA (or MSOD)[1]	MDAA (or MSOD)[2]
DA for KDP A (approve FAD)	MDAA (or MSOD)[1]	MDAA (or MSOD)[2]
DA for KDP B (per DA discretion)	MDAA (or MSOD)[1]	MDAA (or MSOD)[2]
DA for KDP C (approve Project Plan)	MDAA (or MSOD)[1]	MDAA (or MSOD)[2]
DA for KDP D (per DA discretion)	MDAA (or MSOD)[1]	MDAA (or MSOD)[2]
DA for KDP E (per DA discretion)	MDAA (or MSOD)[1]	MDAA (or MSOD)[2]
DA for KDP F (R&T transfer or closure)	MDAA (or MSOD)[1]	MDAA (or MSOD)[2]
Selecting Official for Independent Assessment Team(s)	MDAA (or MSOD)[1]	MDAA (or MSOD)[2]
Governing PMC	MD PMC or MSO Equivalent	MD PMC or MSO Equivalent
Governing Document(s)	R&T Portfolio Project Plan and Program Plan	R&T Portfolio Project Plan and Cross-Program Plan

[1] *The MDAA or MSOD can delegate responsibility to the Program Lead.*

[2] *The MDAA or MSOD can delegate responsibility to the Research Director.*

Table 27-2 R&T Portfolio Project Management Structure

27.3.1 R&T Portfolio Projects shall produce the required technical data and planning as documented in Table 27-3.

R&T Portfolio Technical Data and Planning (per NPR 7120.8 & MPR 7120.1)	Pre-Formulation	Formulation	Implementation						Closure/Transfer of Technology
	KDP A	KDP C	KDP D		KDP E		KDP F		
		FR	Port_FR	SR	Port_PR	SR	Port_SR	SR	
Headquarters and Program Data/Planning									
Formulation Authorization Document (FAD)	B/L								
Agency and International Agreements		B/L							
Environmental Compliance Documentation (see NPR 8580.1 and MPR 8500.1)		FINAL							
Project Technical Data [1]									
Proposal Solicitation Document			FINAL						
Peer Review Panel's Evaluation of Proposals					FINAL				
Proposal Selection Document (approved by the Selection Official)					FINAL				
Annual Progress Report (for the particular research investigation)							FINAL		
Final archive of data and publishing of research results									FINAL
Program Management, Planning, and Control Data									
R&T Portfolio Project Plan		B/L							
Systems Engineering Applicability Assessment (EMC approved)		B/L							
Plans for work to be accomplished during next implementation life cycle phase		Plan		Plan		Plan		Plan	
Documentation of performance against plans for work to be accomplished during next implementation phase, including performance against baselines and status/closure of formal actions from previous KDP		Summary		Summary		Summary		Summary	

[1] These document the work of the key technical activities performed in the associated phases.
Black text = Agency required review/data, Red text = Agency guidance/best practice
Green text = MSFC added required review/data, Blue text = MSFC added guidance/best practice

Table 27-3 Required Technical Data and Planning for R&T Portfolio Projects

Note: Table 27-3 includes data/planning required by NPR 7120.8 and those added by MSFC (shown in green). The following terms and definitions are used in Table 27-3. "Final" is applied to data that are expected to exist in this final form, e.g., minutes and final reports. "Summary" (SUM) is applied to data that synthesize the results of work accomplished. "Plan" is applied to data that capture work that is planned to be performed in the following phases. "Baseline" (B/L) indicates putting the data under configuration control so that changes can be tracked, approved, and communicated to the team and any relevant stakeholders. The expectation on data 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 data that will eventually become part of the Program or Project Plan indicates that the data has the concurrence of stakeholders and is under configuration control.

27.4 Research and Technology Portfolio Project Pre-Formulation

27.4.1 The R&T Portfolio Project Lead shall create an R&T Project FAD, using the template in Appendix G of NPR 7120.8 as guidance, or create an appendix to the Cross-Program Research Plan (using Appendix F of NPR 7120.8 as guidance). The R&T Project FAD is approved by the Project DA with concurrence by the Program Lead.

Note: The Program Lead, in coordination with the MDAA or MSOD, should provide, in writing, a scope of the project to the R&T Portfolio Project Lead. The FAD may be implemented as an early version of the project plan, provided it contains all the specified information. For projects established through the AO process, the MDAA letter selecting a specific AO proposal serves as the FAD.

27.4.2 As a minimum, an R&T Portfolio Project FAD shall:

a. Contain a statement of purpose for the proposed project and define its relationship to the Program's strategic goals and objectives, and its alignment with NASA and/or MSFC technology roadmaps.

b. Establish the scope of work to be accomplished.

c. Identify the R&T Portfolio Project Lead.

d. Identify the management process for the project.

e. Provide initial constraints, including resources, schedule and project participants within and external to NASA, including international partnerships.

f. Define the approach, resources, and reviews required to conduct project formulation and implementation.

g. Identify optional KDP B, if required by the DA, during Formulation or identify if optional KDP B is not needed.

Note: KDP A (Figure 27-1) occurs when the Project DA approves the Project FAD, which initiates the R&T Portfolio Project's movement from Pre-Formulation into the Formulation phase of the life-cycle.

27.5 Research and Technology Portfolio Project Formulation

27.5.1 The R&T Portfolio Project Lead should develop a preliminary WBS, project schedule, and the allocation of resources to perform the project. The project's preliminary WBS and associated WBS should be consistent with Appendix K of NPR 7120.8. In coordination with the OCFO, the R&T Portfolio Project Lead should identify and establish a WBS Element (level 3 or lower) specifically for capital assets, when purchase of capital assets is required. The NASA

Work Breakdown Structure Handbook and NASA Schedule Management Handbook contain additional guidance which programs/projects may use to establish the WBS, accompanying dictionary, and schedule.

Note: NASA/SP-2010-3404 and NASA/SP-2010-3403 are available at https://nen.nasa.gov/web/pm/evm, under the Document Repository folder, in the EVM Reference Guides sub-folder.

27.5.2 In coordination with the OCFO, the R&T Portfolio Project Lead shall complete the CDF form (NF 1739) if any NASA-owned equipment purchased on the project has an acquisition value of $500,000 or greater per item, has an estimated useful life of two years or more, and has a planned use on another project.

27.5.3 The R&T Portfolio Project Lead shall establish project specific R&T goals and objectives, as well as specific research investigation areas needed to accomplish overall goals/objectives, derived from (and consistent with) the NASA/MSFC roadmaps, and Agency vision and mission.

27.5.4 The R&T Portfolio Project Lead shall establish project level technical requirements needed to implement the overall project goals/objectives and define how those requirements flow down into the specific research investigation areas, including identification of the technical performance measures and technical success criteria that will be used for evaluating progress of research investigations throughout the portfolio life-cycle. Project level technical requirements are to be consistent with the overall project goals/objectives, identify the technical scope to be accomplished in each research area and the interrelationships between the different research areas, and include factors such as relevance to Agency's mission, utility of data to be collected, objectivity in the research/data collection process, and the integrity of the resulting data.

27.5.5 The R&T Portfolio Project Lead shall create technology maturity assessment documentation that defines the maturity level of each of the project's research investigation areas and identifies both the current TRL and a desired, target TRL goal that is needed to satisfy the R&T goals/objectives and justify continued funding of the research investigation.

Note: Refer to Appendix L for the system characteristics and criteria that define the standard TRL levels.

27.5.6 The R&T Portfolio Project Lead shall create the R&T Portfolio Project Plan, using the template provided in Appendix I of NPR 7120.8 as guidance, or create an appendix to the Cross-Program Research Plan (using Appendix F of NPR 7120.8 as guidance), update it as required and ensure it is maintained consistent with the R&T Program Plan.

27.5.6.1 As a minimum, an R&T Portfolio Project Plan shall:

a. State the area of specialty of the R&T Portfolio Project, the R&T Portfolio Project's objectives, and the relationship to the program objectives and goals, and alignment with NASA

and/or MSFC technology roadmaps. Describe the specific research investigation areas needed to satisfy the goals and objective, along with the technical requirements and technology maturity assessment results for each area.

b. Define a process for the solicitation, evaluation, and selection of proposals (including identifying Selection Official(s)) for competed portions of the R&T Portfolio Project. (See NPR 1080.1, MWI 5000.1, and MWI 5115.1.)

> *Note: This may be accomplished by referencing appropriate sections of standard R&T process documents, including the Guidebook for Proposers to NASA Research Announcements (http://www.hq.nasa.gov/office/procurement/nraguidebook) and any MD or MSO omnibus NASA Research Announcements (NRA) (e.g., Research Opportunities in Space and Earth Sciences (ROSES) or Research Opportunities in Aeronautics (ROA)).*

c. Establish evaluation criteria, including considerations of technical merit, relevance to the Agency's vision and mission, as defined by NPD 1001.0, NASA Strategic Plan, and cost realism or reference existing documentation that defines this process. Describe how often reviews will be conducted and how the evaluation team will be formed.

d. Identify an integrated budget typically for three or five years, including appropriate WBS elements (see Appendix K of NPR 7120.8) consistent with available R&T program resources.

e. Include a multi-year schedule for the R&T Portfolio Project.

f. Identify the R&T Portfolio Project Lead.

g. Identify a management and control structure to implement the R&T Portfolio Project.

h. Summarize the project’s approach for implementing safety, mission assurance and risk management requirements and whether separate SMA and Risk Management Plans will be developed (see 27.5.11).

i. Define the project's resource requirements, including NASA personnel, facilities, and aircraft uses.

j. Define the specific reviews that will be conducted during the performance of the R&T Portfolio Project, including independent assessments.

k. Document the project's approach to implementing IT security requirements.

> *Note: Refer to NPR 2810.1 for additional detailed requirements.*

l. Identify any optional KDPs (KDP B, D, and E) required by the DA.

m. Summarize the systems engineering processes the project will utilize to carry out the research investigations and produce the deliverable results (i.e. basic knowledge, applied technologies), including (as a minimum) requirements definition, CM/control of research facilities/test equipment, verification/validation, and review/acceptance of research data for compliance with the project level requirements/goals/objectives. Reference separate SEMP, if applicable.

27.5.7 The R&T Portfolio Project Lead shall ensure the applicable Center Director (or designee responsible for committing workforce and facilities) is added as a concurrence signature, to the R&T Portfolio Project Plan, for each Center at which the project resides.

27.5.8 For R&T Portfolio Projects proposing the construction of new or modification to existing NASA-owned facilities using CoF funding, the R&T Portfolio Project Lead shall complete a preliminary business case analysis.

Note: A business case guide can be located at http://www.hq.nasa.gov/office/codej/codejx/codejx.html.
Refer to NPD 8820.2 and NPR 8820.2 for additional details. The "business case analysis" is referred to as a "Life-Cycle Cost Analysis" in NPR 8820.2.

27.5.9 For R&T Portfolio Projects proposing the acquisition of new aircraft, the R&T Portfolio Project Lead shall coordinate with the Office of Strategic Infrastructure and prepare a business case analysis which will be approved by the MDAA and the AA for the Office of Strategic Infrastructure.

Note: Refer to NPR 7900.3 for additional details. The term aircraft includes both piloted and unmanned aerial vehicles.

27.5.10 The R&T Portfolio Project Lead shall ensure that proposals and plans for subordinate activities/tasks include documentation of environmental compliance, environmental permit considerations, and NEPA evaluation.

27.5.11 If an R&T Portfolio Project contains elements that include hardware used for flight (piloted or unpiloted), flight control software, wind tunnel testing, or systems that could result in potential harm to personnel or property, the Project Lead shall ensure that a SMA Plan and a Risk Management Plan exist that address the applicable hazards.

Note: In many cases, these plans are already established by Center and/or facility procedures for operations such as wind tunnel tests and flight testing and do not need to be developed by the Portfolio Project. These plans may be included as part of the R&T Portfolio Project Plan, provided they contain the necessary information.

27.5.11.1 The SMA Plan shall identify and document project specific SMA roles, responsibilities, and relationships with appropriate HQ and/or Center- SMA organizations. The SMA Plan also addresses specific critical SMA disciplines, including system safety/hazard analysis per NPR 8715.3 and NPR 8705.2; quality assurance per NPD 8730.5; SMA compliance

verification, audit, and reviews per NPR 8705.6; reliability and maintainability per NPD 8720.1; software safety and assurance per NASA-STD-8719.13 and NASA-STD-8739.8; parts and material quality assurance per NPR 8735.1; contract quality assurance functions per NPR 8735.2; and other applicable NASA safety and mission success requirements.

Note: The plan should reflect the SMA role in areas such as: 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.

27.5.11.2 MWI 7120.6 contains the Center specific requirements for developing the Risk Management Plan.

27.5.11.3 Refer to NPR 8705.5 for the process and requirements for conducting probabilistic risk assessments.

27.6 Research and Technology Portfolio Project Reviews during Formulation

27.6.1 Prior to KDP C, a FR shall be conducted to include the milestone technical data and planning maturity matrix requirements provided in Table 27-3.

27.6.1.1 The Independent Assessment should be conducted together with the internal component as a single, integrated FR.

Note: The FR has both an internal and external component. The internal component is a project review to ensure the project is ready to proceed to KDP C. The external component is an independent assessment and is optional per DA discretion. The selecting official identified in Table 27-1 assigns the IA to be performed by one or more organizations. The external component is accomplished concurrently with the internal component by adding independent assessors to the internal project review team. The selecting official for the FR team (see Table 27-1) is responsible for the development and approval of the ToR for the FR. Conflicts during ToR development should be resolved in accordance with the dissenting opinion process in MCP 8070.2.

27.6.1.2 The FR shall consist of the following data:

a. The R&T Portfolio Project Plan

b. SMA Plan, if required (see above)

c. Risk Management Plan, if required (see above)

d. ToR

e. Stakeholder expectations and customer/beneficiary requirements/objectives.

f. Technical performance requirements, technical success criteria, and technical performance measures.

g. Verification/Validation process by which research and technologies will be verified and validated for compliance with the project requirements/objectives.

h. Results of EMC approved applicability assessment for the seventeen system engineering processes.

i. Integrated Master Schedule

j. Documentation summarizing performance against baseline plan (for technical, schedule, and cost performance), including status/closure of formal actions from previous KDP, and plans for work to be accomplished during next life-cycle phase.

27.7 Research and Technology Portfolio Project Implementation

27.7.1 At a minimum, the R&T Portfolio Project Lead shall establish a WBS, in accordance with Appendix K of NPR 7120.8, a project schedule with milestones for each element in the WBS, and an allocation of the project's available resources necessary to achieve each milestone The milestones should be chosen at intervals sufficient to demonstrate steady progress.

27.7.2 The R&T Portfolio Project Lead shall track progress against a baseline plan. The WBS, the project schedule, and the allocation of resources to milestones constitute the baseline plan for assessing technical, schedule, and cost performance. Note that it is not uncommon to re-baseline R&T Portfolio Projects due to the uncertain nature of research. It is possible that this may occur as a result of periodic assessments.

> *Note: The Project DA will determine if optional KDPs (KDP D and E) are required during Implementation or if the optional KDPs (KDP D and E) are not needed. These optional KDPs are added at the Project DA's discretion and identified in the Project FAD. If these optional KDPs are required, the Project DA should determine the gate products required prior to these optional KDPs.*

27.7.3 R&T Portfolio Project Status Reviews.

27.7.3.1 The R&T Portfolio Project Lead shall conduct R&T Portfolio Project status reviews annually to assess progress towards the R&T Portfolio Projects goals and for NASA officials to gain better insight into the R&T work being performed. The R&T Portfolio Project status reviews are also utilized by the Program Lead and R&T Portfolio Project Lead to decide whether the R&T Portfolio Project should be continued for another year or transferred/closed for lack of sufficient progress. These reviews can also be called by the MDAA, MSOD, or Program Lead at any time to determine the need to modify or end the project. The R&T Portfolio Project status

reviews and the R&T Portfolio Cycle status reviews may be combined per R&T Portfolio Project Lead direction.

27.7.3.2 The R&T Portfolio Project Lead shall provide (to the R&T Program), documentation summarizing performance against baseline plan (for technical, schedule, and cost performance), including status/closure of formal actions from previous KDP, and plans for work to be accomplished during next life-cycle phase. This includes documentation of progress towards achieving the overall technology maturity goals, technical performance measures, and technical success criteria for the project and research investigation areas.

27.7.4 Portfolio Cycle Status Reviews. (See Figure 27-2.)

27.7.4.1 The R&T Portfolio Project Lead should ensure that a process is in place to track and manage each Portfolio Cycle. The R&T Portfolio Project Plan defines the process to manage the Portfolio Cycle, or reference to other Agency or MD-specific document(s) that provides this information.

27.7.4.2 The R&T Portfolio Project Lead should ensure that the Portfolio Cycle includes sufficient reviews and assessments in formulation to ensure that a balanced and well-constructed group of R&T investigations is developed.

> *Note: The R&T Portfolio Project Lead should solicit and select competed R&T investigations in accordance with NPR 1080.1. A key component to selecting competed investigations is the peer review of proposals, as described in NPR 1080.1. The R&T Portfolio Project Lead should also ensure compliance with the GCAM (formerly NPR 5800.1), as applicable.*

27.7.4.3 The Program Lead and R&T Portfolio Project Lead shall use the status reviews to decide whether each R&T investigation should be continued for another year or transferred/closed for lack of sufficient progress. The status reviews are used to:

a. Determine changes in scope that effect subsequent solicitations.

b. Provide information to support evaluation of performance, as specified in the R&T Portfolio Project Plan, R&T Program Plan, or Cross-Program Research Plan.

c. Determine if the results of any of the R&T investigations are ready to be transitioned to another project or to an organization outside the Agency.

d. Determine if any of the R&T investigations should be terminated.

> *Note: Prior to the decision to terminate a contract or multi-year grant prior to completion of the terms of the document, the R&T Portfolio Project Lead should consult with the Contracting/Procurement Officer to understand the full legal and cost ramifications.*

27.7.4.4 Status of publications shall be reported to the Project Lead on an annual basis and final reports are archived in the NASA Scientific and Technical Information System.

Note: Refer to NPR 2200.2 for additional details.

27.7.5 The R&T Portfolio Project Lead shall periodically report the status of project performance to the CMC in accordance with MPR 7120.4.

27.7.6 During implementation, the R&T Portfolio Project Lead shall conduct portfolio life-cycle FRs, to assess and approve the proposal solicitation documents, and a peer review of proposals, to competitively select R&T investigations, in accordance with NPR 1080.1.

27.7.7 Test Readiness Reviews shall be conducted, as required for any hazardous tests, in accordance with MWI 8715.17 and ED-OWI-004.

27.8 Research and Technology Portfolio Project Transition/Closure

27.8.1 In the R&T Portfolio Project Transition/Closure Phase, the results of R&T investigations shall be published and archived or transitioned to another project, and the investigations closed out.

27.8.2 The R&T Portfolio Project Lead shall document LL, in accordance with this MPR.

27.9 Requirements Flow Down for Research and Technology Portfolio Project Elements

27.9.1 Portions or elements of R&T Portfolio Projects may be accomplished at different Centers. The R&T Portfolio Project Lead shall flow down requirements for this work sufficiently to ensure requirements are met at the R&T Portfolio Project level.

CHAPTER 28. MISSION TYPE 4 AND 5 ACTIVITIES

These are activities that are in response to a request for support from program/projects outside of MSFC and are managed under the requirements flowed down to them from the parent program or project requesting the support. These activities are not subject to the full project management requirements of MPR 7120.1, but are subject to the requirements from the parent program/project, specific requirements of this chapter and other applicable chapters as specified in Table 2-1. Specific requirements are flowed down to the activity (from the parent program or project) in accordance with the Center level documentation of the parent program/project, to the extent necessary to ensure compliance and mission success (as determined by the parent program or project). The parent program/project may impose requirements from NPR 7120.5, NPR 7120.7, or NPR 7120.8. These activities are categorized as Mission Type 4 and 5 (see 3.7, Table 3-1).

28.1 Mission Type 4 and 5 activities shall have a documented agreement with their parent program/project.

Note: See Activity Agreement Template in Appendix I, for guidance on expected content of agreement which defines the task, requirements, expectations, and constraints on the activity from the parent program/project. Center resources are negotiated and approved through the Center resource planning activity. Resource information is included in the Activity Agreement template to document the agreement with the non-MSFC sponsor.

28.2 Mission Type 4 and 5 activities shall have a documented plan for implementing the requested task.

Note: See Activity Plan Template in Appendix J, for guidance on expected content of plan which defines the work to be performed by MSFC team for the conduct of this activity. Planning for Systems Engineering, SMA, and Risk Management is typically covered within a single, integrated Activity Plan. The Activity Agreement template and Activity Plan template will also be available on the MIDL under the Program/Project Documents link. Mission Type 4 & 5 activities may utilize these templates to document the agreements and requirements placed on them from the parent program or project.

28.3 Mission Type 4 and 5 activities shall assess applicability of the following technical reviews; SRR, PDR, CDR, SAR or Pre-Ship Review, and FRR, and document the approach for conducting applicable reviews, as described in MPR 7123.1.

Note: These reviews are recommended but not required for MT 4 and 5 activities. The activity may customize the entrance/success criteria and degree of formality of the reviews, or combine reviews as they determine appropriate to meet their needs.

28.4 Mission Type 4 and 5 activities shall assess applicability of the systems engineering processes and document the technical approach for applicable processes in their activity planning, as described in MPR 7123.1.

Note: The activity may customize the SE processes as they determine appropriate to meet their needs.

28.5 Mission Type 4 and 5 activities shall report a summary of their agreement, plan, and assessment of technical reviews and systems engineering processes, to the Director of the MSFC office responsible for managing the activity, and the Engineering Director, unless governance has been delegated to a lower level.

Note: The Directors may choose to delegate their governance authority down to a lower level for specific activities, on a case-by-case basis. This delegation may occur at any point in the lifecycle. Selection of an appropriate mission type and governance level should be considered early in the process to enable effective activity and resource planning. The approval of the Director of the responsible office and the Engineering Director is typically obtained by briefing the information at the monthly program reviews within the Directorate/Office and to the EMC, but may be obtained through other means.

28.6 Mission Type 4 activities shall report a summary of their agreement, plan, and assessment of technical reviews and systems engineering processes, to the Associate Directorate, Technical, and Center Director, or designee, unless governance has been delegated to a lower level.

Note: The Associate Director, Technical may choose to delegate governance authority down to a lower level for specific activities, on a case-by-case basis. The approval of the Associate Director, Technical and the Center Director are typically obtained by briefing the information to the PPMAC and CMC, but may be obtained through other means.

CHAPTER 29. MSFC INFORMATION TECHNOLOGY AND INSTITUTIONAL INFRASTRUCTURE PROGRAM AND PROJECT MANAGEMENT REQUIREMENTS

These requirements apply to MSFC IT and institutional infrastructure program and projects to include the development of IT capabilities, real property CoF and environmental compliance and restoration (ECR)), and other mission support investments that are defined as highly specialized IT (see Appendix A for definition of highly specialized IT).

29.1 All MSFC IT activities that meet the definition of highly specialized IT shall follow the requirements of Chapters 1-23 of this document, with tailoring as required and appropriate.

> *Note: Per MPD 2800.1, MDs have portfolio management responsibility for Highly Specialized IT that is an embedded component of a flight system, experiment, simulator, ground support environment, or mission control center. This responsibility does not necessarily extend to the IT infrastructure that supports the Highly Specialized IT components. The IT Strategy and Investment Board reviews and the IMSC reviews/approves the Center's IT investment portfolio for Highly Specialized applications.*

29.2 All MSFC IT activities not meeting the definition of highly specialized IT are subject to the requirements of MPD 2800.1, NPR 7120.7, and NID 7120.99.

29.3 For CoF projects, the facilities program is as described in MPR 8823.1, and this document should be referenced for detailed requirements for CoF program/project management.

29.4 For ECR projects, the environmental program is as described in MPD 8500.1, MPR 8500.1, and MPR 8500.2, and these documents should be referenced for detailed requirements for ECR program/project management.

APPENDIX A.

DEFINITIONS

Accepted Risk. A remaining (residual) risk that has not been completely mitigated and has been accepted by the organization management having primary responsibility for the facility/operation.

Accreditation. The official certification that a model, simulation, or federation of models and simulations and its associated data is acceptable for use for a specific purpose.

Acquisition Risk Management (ARM). Includes the identification, analysis, and management of programmatic, infrastructure, technical, environmental, safety, cost, schedule, management, industry, and external policy risks that might jeopardize the success with which the Agency executes its acquisition strategies. (Source. NPD 1000.5A)

Activities. Any of the project components or research functions that are executed to deliver a product or service or provide support or insight to mature technologies. A sequence or set of actions/steps that constitute/support the common technical processes for large and small efforts associated with flight systems, ground support systems, advanced TD, information systems, technology projects, institutional projects, and also Construction of Facility, ECR projects.

Affordability. The engineering process or management discipline which assures the final system, program, project, product, or service can be delivered (or owned, operated, developed, and produced) at a cost which meets previously-established funding constraints while still meeting all approved requirements.

Agency Program Management Council (PMC). The senior management group, chaired by the NASA AA or designee, responsible for reviewing formulation performance, recommending approval, and overseeing implementation of programs and Category 1 projects according to Agency commitments, priorities, and policies.

Agency. The National Aeronautics and Space Administration (NASA).

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 LCC 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).

Center Management Council (CMC). The MSFC CMC provides a Center-level forum to evaluate technical performance of program and project work and to ensure adequate technical and institutional resources are applied to satisfy program requirements and schedules.

Change Package. Released package of information that will recommend a course of action and that addresses known impacts (cost/affordability, schedule, technical performance, and risk) from affected organizations, plus any alternate positions raised during the change review.

Chief SMA Officer (CSO). Serves as the SMA Technical Authority for the Program/Project and is the SMA community's primary interface to the Programmatic Authority (program/project manager) and Engineering Technical Authority (implementing chief engineer) and the functional leader of all assurance activities for a program/project. As SMA Technical Authority, serves on Program/Project decision-making boards and any other forums or processes that may be associated with safety and mission success risk acceptance.

Configuration Management (CM). A management discipline applied over the product's life-cycle to provide visibility into and to control changes to performance, functional, and physical characteristics.

CM Plan. The document that describes the manner in which requirements for CM will be implemented for a particular program, project, or activity.

Computational Model. The numerical representation of the mathematical model.

Conceptual Model. The collection of abstractions, assumptions, and descriptions of physical processes representing the behavior of the reality of interest from which the mathematical model or validation experiments can be constructed.

Customization. The adaptation of MSFC best practices and guidance for a program's or projects specific needs. Customization involves implementing a requirement in a different way that does not match best practices or guidance, but still meets the requirement. Customization is to be described in the program/project documentation.

Data Architecture (DA). A DA describes how data is processed, stored, and utilized in a given system or product definition. It provides criteria for data processing operations that make it possible to design data flows and also control the flow and association of data in the system. A DA should provide descriptions of data in storage and data in motion; descriptions of data stores and their interfaces; data groups and data items; and mappings of those data artifacts to data qualities, applications, and locations. The DA provides a program/project team with a framework from which to map program and project data.

Data Management (DM). The timely and economical identification/definition, preparation, control, and disposition of documents and data required by a program, project, or activity.

Decision Authority. The Agency's responsible individual who authorizes the transition of a program/project to the next life-cycle phase.

Decision Memorandum. The document that summarizes the decisions made at KDPs or as necessary in between KDPs. The decision memorandum includes the ABC (if applicable),

Management Agreement cost and schedule, UFE, and schedule margin managed above the project, as well as the total project cost and schedule estimate.

Decision Package. Identifies all hardware, software, documentation, cost, and schedule impacts, and includes the draft control board directive with disposition language, actions, and suspense dates.

Delegated Governing Authority (DGA). The management entity above the program, project, or activity level with technical oversight responsibility.

Design to Cost. A technical and programmatic approach to achieving an acceptable system design within cost constraints. (Cost, as used herein, includes both non-recurring (or development) cost and recurring (or operations) cost elements).

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.

Dissenting Opinion. A substantive disagreement with a decision or action that an individual judges is not in the best interest of NASA and is of sufficient importance that it warrants a timely review and decision by higher level management. A Dissenting Opinion is to be supportable and based on a sound rationale (not on unyielding opposition). The individual is to specifically request that the dissent be recorded and resolved by the Dissenting Opinion process.

Earned Value Management (EVM). An integrated management control system for assessing, understanding and quantifying what a contractor or field activity is achieving with program/project dollars. EVM integrates technical, cost, schedule with risk management. It allows objective assessment and quantification of current project performance and helps predict future performance based on trends.

Figure of Merit (FOM). A numerical quantity based on one or more characteristics of a system or device that represents a measure of efficiency or effectiveness.

Formulation Agreement (FA). A document prepared by the project as a response to the FAD to establish the technical and acquisition work to be conducted during Formulation, along with schedule and funding requirements for Phase A and Phase B.

Formulation Authorization Document (FAD). The document issued by the MDAA or Mission Support Office Director (MSOD) to authorize the formulation of a program, whose goals will fulfill part of the Agency's Strategic Plan, MD Strategies, or Mission Support Office Functional Leadership Plans. In addition, a FAD or equivalent is used to authorize the formulation of a project.

Heritage. Space hardware and/or software designed, manufactured, processed or integrated for one type of architecture or purpose and now considered for use in a different architecture or application.

Highly Specialized Information Technology (IT). As defined by NPR 7120.7 (NID 7120.99): "Highly specialized 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, and 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). Highly specialized IT acquisitions may include full development (where the IT is a primary issue) to modification of existing systems (information architecture is firm and demonstrated in an operational environment) where IT is not an issue. Real time is often critical – and few opportunities exist to use COTS or Government Off-the-Shelf beyond microprocessors and operating systems because these systems are largely unprecedented or largely unique applications. Certain IT are considered mission critical because the loss would cause the stoppage of mission operations supporting real-time on-orbit mission operations and are identified as "highly specialized" by the Directorate AA. Highly specialized IT is largely custom, as opposed to COTS or commodity IT systems or applications, and includes coding/applications that are integral parts of the research or science requirements (e.g., Shuttle Avionics Upgrade). Common engineering IT tools such as PLM systems, CAD systems, and collaborative engineering systems and environments are not highly specialized IT.

Representative examples of highly specialized IT includes: Avionics software, real-time control systems, onboard processors, Deep Space Network, spacecraft instrumentation software, wind tunnel control system, human physiology monitoring systems, ground support environment, experiment simulators, Mission Control Center, and launch cameras."

Independent Review Team. A small team of independent reviewers from within MSFC, who participate during a normal lifecycle technical review as an alternate to the more formal Agency-level Standing Review Board. The IRT is vetted to be free of personal or organizational or positional conflict of interest, per the NASA SRB Handbook. For projects with a life-cycle cost less than $250 million, the independent SRB function is typically performed by an independent review team at the project's host Center, per the NASA Space Flight Program and Project Management Handbook. Small Category 3, Class D projects with a life-cycle cost under $150 million may utilize an independent review team to perform independent assessments of the project, in place of an SRB, per the guidance from the NASA Associate Administrator, 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.).

Information Support System Architecture (ISSA). The ISSA exists to allow programs/projects to capture, integrate, and manage product and process information from diverse authoring applications in a single environment. This environment enables the definition and standardization of workflow-driven processes that can be leveraged and utilized across multiple programs and projects. The ISSA is designed to integrate multiple mission-critical systems through the use of industry standards in product DM (e.g., open application programming interfaces and Enterprise Service Buses) to aggregate and extend knowledge sharing throughout the organization.

Insight. The Government's access to a supplier's practices, processes, and products for the purpose of understanding and assessing their sufficiency.

Key Decision Point (KDP). 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).

Lead Discipline Engineer. A senior technical expert in an engineering discipline who represents one or more departments or laboratories in support of a program or project; examples include, Avionics and Software LDE, SE&I LDE, and Structures and Environments LDE. The LDE's responsibilities include (but are not limited to) serving as a CECB member; serving as an integrator across elements, systems and sub-systems for his/her discipline area; and ensuring that the end items meet all technical requirements in his/her discipline area.

Lean Decision-Making. Lean decision-making is used to describe how MSFC arrives at final decisions concerning all program or project baseline information in a timely manner. The term "lean" describes streamlined practices that promote the achievement of timely, informed decisions that rarely need to be revisited. To achieve lean decision-making, the following principles are followed: Identification of the deciding parties, avoidance of cycling the decision, avoidance of layering the decision, avoidance of "late comers," and avoidance of endless appeals.

Life-Cycle Cost (LCC). The total of the direct, indirect, recurring, non-recurring, and other related expenses incurred, or estimated to be incurred, in the design, development, verification, production, operation, maintenance, support, and disposal of a project. The LCC of a project or system can also be defined as the total cost of ownership over the project or systems' life-cycle from formulation through implementation. It includes all design, development, deployment, operation and maintenance, and disposal costs.

Models and Simulations (M&S) Producer (developer/analyst). The organization producing an M&S or an M&S result.

M&S User. The organization receiving an M&S or an M&S result for subsequent use; i.e., the receiver/consumer.

M&S Validation. The process of determining the degree to which a model or a simulation is an accurate representation of the real world from the perspective of the intended uses of the model or the simulation.

M&S Verification. The process of determining that a computational model accurately represents the underlying mathematical model and its solution from the perspective of the intended uses of M&S.

Management Agreement. The portion cost (by year) and schedule within which the program or project will complete the approved project scope along with the associated JCL, if required.

The Management Agreement forms the agreement between a Program/Project Manager and his/her management about what he/she will manage to, which provides the basis for NASA's performance assessment.

Mathematical Model. The mathematical equations, boundary values, initial conditions, and modeling data needed to describe the conceptual model.

Mission Directorate Program Management Council. The senior management group, chaired by an MDAA or designee, responsible for reviewing project formulation performance, recommending approval, and overseeing implementation of Category 2 and 3 projects according to Agency commitments, priorities, and policies.

Model. A description or representation of a system, entity, phenomena, or process. A model may be constructed from multiple sub-models; the sub-models and the integrated sub-models are all considered models. Likewise, any data that goes into a model is considered part of the model. A model of a model (commonly called a meta-model); e.g., a response surface constructed from the results of M&S, is considered a model.

NASA Critical Infrastructure. Critical resources/assets that the Agency depends on to perform and maintain its most critical missions. These resources may include critical components and facilities associated with expendable launch vehicles, associated upper stages, International Space Station, command communication and control capability, Government-owned flight or experimental flight vehicles and apparatus, and one-of-a-kind irreplaceable facilities.

New Technology. Technologies that have not been demonstrated in systems representative of the proposed application.

Oversight. The Government's formal review and documentation of and concurrence/non-concurrence with a supplier's products/activities (i.e., life-cycle reviews).

Payload. Any airborne or space equipment or material that is not an integral part of the carrier vehicle (i.e., not part of the carrier aircraft, balloon, sounding rocket, expendable or recoverable launch vehicle). Included are items such as free-flying automated spacecraft, Space Shuttle payloads, Space Station payloads, ELV payloads, flight hardware and instruments designed to conduct experiments, and payload support equipment.

Peer Review. An informal review of a product by someone with a similar expertise.

Process Architecture (PA). PA is a description of the program/project business processes. A well-defined PA sets up rules and bounds in how the program and project will create, manage, and control program and project data. If set up early and properly, all program and project team members will clearly understand data control and release, and it will be well understood by all team members what data is authoritative and the process by which data is released to become authoritative. The flow of the program and project data will be well understood, and the roles and responsibilities for data handling and approval authority will be clear to all team members.

The PA ensures that every person or organization involved executes against the process. Each process to be used is fully documented so that everyone understands their respective involvement in the process.

Product Data Management (PDM). The framework that enables organizations to manage and control engineering and technical information, specifically data surrounding the product's design, definition, and related engineering, manufacturing, and logistics processes and is a key element of PLM. From the product perspective, PDM organizes data required for design evolution, tracks versions and configurations of evolving design concepts, and manages archived data and other product-specific information. PDM tools provide access to product structures and other engineering data such as requirements, as-built, and SMA data. From the process perspective, PDM systems offer the capability to orchestrate controlled procedural events such as design reviews, approvals, product releases, and configuration audits.

PDM System. A combination of the IT applications, users, and processes that implement the management of product data across the product life-cycle.

Product Definition Data (PDD). The data objects and associated elements required to completely describe a product.

Product Life-Cycle Management (PLM). A strategic business approach that applies a consistent set of business solutions in support of the collaborative creation, management, dissemination, and use of product definition data/information across the extended enterprise from concept to end of life. PLM integrates people/organizations, processes, and information. In product-dominated endeavors, PLM serves as the information backbone that extends outside the enterprise. PLM implementations may be composed of multiple elements, including foundation technologies and standards (e.g., Extensible Markup Language, visualization, collaboration, and enterprise application integration), information authoring tools (e.g., mechanical CAD electrical CAD, and technical publishing), core functions (e.g., data vaults, document and content management, work flow and program management), functional applications (e.g., CM), and business solutions built on the other elements.

Program Commitment Agreement (PCA). The contract between the AA and the responsible MDAA that authorizes transition from formulation to implementation of a program.

Program Management Council (PMC). A senior management group responsible for reviewing formulation performance, recommending approval, and overseeing implementation of programs.

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

Program. A strategic investment by a MD 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 establishes a strategic direction that the Agency has identified as critical.

Project. A specific investment having defined goals, objectives, requirements, LCC, a beginning, and an end. A project yields new or revised products or services that directly address NASA's strategic needs. They may be performed wholly in house; by Government, industry, or academic partnerships; or through contracts with private industry.

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.

Quality Plan. The document that establishes the specific quality practices, resources, and sequence of activities relevant to a particular product, project, or activity.

Re-plan. The process by which a program or project updates or modifies its plans.

Re-baseline. The process that results in a change to a project's ABC.

Risk Management. Includes RIDM and CRM in an organized, systematic decision-making process that efficiently identifies, analyzes, plans, tracks, controls, communicates, and documents risk. This is done in order 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.

Safety and Mission Assurance (SMA). Encompasses the technical disciplines of systems safety, probabilistic risk assessment, reliability, maintainability, quality engineering, quality assurance, software safety, software reliability, software assurance, and industrial safety.

Scope Margin. Is one of the resources available to the program/project for risk mitigation; i.e., the cost-performance-risk trade space. Scope margin, like other margins can be traded against risk, except that movement within this space requires sponsor approval.

Security Architecture. The Security Architecture is a collection of components or layers of security that are to be considered to provide information assurance. These include policy and security management, application security, data security, platform security, network and perimeter security, physical security, and user identity security. It provides the program/project with reliability, quality, integrity, availability, and confidentiality of data and systems in compliance with Federal and Agency regulations and requirements.

Simulation. The imitation of the characteristics of a system, entity, phenomena, or process using a computational model.

Specification. A document that prescribes, in a complete, precise, verifiable manner, the requirements, design, behavior, or characteristics of a system or system component.

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 and strength.

System Safety Technical Plan (SSTP). The SSTP is designed to be a technical planning guide for the technical performance and management of the system safety activities. The SSTP can be a stand-alone document, or part of the SMA Plan or the SEMP. It provides the specifics of the system safety modeling activities and describes what and how safety adverse consequences will be modeled, how system safety models (qualitative and probabilistic risk assessments) will be integrated and applied for risk-informed decision making and safety monitoring, how the technical team(s) responsible for generating and maintaining system safety models will interact with the systems engineering organizations, the reporting protocol, and the cost and schedule associated with accomplishing system safety modeling activities in relation to the critical or key events during all phases of the life-cycle.

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 Margin. The allowances carried in technical performance parameters (e.g., weight, power, or memory) to account for uncertainties and risks.

Technical Requirement. A requirement that discusses the design, performance, operational parameters, and constraints of equipment and systems. These are requirements that would typically be contained within a system or equipment specification. Requirements are identified by the word “shall.”

Technical Standard. NASA, voluntary consensus, and other Government documents that contain common and repeated use of rules, conditions, guidelines, or characteristics for products or related processes and production methods and related management systems practices.

Type 4 Activity. Efforts that support programs or projects from a requester outside of MSFC, and that come under the purview of the CMC per the criteria defined in MPR 7120.4.

Type 5 Activity. Efforts that support programs or projects from a requester outside of MSFC, and that do not come under the purview of the CMC per the criteria defined in MPR 7120.4, and those for which the governance has been specifically delegated down to the Directorate/Office level.

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. (Reserves is an obsolete term.)

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 (WBS). A hierarchical division of the work that a program/project performs. It reflects the way in which program/project costs are planned, collected, and reported. WBS standardization allows collection of cost data in a manner that facilitates cost comparisons among projects.

APPENDIX B.

ACRONYMS

AA	Associate Administrator
ABC	Agency Baseline Commitment
AIT	Assembly, Integration and Test
ANSI	American National Standards Institute
AO	Announcement of Opportunity
ARM	Acquisition Risk Management
ASM	Acquisition Strategy Meeting
ASP	Acquisition Strategy Planning
ATP	Authority to Proceed
B/L	Baseline
BOE	Basis of Estimate
CAD	Computer-Aided Design
CADRe	Cost Analysis Data Requirement
CAITS	Center-wide Action Item Tracking System
CCB	Configuration Control Board
CD	Center Director
CDF	Capitalization Determination Form
CDM	Center Data Manager
CDR	Critical Design Review
CECB	Chief Engineer’s Control Board
CFR	Code of Federal Regulations

CHMO	Chief Health and Medical Officer
CIO	Chief Information Officer
CKO	Chief Knowledge Officer
CM	Configuration Management
CMC	Center Management Council
CoF	Construction of Facilities
COTS	Commercial off-the-Shelf
CRM	Continuous Risk Management
CSO	Chief SMA Officer
CSCI	Computer Software Configuration Item
DA	Data Architecture
DCR	Design Certification Review
DGA	Delegated Governing Authority
DM	Data Management
DR	Decommissioning Review
DRD	Data Requirements Description/Document
DRL	Data Requirements List
DRM	Design Reference Mission
ECR	Environmental Compliance and Restoration
EIA	Electronic Industries Alliance
ELV	Expendable Launch Vehicle
EMC	Engineering Management Council
EMD	Environmental Management Division

EOMP	End of Mission Plan
EVM	Earned Value Management
FA	Formulation Agreement
FAD	Formulation Authorization Document
FAR	Federal Acquisition Regulation
FOM	Figure of Merit
FR	Formulation Review
FRR	Flight Readiness Review
GCAM	Grant and Cooperative Agreement Manual
HDM	Headquarters Data Manager
HEOMD	Human Exploration and Operations Mission Directorate
HMTA	Health and Medical Technical Authority
HDBK	Handbook
HQ	Headquarters
H/W	Hardware
ICD	Interface Control Document
ICE-E	Enhanced Integrated Collaborative Environment
ICMC	Integrated Center Management Council
IMSC	Integrated Management Systems Council
IRT	Independent Review Team
ISSA	Information Support System Architecture
IT	Information Technology
JCL	Joint Confidence Level

JSC	Johnson Space Center
KDP	Key Decision Point
KPP	Key Performance Parameters
LCC	Life-Cycle Cost
LCR	Life-Cycle Review
LDE	Lead Discipline Engineer
LL	Lessons Learned
LLC	Lessons Learned Committee
LLIS	Lessons Learned Information System
M&S	Models & Simulations
MCR	Missions Concept Review
MD	Mission Directorate
MDAA	Mission Directorate Associate Administrator
MDR	Mission Definition Review
MGM	Marshall Guidance Manual
MIDL	MSFC Integrated Document Library
MDS	Marshall Directives System
MPD	Marshall Policy Directive
MPR	Marshall Procedural Requirements
MSO	Mission Support Office
MSOD	Mission Support Office Director
MT	Mission Type
MWI	Marshall Work Instruction

NASA	National Aeronautical and Space Administration
NEN	NASA Engineering Network
NEPA	National Environmental Policy Act
NESP	NASA Engineering Standards Panel
NF	NASA Form
NID	NASA Interim Directive
NODIS	NASA Online Directives Information System
NPD	NASA Policy Directive
NPR	NASA Procedural Requirement
NRA	NASA Research Announcement
NRC	National Research Council
NTSP	NASA Technical Standards Program
NTSS	NASA Technical Standards System
OCE	Office of Chief Engineer
OCFO	Office of Chief Financial Officer
OCHMO	Office of the Chief Health and Medical Officer
OCIO	Office of the Chief Information Officer
ODAR	Orbital Debris Assessment Report
OGE	Office of Government Ethics
OI	Organizational Issuance
OPR	Office of Primary Responsibility
Ops	Operations
ORR	Operations Readiness Review
OSAC	Office of Strategic Analysis and Communications

OSMA	Office of Safety and Mission Assurance
OWI	Organizational Work Instructions
PA	Process Architecture
PAL	Process Asset Library
PCA	Program Commitment Agreement
PDD	Product Data Definition
PDM	Product Data Management
PDR	Preliminary Design Review
PIR	Program Implementation Review
PFAR	Post Flight Assessment Review
PLAR	Post Launch Assessment Review
PLM	Product Life-Cycle Management
PMC	Program Management Council
PPMAC	Program/Project Management Advisor Committee
Prel	Preliminary
PRA	Probabilistic Risk Assessment
PSM	Procurement Strategy Meeting
QMS	Quality Management System
R&T	Research & Technology
RFP	Request for Proposal
RID	Review Item Discrepancy
RIDM	Risk Informed Decision Making
ROA	Research Opportunities in Aeronautics
ROSES	Research Opportunities in Space and Earth Sciences

SAR	System Acceptance Review
SDR	System Definition Review
SE&I	Systems Engineering and Integration
SEMP	Systems Engineering Management Plan
SI	System Internationale
SIR	System Integration Review
SLOC	Software Lines of Code
SMA	Safety and Mission Assurance
SMAC	Safety and Mission Assurance Council
SMSR	Safety and Mission Success Review
SOW	Statement of Work
SPP	Single-Project Program
SRA	Software Release Authority
SRB	Standing Review Board
SRR	System Requirements Review
SSTP	System Safety Technical Plan
STD	Standard
SUM	Summary
S/W	Software
SwTA	Software Technical Authority
TC	Tightly Coupled (Program)
TD	Technology Development
ToR	Terms of Reference
TRL	Technology Readiness level

UCLC	Uncoupled and Loosely Coupled (Program)
UFE	Unallocated Future Expense
Upd	Update
V&V	Verification and Validation
VCS	Voluntary Consensus Standards
WBS	Work Breakdown Structure

APPENDIX C.

COMPLIANCE MATRIX TEMPLATE

C.1 SPACE FLIGHT PROGRAM/PROJECT COMPLIANCE MATRIX TEMPLATE

Note: The compliance matrix is to be attached to the Program/Project Plan and the Project/ SPP FA (see 3.4). This compliance matrix template is also available on the MIDL under the Program/Project Documents link.

Ref. No.	NPR No. and Section or MSFC Derived	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	Approvals Required for Tailoring	Program/Project Compliance			Approval Signatures for Tailoring
					Program/ Project Documentation	Comply? (Full, Tailored, or NA)	Rationale for Decisions, Comments, Waiver/Deviations	
Chapter 3. MSFC Assessment of Compliance and Governance								
1	MSFC Derived	3.1	MSFC programs/projects/activities shall submit a compliance assessment for MPR 7120.1 to the MSFC Chief Engineer's Office.	CD				
2	MSFC Derived	3.2	The MSFC Chief Engineer's Office shall assess and concur with the program's/project's/activity's compliance assessment (see 3.4 for approval schedule).	CD				
3	MSFC Derived	3.3	The compliance assessment and all waiver/deviation requests (i.e., tailoring) for requirements involving program/project/activity execution in this MPR shall receive the concurrence of the Implementing Chief Engineer, the CSO, and the Program/Project/Activity Manager.	CD				
4	MSFC Derived	3.3.1	The compliance assessment and all waivers and deviations shall also receive the concurrence of the Director of the MSFC Office responsible for managing the program/project/activity and the Engineering Director. The Directors may choose to delegate their concurrence authority down to a lower level, for specific programs, projects, or activities, provided that the compliance assessment does not include any Agency-level waivers/deviations.	CD				
5	MSFC Derived	3.3.2	For those programs, projects, and activities governed by the CMC (and those with Agency-level waiver/deviation), the compliance assessment and the waiver/deviation shall also receive the concurrence of the Associate Director, Technical, prior to review and approval by the Center Director, or designee.	CD				
6	MSFC Derived	3.3.3	Approvals for waivers and deviations to requirements involving program/project/activity execution shall be documented by the approvals of the appropriate approving authorities on the FA or Program/Project Plan and the associated compliance matrix.	CD				
7	NPR 7120.5: 3.5.1	3.3.4	Program/Project/Activity Managers shall obtain approval for waivers and deviations to requirements involving program/project/activity execution from the appropriate Agency-level authorities, in those cases where the approval authority has been retained at the Agency-level.	CD, OCE				
8	NPR 7120.5: 2.2.10	3.4	The completed compliance matrix shall be attached to the FA for space flight projects and SPP in Formulation, and/or to the Program Plan, or Project Plan, for programs or projects entering or in Implementation, and be submitted to OCE. The compliance assessment is approved along with the applicable agreement/planning document to which it is attached. For space flight projects and SPP the FA/compliance assessment is approved at MCR and SDR. For uncoupled, loosely coupled, and tightly-coupled programs, the Program Plan/compliance assessment is approved at SDR. For space flight projects, the Project Plan/compliance assessment is approved at SRR. For SSP, the Program Plan/compliance assessment is approved at SRR. For R&T Programs, the Program Plan/compliance assessment is approved at Formulation Review (FR). For TD Projects, the project plan/compliance assessment is approved at FR. For R&T Portfolio Projects, the project plan/compliance assessment is approved at FR. For activities, the compliance assessment is approved when the activity plan is approved by the appropriate Center governing authority.	CD, OCE				
9	MSFC Derived	3.5	Programs/projects/activities shall identify significant customization of best practices or guidance within their planned documentation.	CD				
10	MSFC Derived	3.6	The implementing chief engineer shall concur with the customization used by the program/project/activity.	CD				
11	NPR 7120.5: 2.1.4.1	3.7	The Center Director and Program/Project/Activity Manager shall establish a Category/Mission Type 1, 2, 3, 4, or 5 in accordance with Table 3-1 for each MSFC project and activity.	CD, OCE				
12	NPR 7120.5: 2.1.4.1	3.8	The Center Director and Program/Project Manager shall establish a Risk Classification for each MSFC payload project according to Table 3-2.	CD, OCE				
13	NPR 7120.5: 2.1.4.1	3.9	The Center Director and Program/Project Manager shall approve any deviations from the guidelines in Appendix B of NPR 8705.4 for the established risk classification, for each MSFC payload project..	CD, OCE				
14	NPR 7120.5: 2.3.3	3.10	All Center programs, projects, and Mission Type 4 activities shall be reviewed by the MSFC CMC, in accordance with MPR 7120.4, unless the governance has been specifically delegated down to the Directorate/Office level.	CD, OCE				
Chapter 4. Common Center Processes for all Programs/Projects								
4.1 Knowledge Management and Infusion of Lessons Learned								
15	MSFC Derived from NPD 7120.6: 5.d(4)(d)	4.1.1	Individuals or groups shall identify discrete, actionable observations that may have application to future projects.	CD				
16	MSFC Derived from NPD 7120.6: 5.d(4)(d)	4.1.7	Program/project/activity managers shall ensure review of lessons learned (referred by LLC) for knowledge infusion throughout the program/project life cycle.	CD				

Ref. No.	NPR No. and Section or MSFC Derived	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	Approvals Required for Tailoring	Program/Project Compliance			Approval Signatures for Tailoring
					Program/ Project Documentation	Comply? (Full, Tailored, or NA)	Rationale for Decisions, Comments, Waiver/Deviations	
4.2 Technical Standards								
17	NPR 7120.10, 3.1.1, 3.1.2, 3.3.1	4.2.1.1	Programs/projects/activities, in conjunction with the appropriate Technical Authority, shall select technical standards for use as program/project and contract requirements, giving preference to outcome-based, performance standards (as opposed to prescriptive, process-based design standards), according to the following order of priority: a. Standards imposed by legal requirements (e.g. regulations). b. Mandatory NASA Technical Standards (i.e. those imposed by NASA directives). c. VCS, domestic and international. d. Other Government (Non-NASA) Standards. e. Other NASA Technical Standards (i.e. those not imposed by NASA directives). f. MSFC Technical Standards.	CD, OCE				
18	NPR 7120.10, 3.3.b	4.2.1.2	Programs/projects/activities, in conjunction with the appropriate Technical Authority, shall evaluate those standards listed as "NASA-endorsed technical standards" for use as program/project and contract requirements.	CD, OCE				
19	NPR 7120.10, 3.1.2	4.2.1.3	Use of alternate standards shall be invoked through the program/project/activities technical requirements documents at the discretion of the implementing chief engineer and/or CSO.	CD, OCE				
20	NPR 7120.10, 3.2.1	4.2.1.4	When tailoring requirements in technical standards, programs/projects/activities shall document the changes with traceability to the original requirements, and obtain approval from the appropriate Technical Authority.	CD, OCE				
21	NPR 7120.10, 3.2.1.c, 3.3.1.d	4.2.1.5	Programs/projects/activities shall identify, assess, and document the impact of changes to technical standards being used as program/project and contract requirements.	CD, OCE				
22	NPR 7120.10, 3.1.3	4.2.1.6	Program/project/activities managers shall ensure review of lessons learned (referred by LLC) for applicability to current technical standards applications (see 4.1).	CD, OCE				
4.3 Software Engineering								
23	NPR 7150.2, P.2.1, P.2.3 (SWE-001)	4.3.1	All MSFC software development, maintenance, retirement, operations, management, acquisition, and assurance activities shall comply with requirements in NPR 7150.2. *Note: The software engineering requirements in NPR 7150.2 , and this MPR, section 4.3, are not applicable to software development, maintenance, operations, management, acquisition, and assurance activities started before September 27, 2004 (i.e., existing systems and subsystems . including any maintenance to products whose initial development started before September 27, 2004. The NASA Engineering Network, Software Engineering Community has the following references and aids: NASA-HDBK-2203, NASA Software Engineering Handbook, Software Classification Tool, Safety Critical Assessment Tool, and Compliance Matrices by Class. Compliance Matrices are located in software document repository at: https://nen.nasa.gov/web/software/documents.*	CD, OCE				
24	NPR 7150.2, 1.2.4 (SWE-005)	4.3.3	MSFC organizations responsible for software development, maintenance, retirement, operations, management, acquisition, or assurance activities shall establish, document, execute, and maintain their software processes.	CD, OCE				
25	NPD 7120.4, 1.f(4), NPR 2210.1	4.3.8	Programs/projects/activities releasing software shall follow the requirements in NPR 2210.1. *Note: NPR 2210.1addresses the release of software created by or for NASA to external entities for commercial, industrial, educational, and other Governmental purposes, with appropriate restrictions on the use and redistribution of the software. The responsibilities of programs/projects are summarized in section 1.8 of NPR 2210.1.*	CD, OCE				
26	MSFC Derived	4.3.10	Programs/projects/activities requesting relief from requirements in NPR 7150.2 for which the approval authority has been retained at the Agency-level, shall obtain concurrence of the Associate Director, Technical, prior to requesting approval from the Agency-level authorities.	CD				
4.4 Office of Safety and Mission Assurance Requirements								
27	MSFC Derived	4.4.2	PPA Manager and CSO utilize the OSMA requirements trace matrix to assess the OSMA requirements and their applicability, and ensure that the applicable requirements are implemented on their project, or relief is properly requested and approved.	CD				
28	MSFC Derived	4.4.3	For those PPA governed at the Directorate (or higher) level, the OSMA applicability assessment shall receive the concurrence of the Director, Safety Mission Assurance Directorate. The SMA Director may choose to delegate concurrence authority down to a lower level, for specific PPA's.	CD				
29	MSFC Derived	4.4.4	For requests for relief from OSMA requirements involving PPA execution, for which the approval authority is retained at the Agency or Center Director level, the PPA Managers shall obtain concurrence of the SMA Director, prior to requesting approval from the higher-level authorities.	CD				
30	MSFC Derived	4.4.5	For those PPA governed by the CMC, PPA Managers shall report a summary of OSMA applicability assessment to the Associate Director, Technical for concurrence.	CD				
31	MSFC Derived	4.4.6	For requests for relief from Agency requirements involving program/project/activity execution, for which the approval authority has been retained at the Agency-level, the Program/Project/Activity Managers shall obtain concurrence of the Associate Director, Technical, prior to requesting approval from the Agency-level authorities.	CD				
32	MSFC Derived	4.4.7	For requests for relief from Agency requirements involving program/project/activity execution, for which the approval authority is the MSFC Center Director, the Program/Project/Activity Managers shall obtain concurrence of the Associate Director, Technical, prior to approval of the Center Director, or designee.	CD				
Chapter 5. Space Flight Program/Project Life Cycle								
33	NPR 7120.5: 2.2.1	5.1	Programs and Projects for which MSFC has management responsibility shall follow the appropriate NASA life cycle as shown in Appendix F. UCLC programs follow the life cycle shown in Figure F-1. TC programs follow the life cycle shown in Figure F-2, SPP follow the life cycle shown in Figure F-3, and projects follow the life cycle shown in Figure F-4.	CD				
34	NPR 7120.5: 2.2.2	5.2	Programs/projects for which MSFC has management responsibility shall follow the MSFC Systems Engineering processes as documented in MPR 7123.1 with respect to the 17 systems engineering processes, the development of control plans in accordance with specified Data Requirement Description/Documents (DRDs), and the conduct of LCRs.	CD				
35	MSFC Derived	5.3	Program/project managers shall present requests for Center resource requirements to the CMC at KDPs (during formulation and implementation), commensurate with program/project parameters defined in the Formulation Authorization Document (FAD) and Program/Project Plans.	CD				
36	NPR 7120.5: 2.2.1	5.4	As programs, projects, and activities are implemented, they will be impacted by external forces (budget modifications, schedule and/or requirements changes) and internal situations (technical challenges, new requirements). When this occurs, programs, projects, and activities shall revisit the formulation phase to ensure program/project/activity planning is consistent with schedule commitments and resource availability.	CD				

Ref. No.	NPR No. and Section or MSFC Derived	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	Approvals Required for Tailoring	Program/Project Compliance			Approval Signatures for Tailoring
					Program/ Project Documentation	Comply? (Full, Tailored, or NA)	Rationale for Decisions, Comments, Waiver/Deviations	
37	NPR 7120.5: 2.2.1	5.4.1	PCAs, Program/Project Plans, and other planning data shall be modified as needed by programs, projects, and activities when impacted by external forces (as described in 5.4).	CD				
38	NPR 7120.5: 2.4.1.7	5.4.2	Programs and Category 1 and 2 projects shall be rebaselined if the estimated development cost exceeds the Agency Baseline Commitment (ABC) development cost by 30 percent or more, the NASA AA determines that events external to the Agency make a rebaseline appropriate; or the NASA AA determines that the program or project scope defined in the ABC has been changed or theTC program or project has been interrupted.	CD, OCFO				
39	NPR 7120.5: 2.2.5.3	5.6	The Center Director (or designee), the Program/Project Manager and the SRB (or IRT) chair shall assess the readiness to conduct an LCR (typically 30-90 days prior to the start of the LCR) by reviewing the entrance data package and reporting the results to the decision authority.	CD, OCE				
40	NPR 7120.5: 2.3.4	5.7	The results of each LCR shall be briefed by the SRB (or IRT) and the program/project manager to the appropriate management council per Table 3-1.	CD, OCE				
41	NPR 7120.5: 2.3.4	5.8	After the final LCR in a given life cycle phase, the Center Director and the Program Manager (for projects in their program) shall assess the readiness of a program or project to progress to the next phase of the life cycle (per the LCR objectives and expected maturity states in Appendix G), and provide their assessments and recommendations to the MDAA to support the Decision Authority's determination at the KDP.	CD, OCE				
42	NPR 7120.5: 2.4.1, 2.4.1.1	5.9	The results of the KDPs shall be documented in a decision memorandum that describes whether the program/project is approved to enter the next phase of the life cycle and the constraints and parameters within which the Agency, the program manager, and the project manager will operate, as well as, any plan changes that can be made without additional approval and any actions resulting from the KDP.	CD, OCE				
43	NPR 7120.5: 2.4.1.3, 2.4.1.5, 2.4.1.6	5.10	The decision memorandum shall include a total LCC (documented in the form of a target range during formulation, and in the form of an estimated number during implementation) and schedule estimate, which includes the Unallocated Future Expenses (UFE) or cost margin, and schedule margin that is managed above the program/project.	CD, OCE				
44	NPR 7120.5: 2.4.1.2	5.10.1	In addition, the decision memorandum shall also include a management agreement which establishes the parameters and authority for which the Program/Project Manager has control and is accountable to manage within.	CD, OCE				
45	NPR 7120.5: 2.3.1.1	5.10.2	The Program/Project Manager shall coordinate with the MDAA to obtain the NASA AA's approval for all ABCs for tightly-coupled and SPP (regardless of life-cycle cost) 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.	CD, OCE				
46	NPR 7120.5: 2.4.4.1	5.10.3	For tightly-coupled and SPP (regardless of life-cycle cost) and projects with an estimated life-cycle cost greater than $250 million, Program/Project Managers shall coordinate with the MDAA to ensure that appropriate justification is documented in the Decision Memorandum, whenever the program/project is funded at less than an equivalent of a 70 percent JCL.	CD, OCE				
47	NPR 7120.5: 2.4.1	5.11	The approved decision memorandum shall be attached to the Program Plan (if a program), the Project Plan, or the project FA as appropriate.	CD, OCE				
5.12 Program Formulation & Implementation								
48	MSFC Derived	5.12.1	CMC content for KDP presentations shall be documented per MPR 7120.4.	CD				
49	NPR 7120.5: 2.2.3	5.12.2.1	The Program Manager shall work with the MDAA and the Decision Authority to develop and approve the Program's FAD in accordance with NPR 7120.5, Appendix E, to include the approved cost and schedule margins.	CD				
50	NPR 7120.5: 2.2.6	5.12.2.2	Uncoupled and loosely coupled program products shall be as documented in Table 5.12-1.	CD, OCE				
51	NPR 7120.5: 2.2.6	5.12.2.3	Tightly coupled program products shall be as documented in Table 5.12-3.	CD, OCE				
52	NPR 7120.5: 2.2.6	5.12.2.4	SPP products shall be as documented in Table 5.12-5.	CD, OCE				
53	NPR 7120.5: 2.2.3	5.12.3	The PCA shall be developed and updated in accordance with NPR 7120.5, Appendix D.	CD				
54	NPR 7120.5: 2.2.3	5.12.4	The program plan shall be developed, updated, and approved in accordance with NPR 7120.5, Appendix G.	CD				
55	MSFC Derived	5.12.5	Program plan concurrence shall be obtained from the S&MA Directorate, Engineering Directorate, Office of Procurement, Office of the Chief Financial Officer, and other affected direct report offices.	CD				
56	NPR 7120.5: 2.2.6	5.12.6.1	UCLC program control plans shall be as documented in Table 5.12-2.	CD, OCE				
57	NPR 7120.5: 2.2.6	5.12.6.2	Tightly coupled program control plans shall be as documented in Table 5.12-4.	CD, OCE				
58	NPR 7120.5: 2.2.6	5.12.6.3	SPP control plans shall be as documented in Table 5.12-6.	CD, OCE				
59	MSFC Derived	5.12.6.4	Implementing Chief Engineer shall review the program plan and sign the SEMP.	CD				
60	MSFC Derived	5.12.7	Content for routine performance reports to the CMC shall be in accordance with MPR 7120.4.	CD				
61	NPR 7120.5: 3.7.1	5.12.8	Programs shall determine and document an approach that maximizes the use of the International System of Units (commonly known as the System Internationale or SI).	CD, OCE				
62	MSFC Derived	5.12.19	The Program Manager shall support content development of agreements with international and other government agencies.	CD				
63	NPR 7120.5: Table I-1	Table 5.12-1	(UC/LC products shall be …) FAD (baseline at SRR)	CD				
64	NPR 7120.5: Table I-1	Table 5.12-1	(UC/LC products shall be …) PCA (baseline at SDR)	CD				
65	NPR 7120.5: Table I-1	Table 5.12-1	(UC/LC products shall be …) Program Plan (baseline at SDR)	CD				
66	NPR 7120.5: Table I-1	Table 5.12-1	(UC/LC products shall be …) Mission Directorate requirements & constraints (baseline at SRR)	CD				
67	NPR 7120.5: Table I-1	Table 5.12-1	(UC/LC products shall be …) Traceability of program-level requirements on projects to the Agency strategic goals & MD requirements and constraints (baseline at SDR)	CD				
68	NPR 7120.5: Table I-1	Table 5.12-1	(UC/LC products shall be …) Documentation of driving ground rules & program assumptions (baseline at SDR)	CD				
69	NPR 7120.5: Table I-1	Table 5.12-1	(UC/LC products shall be …) Interagency and International Agreements (baseline at SDR)	CD				
70	NPR 7120.5: Table I-1	Table 5.12-1	(UC/LC products shall be …) ASM Minutes (final at SDR)	CD				

Ref. No.	NPR No. and Section or MSFC Derived	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	Approvals Required for Tailoring	Program/Project Compliance			Approval Signatures for Tailoring
					Program/ Project Documentation	Comply? (Full, Tailored, or NA)	Rationale for Decisions, Comments, Waiver/Deviations	
71	NPR 7120.5: Table I-1	Table 5.12-1	(UC/LC products shall be …) Risk mitigation plans & resources for significant risks (initial at SRR)	CD				
72	NPR 7120.5: Table I-1	Table 5.12-1	(UC/LC products shall be …) Documented cost & schedule baselines (Baseline at SDR)	CD				
73	NPR 7120.5: Table I-1	Table 5.12-1	(UC/LC products shall be …) Documentation of BOE-cost & schedule (baseline at SDR)	CD				
74	NPR 7120.5: Table I-1	Table 5.12-1	(UC/LC products shall be …) Documentation of performance against plan/baseline, including status/closure of formal actions from previous KDP (summary at SRR, SDR, PIR)	CD				
75	NPR 7120.5: Table I-1	Table 5.12-1	(UC/LC products shall be …) Plans for work to be accomplished during next life cycle phase (Plan at SDR, PIR)	CD				
76	NPR 7120.5: Table I-1	Table 5.12-2	(UC/LC control plans shall be …) Technical, Schedule, and Cost Control Plan (Baseline at SDR)	CD				
77	NPR 7120.5: Table I-1	Table 5.12-2	(UC/LC control plans shall be …) S&MA Plan (Baseline at SDR) (see NPDs 8730.5 and 8720.1, NPRs 8715.3, 8705.2, 8705.6 and 8735.2, and NASA STDs 8719.13 and 8739.8)	CD, OSMA				
78	NPR 7120.5: Table I-1	Table 5.12-2	(UC/LC control plans shall be …) Risk Management Plan (Baseline at SDR) (see NPR 8000.4)	CD, OSMA				
79	NPR 7120.5: Table I-1	Table 5.12-2	(UC/LC control plans shall be …) Acquisition Plan (Baseline at SDR)	CD				
80	NPR 7120.5: Table I-1	Table 5.12-2	(UC/LC control plans shall be …) Technology Development Plan (Baseline at SDR) (see NPD 7500.2 and NPR 7500.1)	CD, OCT				
81	NPR 7120.5: Table I-1	Table 5.12-2	(UC/LC control plans shall be …) SEMP (Baseline at SDR)	CD				
82	NPR 7120.5: Table I-1	Table 5.12-2	(UC/LC control plans shall be …) Review Plan (Baseline at SRR)	CD				
83	NPR 7120.5: Table I-1	Table 5.12-2	(UC/LC control plans shall be …) Environmental Management Plan (Baseline at SDR) (see NPR 8580.1)	CD, EMD				
84	NPR 7120.5: Table I-1	Table 5.12-2	(UC/LC control plans shall be …) CM Plan (Baseline at SDR)	CD				
85	NPR 7120.5: Table I-1	Table 5.12-2	(UC/LC control plans shall be …) Security Plan (Baseline at SDR) (see NPD 1600.2, NPRs 1600.1, 1040.1, 2810.1, and MPR 1600.1)	CD, OPS, OCIO				
86	NPR 7120.5: Table I-1	Table 5.12-2	(UC/LC control plans shall be …) Threat Summary (Baseline at SDR) (Contact Systems Engineering Office in MSFC Chief Engineer Office for additional information on applicability and approval requirements for these products which is determined on a case-by-case basis for each program/project)	CD, OCE				
87	NPR 7120.5: Table I-1	Table 5.12-2	(UC/LC control plans shall be …) Export Control Plan (Baseline at SDR) (see MPR 2190.1)	CD, OIIR				
88	NPR 7120.5: Table I-1	Table 5.12-2	(UC/LC control plans shall be …) Technology Transfer Plan (Baseline at SDR) (see NPR 2190.1)	CD, OIIR				
89	NPR 7120.5: Table I-1	Table 5.12-2	(UC/LC control plans shall be …) Education Plan (Baseline at SDR)	CD, OE				
90	NPR 7120.5: Table I-1	Table 5.12-2	(UC/LC control plans shall be …) Communication Plan (Baseline at SDR)	CD, OComm				
91	NPR 7120.5: Table I-1	Table 5.12-2	(UC/LC control plans shall be …) Lessons Learned Plan (Baseline at SDR) (see NPD 7120.4 and NPD 7120.6])	CD				
92	NPR 7120.5: Table I-2	Table 5.12-3	(TC products shall be …) FAD (baseline at SRR)	CD				
93	NPR 7120.5: Table I-2	Table 5.12-3	(TC products shall be …) PCA (baseline at PDR)	CD				
94	NPR 7120.5: Table I-2	Table 5.12-3	(TC Products shall be …) Program Plan (baseline at SDR)	CD				
95	NPR 7120.5: Table I-2	Table 5.12-3	(TC products shall be …) Mission Directorate requirements & constraints (Baseline at SRR)	CD				
96	NPR 7120.5: Table I-2	Table 5.12-3	(TC products shall be …) Traceability of program-level requirements on projects to the Agency strategic goals & MD requirements and constraints (baseline at SDR)	CD				
97	NPR 7120.5: Table I-2	Table 5.12-3	(TC products shall be …) Documentation of driving ground rules & program assumptions (baseline at SDR)	CD				
98	NPR 7120.5: Table I-2	Table 5.12-3	(TC products shall be …) Interagency and International Agreements (baseline at SDR)	CD				
99	NPR 7120.5: Table I-2	Table 5.12-3	(TC products shall be …) ASM Minutes (final at SDR)	CD				
100	NPR 7120.5: Table I-2	Table 5.12-3	(TC products shall be …) Risk mitigation plans & resources for significant risks (initial at SRR)	CD				
101	NPR 7120.5: Table I-2	Table 5.12-3	(TC products shall be …) Documented cost & schedule baselines (Baseline at PDR)	CD				
102	NPR 7120.5: Table I-2	Table 5.12-3	(TC products shall be …) Documentation of BOE-cost & schedule (baseline at PDR)	CD				
103	NPR 7120.5: Table I-2	Table 5.12-3	(TC products shall be …) JCL & supporting documentation (baseline at PDR)	CD, Cost Analysis Division				
104	NPR 7120.5: Table I-2	Table 5.12-3	(TC products shall be …) Shared infrastructure, staffing, and scarce material requirements & plans (Initial at SRR)	CD				
105	NPR 7120.5: Table I-2	Table 5.12-3	(TC products shall be …) Documentation of performance against plan/baseline, including status/closrue of formal actions from previous KDP (summary at all except SRR)	CD				
106	NPR 7120.5: Table I-2	Table 5.12-3	(TC products shall be …) Plans for work to be accomplished during next life cycle phase (plan at SRR, PDR, CDR, ORR, and DR)	CD				
107	NPR 7120.5: Table I-3	Table 5.12-4	(TC control plans shall be …) Technical, Schedule, and Cost Control Plan (Baseline at SDR)	CD				
108	NPR 7120.5: Table I-3	Table 5.12-4	(TC control plans shall be …) S&MA Plan (Baseline at SDR) (see NPDs 8730.5 and 8720.1, NPRs 8715.3, 8705.2, 8705.6 and 8735.2, and NASA Stds 8719.13 and 8739.8)	CD, OSMA				
109	NPR 7120.5: Table I-3	Table 5.12-4	(TC control plans shall be …) Risk Management Plan (Baseline at SDR) (see NPR 8000.4)	CD, OSMA				
110	NPR 7120.5: Table I-3	Table 5.12-4	(TC control plans shall be …) Acquisition Plan (Baseline at SDR)	CD				
111	NPR 7120.5: Table I-3	Table 5.12-4	(TC control plans shall be …) Technology Development Plan (Baseline at SDR) (see NPD 7500.2 and NPR 7500.1)	CD, OCT				

Ref. No.	NPR No. and Section or MSFC Derived	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	Approvals Required for Tailoring	Program/Project Compliance			Approval Signatures for Tailoring
					Program/ Project Documentation	Comply? (Full, Tailored, or NA)	Rationale for Decisions, Comments, Waiver/Deviations	
112	NPR 7120.5: Table I-3	Table 5.12-4	(TC control plans shall be …) SEMP (Baseline at SDR)	CD				
113	NPR 7120.5: Table I-3	Table 5.12-4	(TC control plans shall be …) V&V Plan (Baseline at PDR)	CD				
114	NPR 7120.5: Table I-3	Table 5.12-4	(TC control plans shall be …) IT Plan (Baseline at SDR) (see NPDs 2200.1 and 1440.6 and NPRs 2200.2, 1441.1, and 2810.1)	CD, OCIO				
115	NPR 7120.5: Table I-3	Table 5.12-4	(TC control plans shall be …) Review Plan (Baseline at SRR)	CD				
116	NPR 7120.5: Table I-3	Table 5.12-4	(TC control plans shall be …) Mission Operations Plan (Baseline at ORR)	CD				
117	NPR 7120.5: Table I-3	Table 5.12-4	(TC control plans shall be …) Environmental Management Plan (Baseline at PDR) (see NPR 8580.1)	CD, EMD				
118	NPR 7120.5: Table I-3	Table 5.12-4	(TC control plans shall be …) Integrated Logistics Support Plan (Baseline at PDR) (see NPD 7500.1)	CD, LMD				
119	NPR 7120.5: Table I-3	Table 5.12-4	(TC control plans shall be …) Science Data Management Plan (Baseline at ORR) (see NPD 2200.1 and NPRs 2200.2, 1441.1, and 8020.12)	CD, SMD				
120	NPR 7120.5: Table I-3	Table 5.12-4	(TC control plans shall be …) CM Plan (Baseline at SDR)	CD				
121	NPR 7120.5: Table I-3	Table 5.12-4	(TC control plans shall be …) Security Plan (Baseline at PDR) (see NPD 1600.2 NPRs 1600.1, 2810.1, 1040.1, and MPR 1600.1)	CD, OPS, OCIO				
122	NPR 7120.5: Table I-3	Table 5.12-4	(TC control plans shall be …) Threat Summary (Baseline at PDR) (Contact Systems Engineering Office in MSFC Chief Engineer Office for additional information on applicability and approval requirements for these products which is determined on a case-by-case basis for each program/project)	CD, OCE				
123	NPR 7120.5: Table I-3	Table 5.12-4	(TC control plans shall be …) Export Control Plan (Baseline at PDR) (see MPR 2190.1)	CD, OIIR				
124	NPR 7120.5: Table I-3	Table 5.12-4	(TC control plans shall be …) Technology Transfer Plan (Baseline at PDR) (see NPR 2190.1)	CD, OIIR				
125	NPR 7120.5: Table I-3	Table 5.12-4	(TC control plans shall be …) Education Plan (Baseline at PDR)	CD, OE				
126	NPR 7120.5: Table I-3	Table 5.12-4	(TC control plans shall be …) Communications Plan (Baseline at PDR)	CD, OComm				
127	NPR 7120.5: Table I-3	Table 5.12-4	(TC control plans shall be …) Lessons Learned Plan (Baseline at SDR) (see NPD 7120.4 and NPD 7120.6)	CD				
128	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) FAD (Baseline at MCR)	CD				
129	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) PCA (Baseline at PDR)	CD				
130	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) Traceability of Agency strategic goals and Mission Directorate requirements and constraints to program/project-level requirements and constraints (Baseline at SRR)	CD				
131	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) Documentation of driving mission, technical, and programmatic ground rules and assumptions (Baseline at SDR/MDR)	CD				
132	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) Partnerships and inter-agency and international agreements (Baseline at SDR/MDR for US partnerships & agreements; Baseline at PDR for international agreements)	CD				
133	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) ASM Minutes (final at SRR)	CD				
134	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) NEPA compliance documentation (Baseline at PDR) (see NPR 8580.1)	CD, EMD				
135	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) Mishap preparedness and contingency plan (Baseline at MRR/FRR(SMSR)) (see NPR 8621.1)	CD, OSMA				
136	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) Concept documentation (Approve at MCR)	CD				
137	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) Mission, spacecraft, ground, and payload architectures (Baseline mission and spacecraft architecture at SRR; Baseline ground and payload architectures at SDR/MDR)	CD				
138	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) Project level, system, and subsystem requirements (Baseline project-level and system-level requirements at SRR; Baseline subsystem requirements at PDR)	CD				
139	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) Design documentation (Baseline preliminary design at PDR; Baseline detailed design at CDR; Baseline As-built hardware and software at MRR/FRR)	CD				
140	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) Ops Concept (Baseline at PDR)	CD				
141	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) Technology readiness assessment documentation (Initial at MCR)	CD				
142	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) Engineering development assessment documentation (Initial at MCR)	CD				
143	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) Heritage assessment documentation (Initial at MCR)	CD				
144	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) Safety data packages (Baseline at CDR) (see NPRs 8715.3 and 8735.2)	CD, OSMA				
145	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) ELV Payload Safety Process Deliverables (Baseline at SIR) (see NPR 8715.7)	CD, OSMA				
146	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) V&V Report (Baseline at MRR/FRR)	CD				
147	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) Operations Handbook (Baseline at ORR)	CD				
148	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) Orbital Debris Assessment (Final ODAR at MRR/FRR (SMSR)) (see NPR 8715.6)	CD, OSMA				
149	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) End of Mission Plans (EOMP) (Baseline at MRR/FRR (SMSR)) (see NPR 8715.6/NASA-STD 8719.14, App B)	CD, OSMA				
150	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) Mission Report (final at DRR)	CD				
151	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) Formulation Agreement (Baseline for Phase A at MCR; Baseline for Phase B at SDR/MDR)	CD				
152	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) Program Plan (Baseline at SRR) (Program & Project Plans may be combined with approval of the MDAA)	CD				

Ref. No.	NPR No. and Section or MSFC Derived	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	Approvals Required for Tailoring	Program/Project Compliance			Approval Signatures for Tailoring
					Program/ Project Documentation	Comply? (Full, Tailored, or NA)	Rationale for Decisions, Comments, Waiver/Deviations	
153	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) Project Plan (Baseline at SRR) (Program & Project Plans may be combined with approval of the MDAA)	CD				
154	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) Plans for work to be accomplished during next implementation life cycle phase (Baseline at PDR for Phase C; Baseline at SIR for Phase D; Baseline at MRR/FRR for Phase E; Baseline at DR for Phase F)	CD				
155	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) Documentation of performance against FA or against plans for work to be accomplished during implementation phase, including performance against baselines and status/closure of formal actions from previous KDP (summary at all except SRR)	CD				
156	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) Project Baseline (Baseline at PDR)	CD				
157	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) Top Technical, cost, schedule, and safety risks, risk mitigation plans and associated resources (Initial at MCR)	CD				
158	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) Staffing requirements and plans (Initial at MCR)	CD				
159	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) Infrastructure requirements and plans, business case analysis for infrastructure; Alternative Future Use questionnaire (Form NF 1739) (Baseline for NF 1739/Sect A at SDR/MDR; Baseline for NF 1739/Section B at PDR) (see NPR 9250.1)	CD, FED, OCFO				
160	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) Schedule (Baseline IMS at PDR)	CD				
161	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) Cost estimate (Rsik informed or schedule-adjusted depending on phase) (Baseline at PDR)	CD				
162	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) BOE (cost & schedule) (Initial at MCR)	CD				
163	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) Confidence levels & supporting documentation (JCL at PDR)	CD, Cost Analysis Division				
164	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) External cost & schedule commitments (Baseline at PDR)	CD				
165	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) Cost analysis data requirement (Baseline at PDR)	CD, Cost Analysis Division				
166	NPR 7120.5: Table I-6	Table 5.12-5	(SPP products shall be …) Decommissioning/Disposal Plan (Baseline at DR)	CD				
167	NPR 7120.5: Table I-7	Table 5.12-6	(SPP control plans shall be …) Techncial, schedule, and cost control plan (Baseline at SDR/MDR)	CD				
168	NPR 7120.5: Table I-7	Table 5.12-6	(SPP control plans shall be …) S&MA Plan (Baseline at SRR) (see NPDs 8730.5 and 8720.1, NPRs 8715.3, 8705.2, 8705.6, and 8735.2, and NASA Stds 8719.13 and 8739.8)	CD, OSMA				
169	NPR 7120.5: Table I-7	Table 5.12-6	(SPP control plans shall be …) Risk Management Plan (Baseline at SRR) (see NPR 8000.4)	CD, OSMA				
170	NPR 7120.5: Table I-7	Table 5.12-6	(SPP control plans shall be …) Acquisition Plan (Baseline at SRR)	CD				
171	NPR 7120.5: Table I-7	Table 5.12-6	(SPP control plans shall be …) Technology Development Plan (Baseline at MCR) (see NPD 7500.2 and NPR 7500.1)	CD, OCT				
172	NPR 7120.5: Table I-7	Table 5.12-6	(SPP control plans shall be …) SEMP (Baseline at SRR)	CD				
173	NPR 7120.5: Table I-7	Table 5.12-6	(SPP control plans shall be …) IT Plan (Baseline SDR/MDR) (see NPDs 2200.1 and 1440.6 and NPRs 2200.2, 1441.1, 2800.1, and 2810.1)	CD, OCIO				
174	NPR 7120.5: Table I-7	Table 5.12-6	(SPP control plans shall be …) SW Management Plan (Baseline at SDR/MDR) (see NPR 7150.2 and NASA Std 8739.8)	CD				
175	NPR 7120.5: Table I-7	Table 5.12-6	(SPP control plans shall be …) V&V Plan (Baseline at PDR)	CD				
176	NPR 7120.5: Table I-7	Table 5.12-6	(SPP control plans shall be …) Review Plan (Baseline at SRR)	CD				
177	NPR 7120.5: Table I-7	Table 5.12-6	(SPP control plans shall be …) Mission Ops Plan (Baseline at ORR)	CD				
178	NPR 7120.5: Table I-7	Table 5.12-6	(SPP control plans shall be …) Evironmental Management Plan (Baseline at SDR/MDR) (see NPR 8580.1)	CD, EMD				
179	NPR 7120.5: Table I-7	Table 5.12-6	(SPP control plans shall be …) Integrated Logistics Support Plan (Baseline at PDR) (see NPD 7500.1)	CD, LMD				
180	NPR 7120.5: Table I-7	Table 5.12-6	(SPP control plans shall be …) Science Data Management Plan (Baseline at ORR) (see NPD 2200.1, and NPRs 2200.2 and 1441.1)	CD, SMD				
181	NPR 7120.5: Table I-7	Table 5.12-6	(SPP control plans shall be …) Integration Plan (Baseline at PDR)	CD				
182	NPR 7120.5: Table I-7	Table 5.12-6	(SPP control plans shall be …) Threat Summary (Baseline at PDR) (Contact Systems Engineering Office in MSFC Chief Engineer Office for additional information on applicability and approval requirements for these products which is determined on a case-by-case basis for each program/project)	CD, OCE				
183	NPR 7120.5: Table I-7	Table 5.12-6	(SPP control plans shall be …) CM Plan (Baseline at SRR)	CD				
184	NPR 7120.5: Table I-7	Table 5.12-6	(SPP control plans shall be …) Security Plan (Baseline at PDR) (see NPD 1600.2, NPRs 1600.1, 1040.1, and MPR 1600.1)	CD, OPS, OCIO				
185	NPR 7120.5: Table I-7	Table 5.12-6	(SPP control plans shall be …) Project Protection Plan (Baseline at PDR) (Contact Systems Engineering Office in MSFC Chief Engineer Office for additional information on applicability and approval requirements for these products which is determined on a case-by-case basis for each program/project)	CD				
186	NPR 7120.5: Table I-7	Table 5.12-6	(SPP control plans shall be …) Export Control Plan (Baseline at PDR) (see MPR 2190.1)	CD, OIIR				
187	NPR 7120.5: Table I-7	Table 5.12-6	(SPP control plans shall be …) Technology Transfer Plan (Baseline at PDR) (see NPR 2190.1)	CD, OIIR				
188	NPR 7120.5: Table I-7	Table 5.12-6	(SPP control plans shall be …) Lessons Learned Plan (Baseline at PDR) (see NPD 7120.4 and NPD 7120.6)	CD				
189	NPR 7120.5: Table I-7	Table 5.12-6	(SPP control plans shall be …) Human Rating Certification Pkg (Approve Certification at MRR/FRR) (see NPR 8705.2)	CD, OSMA				
190	NPR 7120.5: Table I-7	Table 5.12-6	(SPP control plans shall be …) Planetary Protection Plan (Certification at PDR) (see NPD 8020.7 and NPR 8020.12)	CD, SMD				

Ref. No.	NPR No. and Section or MSFC Derived	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	Approvals Required for Tailoring	Program/Project Compliance			Approval Signatures for Tailoring
					Program/ Project Documentation	Comply? (Full, Tailored, or NA)	Rationale for Decisions, Comments, Waiver/Deviations	
191	NPR 7120.5: Table I-7	Table 5.12-6	(SPP control plans shall be …) Nuclear Safety Launch Approval Plan (Baseline at SDR/MDR) (see NPR 8715.3)	CD, OSMA				
192	NPR 7120.5: Table I-7	Table 5.12-6	(SPP control plans shall be …) Range Safety Risk Mgt Process Documentation (Baseline at SIR) (see NPR 8715.5)	CD, OSMA				
193	MSFC Derived	Table 5.12-6	(SPP control plans shall be …) DM Plan (Baseline at SRR)	CD				
194	MSFC Derived	Table 5.12-6	(SPP control plans shall be …) Quality Plan (Baseline at PDR)	CD				
195	NPR 7120.5: Table I-7	Table 5.12-6	(SPP control plans shall be …) Education Plan (Baseline at PDR)	CD, OE				
196	NPR 7120.5: Table I-7	Table 5.12-6	(SPP control plans shall be …) Communication Plan (Baseline at PDR)	CD, OComm				
5.13 Project Formulation & Implementation								
197	MSFC Derived	5.13.1	CMC content for KDP presentation shall be in accordance with MPR 7120.4.	CD				
198	NPR 7120.5: 2.2.6	5.13.2	Project products shall be as documented in Table 5.13-1.	CD, OCE				
199	NPR 7120.5: 2.2.3	5.13.2.1	The Project Manager shall work with the MDAA and the Decision Authority to develop and approve the Project's FAD in accordance with NPR 7120.5, Appendix E, to include the approved cost and schedule margins.	CD				
200	NPR 7120.5: 2.2.3	5.13.3	Project plan preparation and approval shall be in accordance with NPR 7120.5, Appendix H	CD				
201	NPR 7120.5: 2.2.6	5.13.4	Project control plans shall be as documented in Table 5.13-2. Unless otherwise required, the control plans may be separate plans or included as sections in the project plan.	CD, OCE				
202	MSFC Derived	5.13.4.1	Implementing Chief Engineer shall review the project plan and the SEMP.	CD				
203	MSFC Derived	5.13.5	Content for routine performance reports to the CMC shall be in accordance with MPR 7120.4.	CD				
204	NPR 7120.5: 2.2.3	5.13.6	FA preparation and approval shall be in accordance with NPR 7120.5, Appendix F.	CD				
205	NPR 7120.5: 3.7.1	5.13.7	Projects shall determine and document an approach that maximizes the use of SI.	CD, OCE				
206	MSFC Derived	5.13.8	The Project Manager shall support content development of agreements with international and other government agencies.	CD				
207	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) FAD (Baseline at MCR)	CD				
208	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) Program Plan (Baseline at MCR)	CD				
209	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) Applicable Agency strategic goals (Baseline at MCR)	CD				
210	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) Documentation of program-level requirements and constraints on the project (from Program Plan) and stakeholder expectations, including mission objectives/goals and mission success criteria (Baseline at SRR)	CD				
211	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) Documentation of driving mission, technical, and programmatic ground rules and assumptions (Baseline at SDR/MDR)	CD				
212	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) Partnerships and inter-agency and international agreements (Baseline at SDR/MDR for US partnerships & agreements; Baseline at PDR for international agreements)	CD				
213	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) ASM Minutes (final at SRR)	CD				
214	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) NEPA compliance documentation (Baseline at PDR) (see NPR 8580.1)	CD, EMD				
215	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) Mishap preparedness and contingency plan (Baseline at MRR/FRR(SMSR)) (see NPR 8621.1)	CD, OSMA				
216	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) Concept documentation (Approve at MCR)	CD				
217	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) Mission, spacecraft, ground, and payload architectures (Baseline mission and spacecraft architecture at SRR; Baseline ground and payload architectures at SDR/MDR)	CD				
218	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) Project level, system, and subsystem requirements (Baseline project-level and system-level requirements at SRR; Baseline subsystem requirements at PDR)	CD				
219	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) Design documentation (Baseline preliminary design at PDR; Baseline detailed design at CDR; Baseline As-built hardware and software at MRR/FRR)	CD				
220	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) Ops Concept (Baseline at PDR)	CD				
221	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) Technology readiness assessment documentation (Initial at MCR)	CD				
222	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) Engineering development assessment documentation (Initial at MCR)	CD				
223	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) Heritage assessment documentation (Initial at MCR)	CD				
224	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) Safety data packages (Baseline at CDR) (see NPRs 8715.3 and 8735.2)	CD, OSMA				
225	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) ELV Payload Safety Process Deliverables (Baseline at SIR) (see NPR 8715.7)	CD, OSMA				
226	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) V&V Report (Baseline at MRR/FRR)	CD				
227	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) Operations Handbook (Baseline at ORR)	CD				
228	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) Orbital Debris Assessment (Final ODAR at MRR/FRR (SMSR)) (see NPR 8715.6)	CD, OSMA				
229	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) End of Mission Plans (EOMP) (Baseline at MRR/FRR (SMSR)) (see NPR 8715.6/NASA-STD 8719.14, App B)	CD, OSMA				
230	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) Mission Report (final at DRR)	CD				
231	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) Formulation Agreement (Baseline for Phase A at MCR; Baseline for Phase B at SDR/MDR)	CD				
232	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) Project Plan (Baseline at SRR)	CD				

Ref. No.	NPR No. and Section or MSFC Derived	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	Approvals Required for Tailoring	Program/Project Compliance			Approval Signatures for Tailoring
					Program/ Project Documentation	Comply? (Full, Tailored, or NA)	Rationale for Decisions, Comments, Waiver/Deviations	
233	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) Plans for work to be accomplished during next implementation life cycle phase (Baseline at PDR for Phase C; Baseline at SIR for Phase D; Baseline at MRR/FRR for Phase E; Baseline at DR for Phase F)	CD				
234	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) Documentation of performance against FA or against plans for work to be accomplished during implementation phase, including performance against baselines and status/closure of formal actions from previous KDP (summary at all except SRR)	CD				
235	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) Project Baseline (Baseline at PDR)	CD				
236	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) Top Technical, cost, schedule, and safety risks, risk mitigation plans and associated resources (Initial at MCR)	CD				
237	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) Staffing requirements and plans (Initial at MCR)	CD				
238	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) Infrastructure requirements and plans, business case analysis for infrastructure; Alternative Future Use questionnaire (Form NF 1739) (Baseline for NF 1739/Sect A at SDR/MDR; Baseline for NF 1739/Section B at PDR) (see NPR 9250.1)	CD, FED, OCFO				
239	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) Schedule (Baseline IMS at PDR)	CD				
240	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) Cost estimate (Rsik informed or schedule-adjusted depending on phase) (Baseline at PDR)	CD				
241	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) BOE (cost & schedule) (Initial at MCR)	CD				
242	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) Confidence levels & supporting documentation (JCL at PDR)	CD, Cost Analysis Division				
243	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) External cost & schedule commitments (Baseline at PDR)	CD				
244	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) Cost analysis data requirement (Baseline at PDR)	CD, Cost Analysis Division				
245	NPR 7120.5: Table I-4	Table 5.13-1	(Project products shall be …) Decommissioning/Disposal Plan (Baseline at DR)	CD				
246	NPR 7120.5: Table I-5	Table 5.13-2	(Project control plans shall be …) Techncial, schedule, and cost control plan (Baseline at SDR/MDR)	CD				
247	NPR 7120.5: Table I-5	Table 5.13-2	(Project control plans shall be …) S&MA Plan (Baseline at SRR) (see NPDs 8730.5 and 8720.1, NPRs 8715.3, 8705.2, 8705.6, and 8735.2, and NASA Stds 8719.13 and 8739.8)	CD, OSMA				
248	NPR 7120.5: Table I-5	Table 5.13-2	(Project control plans shall be …) Risk Management Plan (Baseline at SRR) (see NPR 8000.4)	CD, OSMA				
249	NPR 7120.5: Table I-5	Table 5.13-2	(Project control plans shall be …) Acquisition Plan (Baseline at SRR)	CD				
250	NPR 7120.5: Table I-5	Table 5.13-2	(Project control plans shall be …) Technology Development Plan (Baseline at MCR) (see NPD 7500.2 and NPR 7500.1)	CD, OCT				
251	NPR 7120.5: Table I-5	Table 5.13-2	(Project control plans shall be …) SEMP (Baseline at SRR)	CD				
252	NPR 7120.5: Table I-5	Table 5.13-2	(Project control plans shall be …) IT Plan (Baseline SDR/MDR) (see NPDs 2200.1 and 1440.6 and NPRs 2200.2, 1441.1, 2800.1, and 2810.1)	CD, OCIO				
253	NPR 7120.5: Table I-5	Table 5.13-2	(Project control plans shall be …) SW Management Plan (Baseline at SDR/MDR) (see NPR 7150.2 and NASA Std 8739.8)	CD				
254	NPR 7120.5: Table I-5	Table 5.13-2	(Project control plans shall be …) V&V Plan (Baseline at PDR)	CD				
255	NPR 7120.5: Table I-5	Table 5.13-2	(Project control plans shall be …) Review Plan (Baseline at SRR)	CD				
256	NPR 7120.5: Table I-5	Table 5.13-2	(Project control plans shall be …) Mission Ops Plan (Baseline at ORR)	CD				
257	NPR 7120.5: Table I-5	Table 5.13-2	(Project control plans shall be …) Evironmental Management Plan (Baseline at SDR/MDR) (see NPR 8580.1)	CD, EMD				
258	NPR 7120.5: Table I-5	Table 5.13-2	(Project control plans shall be …) Integrated Logistics Support Plan (Baseline at PDR) (see NPD 7500.1)	CD, LMD				
259	NPR 7120.5: Table I-5	Table 5.13-2	(Project control plans shall be …) Science Data Management Plan (Baseline at ORR) (see NPD 2200.1, and NPRs 2200.2 and 1441.1)	CD, SMD				
260	NPR 7120.5: Table I-5	Table 5.13-2	(Project control plans shall be …) Integration Plan (Baseline at PDR)	CD				
261	NPR 7120.5: Table I-5	Table 5.13-2	(Project control plans shall be …) CM Plan (Baseline at SRR)	CD				
262	NPR 7120.5: Table I-5	Table 5.13-2	(Project control plans shall be …) Security Plan (Baseline at PDR) (see NPD 1600.2, NPRs 1600.1 , 1040.1, and MPR 1600.1)	CD, OPS, OCIO				
263	NPR 7120.5: Table I-5	Table 5.13-2	(Project control plans shall be …) Project Protection Plan (Baseline at PDR) (Contact Systems Engineering Office in MSFC Chief Engineer Office for additional information on applicability and approval requirements for these products which is determined on a case-by-case basis for each program/project)	CD				
264	NPR 7120.5: Table I-5	Table 5.13-2	(Project control plans shall be …) Export Control Plan (Baseline at PDR) (see MPR 2190.1)	CD, OIIR				
265	NPR 7120.5: Table I-5	Table 5.13-2	(Project control plans shall be …) Technology Transfer Plan (Baseline at PDR) (see NPR 2190.1)	CD, OIIR				
266	NPR 7120.5: Table I-5	Table 5.13-2	(Project control plans shall be …) Lessons Learned Plan (Baseline at PDR) (see NPD 7120.4 and NPD 7120.6)	CD				
267	NPR 7120.5: Table I-5	Table 5.13-2	(Project control plans shall be …) Human Rating Certification Pkg (Approve Certification at MRR/FRR) (see NPR 8705.2)	CD, OSMA				
268	NPR 7120.5: Table I-5	Table 5.13-2	(Project control plans shall be …) Planetary Protection Plan (Certification at PDR) (see NPD 8020.7 and NPR 8020.12)	CD, SMD				
269	NPR 7120.5: Table I-5	Table 5.13-2	(Project control plans shall be …) Nuclear Safety Launch Approval Plan (Baseline at SDR/MDR) (see NPR 8715.3)	CD, OSMA				
270	NPR 7120.5: Table I-5	Table 5.13-2	(Project control plans shall be …) Range Safety Risk Mgt Process Documentation (Baseline at SIR) (see NPR 8715.5)	CD, OSMA				
271	MSFC Derived	Table 5.13-2	(Project control plans shall be …) DM Plan (Baseline at SRR)	CD				

Ref. No.	NPR No. and Section or MSFC Derived	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	Approvals Required for Tailoring	Program/Project Compliance			Approval Signatures for Tailoring
					Program/ Project Documentation	Comply? (Full, Tailored, or NA)	Rationale for Decisions, Comments, Waiver/Deviations	
272	MSFC Derived	Table 5.13-2	(Project control plans shall be …) Quality Plan (Baseline at PDR)	CD				
273	NPR 7120.5: Table I-5	Table 5.13-2	(Project control plans shall be …) Education Plan (Baseline at PDR)	CD, OE				
274	NPR 7120.5: Table I-5	Table 5.13-2	(Project control plans shall be …) Communication Plan (Baseline at PDR)	CD, OComm				
Chapter 6. Design to Cost								
275	MSFC Derived	6.1	Programs/projects shall manage and design to full LCC constraints.	CD				
276	MSFC Derived	6.2	As part of seeking authority to proceed, programs/projects, with the involvement of independent cost modeling, shall establish cost predictions and receive cost constraints from NASA sponsors. *Note: The requirement for independent cost modeling may be accomplished by utilizing the MSFC Office of Strategic Analysis and Communications (OSAC) cost modeling experts.*	CD				
277	MSFC Derived	6.3	Upon establishing feasible cost baselines, programs and projects shall manage to cost constraints and report margin status monthly to the Center Director via the CMC.	CD				
278	MSFC Derived	6.4	If the cost predictions exceed the cost constraints (including cost margins) following ATP, MSFC Engineering shall develop programmatic decision options for the Program/Project Manager that bring the program/project within cost constraints, with independent cost modeling to determine the probable magnitude of the overrun and the cost savings associated with descope options. *Note: The requirement for independent cost modeling may be accomplished by utilizing the MSFC Office of Strategic Analysis and Communications (OSAC) cost modeling experts. Note: If the program or project finds no options to meet cost constraints, the issue is elevated to the Center Director.*	CD				
279	MSFC Derived	6.5	Programs/projects shall allocate costs at all levels of the system decomposition.	CD				
280	MSFC Derived	6.6	The implementing chief engineer shall be responsible for reviewing design decisions at all WBS levels and assessing impacts using applicable criteria such as that included in 18.2, a-f.	CD				
281	MSFC Derived	6.7	If a design is predicted to exceed a cost allocation, the responsible designer shall prepare a decision package to define options to meet allocations.	CD				
282	MSFC Derived	6.8	Programs/projects shall identify the major cost drivers and perform a risk assessment on the cost drivers.	CD				
283	MSFC Derived	6.9	Cost prediction models shall be developed or approved with the involvement of independent cost modeling and be continually updated as the design and operations planning matures.	CD				
284	MSFC Derived	6.10	Designers (in-house or contracted) shall submit their designs for baselining (at system level through the piece part level) when the design is predicted to meet cost (recurring and non-recurring) estimates within acceptable levels of risk and its requirements are within the programmatic constraints, per Chapter 12.	CD				
285	MSFC Derived	6.11	After the design has become part of the technical baseline, continued design work shall be limited to one or more of the following cases: a. Designer requests funds to explore new designs to improve margins of cost, performance, schedule, risk, etc. where the expected return is greater than the investment. b. Further development of design details is authorized by the implementing program/project chief engineer leading to final design definition and documentation. c. Further analysis/test of the design is authorized by the implementing chief engineer in order to reduce uncertainties in predicted performance within discipline standard practice. d. Design changes are authorized to resolve issues or mitigate risk as documented in Chapter 16.	CD				
286	NPR 7120.5: 2.4.3, 2.4.3.1	6.12	Tightly coupled programs, SPP, and projects with estimated LCC >$250M shall develop cost and schedule estimates by KDP 0/KDP B using probabilistic analyses to provide a level of confidence that cost and schedule will be within a specified range.	CD, Cost Analysis Division				
287	NPR 7120.5: 2.4.3.2	6.13	By KDP I/KDP C, tightly coupled programs, SPP, and projects with estimated LCC > $250M shall develop a JCL analysis, based on the program/project's resource-loaded (i.e. cost-loaded) schedule and approved risks.	CD, Cost Analysis Division				
288	NPR 7120.5: 2.4.3.2	6.14	By KDP I/KDP C, TC programs, SPP, and projects with LCC > $250M shall generate a schedule-based JCL analysis (which includes approved risks) that meets the Decision Authority's approved JCL (70%, unless otherwise stated in the FAD).	CD, Cost Analysis Division				
289	NPR 7120.5: 2.4.5	6.15	Loosely coupled and uncoupled programs shall provide analysis of the program's risk at each project's KDP B and KDP C or when a project's ABC is rebaselined.	CD, Cost Analysis Division				
Chapter 7. Requirements, Compliance, and Verification								
290	MSFC Derived	7.1	Programs/projects shall develop technical requirements, program/project control documentation, and design documentation during formulation and implementation.	CD				
291	MSFC Derived	7.2	Technical requirements and contractual documentation, where the contractor provides evidence of compliance, shall be documented using verifiable "shall" statements.	CD				
292	MSFC Derived	7.3	Technical & design requirements' compliance reporting information shall be documented and presented to the CECB (or program/project CCB) for approval.	CD				
293	MSFC Derived	7.4	The CECB (or program/project CCB) shall approve the verification compliance data packages.	CD				
294	MSFC Derived	7.5	Verification compliance data packages shall contain waivers for any non-compliant baselined technical/design requirement, including the technical rationale and a risk assessment for the non-compliance.	CD				
295	MSFC Derived	7.6	Program/project and Center requirements compliance shall be subject to review at regular status and milestone reviews for each project.	CD				
Chapter 8. Work Breakdown Structure								
296	MSFC Derived	8.1	During program/project formulation, each program/project shall develop a preliminary WBS and accompanying dictionary.	CD				
297	MSFC Derived	8.2	During program/project implementation, each program/project shall develop a final WBS and accompanying dictionary.	CD				
298	NPR 7120.5: 2.2.2	8.3	8.3 Programs/projects shall ensure the WBS and WBS dictionary are developed in accordance with the templates for the standard Level 2 element names and content descriptions found in NPR 7120.5, Appendices G and H. The NASA WBS Handbook contains additional guidance which programs/projects may use to establish the WBS and accompanying dictionary.	CD				
299	MSFC Derived	8.4	Programs/projects shall define the WBS and WBS dictionary to the level necessary to implement and verify the work.	CD				
300	MSFC Derived	8.5	Each program's/project's WBS and WBS dictionary shall be approved by OSAC, for structure and completeness at WBS level 2, and by the MSFC OCFO at WBS level 1, for assignment of WBS numbers.	CD				

Ref. No.	NPR No. and Section or MSFC Derived	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	Approvals Required for Tailoring	Program/Project Compliance			Approval Signatures for Tailoring
					Program/ Project Documentation	Comply? (Full, Tailored, or NA)	Rationale for Decisions, Comments, Waiver/Deviations	
Chapter 9. Heritage Hardware and Software								
301	MSFC Derived	9.1	During formulation, programs/projects shall perform a complete review of all heritage hardware or software considered for use in an application or architecture different from its original design.	CD				
302	MSFC Derived	9.2	During program/project formulation, programs/projects shall perform a cost-versus-benefit analysis prior to baselining any heritage designs, hardware, software or ground support equipment in any new application or architecture.	CD				
Chapter 10. Acquisition and Make-or-Buy								
303	MSFC Derived	10.1	In order to maintain Center technical expertise and core capabilities, programs/projects shall evaluate (and consider using) Center technical capabilities to perform in-house and in-line work (such as analytical tasks or hardware/software design and delivery).	CD				
304	MSFC Derived	10.2	Programs/projects shall document "make or buy" decision analyses at all WBS levels when the expected value of the product or service is expected to exceed $5M.	CD				
305	MSFC Derived	10.2.1	The "make or buy" analyses shall identify the planned in-house work along with the planned acquisitions (including the relative breakout of labor and scope responsibilities for each), and include a statement describing benefits to the Center, and a justification for any out-of-house work that could be performed in-house.	CD				
306	MSFC Derived	10.2.2	The decision of in-house and contracted work shall be reflected in the MSFC program/project's SEMP, and conveyed to the contractor (through the Request for Proposal (RFP)), to include the scope of responsibilities for the NASA portion of the technical work.	CD				
307	MSFC Derived	10.2.3	The resulting contractor SEMP (produced by the contractor in response to the RFP) shall acknowledge and define the working relationships and interfaces for the contractor side of the interface.	CD				
308	NPR 7120.5: 2.2.3	10.3	Programs/projects shall prepare both a preliminary and a final acquisition plan per NPR 7120.5, Appendices G and H.	CD				
309	MSFC Derived	10.4	Early in formulation, programs/projects shall prepare a list of long lead items to be procured in Phase B.	CD				
310	MSFC Derived	10.4.1	The Program/Project Manager (or designee) shall approve the list of the program's/project's long-lead items to be procured in Phase B.	CD				
311	MSFC Derived	10.5	Early in the acquisition planning process, programs/projects shall inform industry and other partners of possible science, technology, and engineering opportunities.	CD				
312	MSFC Derived	10.6	Programs/projects shall prepare procurement requirements packages.	CD				
313	MSFC Derived	10.7	Programs/projects shall flow relevant MSFC requirements to contractors through the contracting process, and negotiate any known deviations prior to contract execution.	CD				
314	MSFC Derived	10.8	Procurement documents involving common buys of flight hardware shall be reviewed by all necessary program/project managers and S&MA managers prior to RFP issuance.	CD				
315	MSFC Derived	10.9	In-house procurements of flight, critical ground systems, and other critical item products and services shall be from approved sources.	CD				
Chapter 11. Government Insight and Oversight								
316	MSFC Derived	11.1	Programs/projects shall establish a management model for insight and oversight (refer to Table 11.1-1 for definition of standard penetration levels).	CD				
317	MSFC Derived	11.1.1	The program/project management team, including program/project manager, implementing chief engineer, and CSO shall hold deliberations to determine the insight/oversight model and plan.	CD				
318	MSFC Derived	11.1.2	11.1.2 The Center Director shall assist in determination of the insight level for the program/project management model for insight and oversight.	CD				
319	MSFC Derived	11.2	In the solicitations (e.g., RFPs), programs/projects shall provide clear written expectations on how the Government will conduct insight and oversight on the supplier's design and products, including sufficient detail of the approach to insight and oversight in order for the supplier to perform an assessment on safety, cost, schedule, and technical risks.	CD				
320	MSFC Derived	11.3	Prior to contractor negotiations, the program/project, Engineering and S&MA shall conduct a risk assessment of the selected supplier based on proposal input and NASA experience.	CD				
321	MSFC Derived	11.4	Programs/projects shall include contractual language in the SOW that enables contractor-to-NASA interaction and includes access by the Government to the supplier's tools, documents, standards, processes, and procedures.	CD				
322	MSFC Derived	11.5	Throughout the program/project life cycle, the program/project management team shall routinely assess the effectiveness of the insight and oversight management model(s).	CD				
323	MSFC Derived	11.6	The program/project management team shall assign insight and oversight leadership responsibilities.	CD				
324	MSFC Derived	11.7	Task Agreements for the Government's insight/oversight scope of work shall be developed in accordance with Chapter 13.	CD				
Chapter 12. Technical Baseline Control								
325	MSFC Derived	12.1	Prior to the control by a control board structure, the implementing chief engineer shall initially approve and issue technical documents.	CD				
326	MSFC Derived	12.2	Subsequently, the technical documents shall be formally controlled through a program/project control board structure.	CD				
327	MSFC Derived	12.3	Prior to baselining, Engineering shall maintain version control and track the applicability of draft versions of technical documentation used by the various technical disciplines.	CD				
Chapter 13. Task Agreements								
328	MSFC Derived	13.1	Program/Project Managers shall specify the format and content required in the program/project's task agreements.	CD				
329	MSFC Derived	13.2	Programs/projects shall document formal agreements between Program/Project Managers and the product or service provider organizations using task agreements.	CD				
330	MSFC Derived	13.3	Task agreements shall be baselined by program/project control boards.	CD				
331	MSFC Derived	13.4	All proposed changes to task agreements involving revisions to cost, schedule, deliverables, workforce levels, or any other substantive modification, shall be processed through the program/project control board for review of impacts and final approval.	CD				
332	MSFC Derived	13.5	Resource requirements from task agreements shall be included in the Center resource planning activity.	CD				
333	MSFC Derived	13.6	MSFC support tasks not identified in task agreements shall be negotiated through the Center resource planning activity.	CD				
Chapter 14. Systems Engineering and Integration (SE&I)								
334	MSFC Derived	14.1	SE&I shall be implemented by Engineering and function as a unique discipline with membership on the CECB, if a separate CECB is established by the program/project.	CD				
335	MSFC Derived	14.1.1	For those projects that do not establish a separate CECB, the SE&I function is covered by the implementing Chief Engineer's participation on the program/project CCB.	CD				

Ref. No.	NPR No. and Section or MSFC Derived	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	Approvals Required for Tailoring	Program/Project Compliance			Approval Signatures for Tailoring
					Program/ Project Documentation	Comply? (Full, Tailored, or NA)	Rationale for Decisions, Comments, Waiver/Deviations	
336	MSFC Derived	14.2	SE&I shall evaluate all project decision or change packages for cross-discipline and cross-hardware impacts.	CD				
337	MSFC Derived	14.3	As part of the CM process, SE&I shall ensure that all affected organizations have evaluated the change package for impacts with respect to their discipline responsibility.	CD				
338	MSFC Derived	14.4	SE&I system design responsibility shall include functional analysis, design synthesis, and interface design where the functional and physical interface crosses Engineering organizational design responsibility (e.g., propellant tank-to-feed system).	CD				
339	MSFC Derived	14.5	In cases where system interfaces cross element responsibilities (e.g., Engine to Stage), SE&I shall develop and control the interface definition and design through Interface Requirement Documents and ICDs.	CD				
340	MSFC Derived	14.6	ICDs shall contain the authoritative interface design basis for all requirements verification activities that involve the interface.	CD				
341	MSFC Derived	14.7	The lead discipline engineer (LDE) shall be responsible for the technical adequacy and verification of each program/project-level technical requirement within his/her discipline area.	CD				
342	MSFC Derived	14.8	The LDE shall ensure that the requirement and its verification compliance are approved by all affected Engineering and S&MA disciplines and the implementing program/project chief engineer.	CD				
343	MSFC Derived	14.9	MSFC programs/projects shall document the CM and DM implementation approaches for each control board in the Program/Project Plan or a stand-alone plan.	CD				
Chapter 15. Safety and Mission Assurance								
344	MSFC Derived	15.1	For in-house activities, programs/projects shall ensure that SMA performs the safety and mission assurance analyses.	CD				
345	MSFC Derived	15.2	For in-house activities, Engineering shall work with S&MA to identify the derived requirements, risk mitigations, inspections and hazard controls to be incorporated into verification plans and work authorizing documents used in manufacturing, assembly, and tests.	CD				
346	MSFC Derived	15.3	Programs/projects shall ensure that a CSO is named by S&MA.	CD				
347	MSFC Derived	15.4	Programs/projects shall ensure that the CSO is represented on program/project decision-making boards and any other forums or processes which may be associated with risk acceptance.	CD				
348	MSFC Derived	15.5	For critical in-house activities, programs/projects shall ensure that the S&MA assurance functions are implemented so that products and services are compliant with applicable requirements.	CD				
349	MSFC Derived	15.6	For prime-contracted activities, programs/projects shall ensure that S&MA defined assurance functions (via the insight and oversight processes) are performed to assure that products and services are compliant with applicable requirements.	CD				
350	MSFC Derived	15.7	For Category 1 projects/programs, the System Safety Technical Plan shall have the concurrence of the cognizant S&MA managers. Concurrence may be obtained by presenting the plan to the SMAC.	CD				
Chapter 16. Risk Management								
351	MSFC Derived	16.1	Risk shall be evaluated on a 5x5 matrix of likelihood and consequence.	CD				
352	MSFC Derived	16.1.1	The Program/Project Manager, the implementing Chief Engineer, and the CSO, shall have the authority to make the determination on risk items to be entered in the system and to adjust the likelihood and consequence levels.	CD				
353	MSFC Derived	16.2	Programs/projects shall assign a risk owner for each risk item for as long as the risk item remains open.	CD				
354	MSFC Derived	16.3	A risk owner shall present the following information (in addition to the 5x5 assessment) to the CECB and/or Project CCB: the tasks, funding, and schedule required to mitigate the risk and the impacts of not mitigating (technical, cost, schedule, safety).	CD				
355	MSFC Derived	16.4	Program/project implementing chief engineer shall make a decision (if within the designated level of authority) or a recommendation to the Program/Project Manager to: 1) mitigate the risk, 2) accept the risk, 3) watch the risk, 4) research the risk, or 5) close the risk.	CD				
356	MSFC Derived	16.4.1	If risk mitigation requires adding scope to the project, the project's cost, schedule and technical baseline, as well as project margins/UFE shall be updated to reflect this mitigation.	CD				
357	MSFC Derived	16.5	Programs/projects shall present top risk item(s) to the CMC as determined by the Program/Project Manager.	CD				
Chapter 17. Margin and Resource Management								
358	MSFC Derived	17.1	Programs/projects shall develop sponsor or program de-scope plans, which are included in the preliminary and final versions of the Program/Project Plan.	CD				
359	MSFC Derived	17.2	Programs/projects shall report to the sponsor any shortfall against the agency requirements baseline established at the time of KDP-C and identify option(s), with associated impacts, by which the baseline performance could be re-established through margin reduction.	CD				
360	MSFC Derived	17.3	Programs/projects shall determine, track, and actively manage technical, cost, and schedule margins throughout the life cycle of the program/project.	CD				
361	MSFC Derived	17.4	Programs/projects shall assess and report margins periodically and at major milestone reviews.	CD				
362	MSFC Derived	17.5	Programs/projects shall develop margin corrective action and mitigation plans when necessary.	CD				
363	MSFC Derived	17.6	The program/project manager shall provide estimates of UFE, or cost margin, to the Decision Authority.	CD				
364	MSFC Derived	17.7	The program/project manager shall control that portion of the UFE, or cost margins, assigned to the program/project by the Decision Authority in the Decision Memorandum.	CD				
365	MSFC Derived	17.8	During program/project formulation and implementation, programs/projects shall document the planned cost and schedule margin at life cycle key milestones.	CD				
366	MSFC Derived	17.9	Programs/projects shall assess their planned cost and schedule margins against the standard cost and schedule margins (as shown in Tables 17-1 through 17-3) and present the results to the Center Director, or designee, for approval, prior to life cycle key milestones.	CD				
Chapter 18. Trade Studies								
367	MSFC Derived	18.1	Program/project budgets shall include adequate resources to perform design trades as an integral part of the system design process.	CD				

Ref. No.	NPR No. and Section or MSFC Derived	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	Approvals Required for Tailoring	Program/Project Compliance			Approval Signatures for Tailoring
					Program/ Project Documentation	Comply? (Full, Tailored, or NA)	Rationale for Decisions, Comments, Waiver/Deviations	
368	MSFC Derived	18.2	As the system design matures, all design decisions shall be assessed for impacts, as a minimum, using the following Figures of Merit (FOM): a. Cost (Design, Development, Test & Evaluation and Operations) b. Safety c. System performance (as determined by requirements or resource allocations) d. Development schedule e. Operations timeline f. Risk.	CD				
369	MSFC Derived	18.3	The design organization that has lead or insight responsibility for the specific design shall ensure that FOM impacts are identified by working with the necessary disciplines.	CD				
370	MSFC Derived	18.4	When a trade study is identified, a trade recommendation package shall be developed by a trade study team.	CD				
371	MSFC Derived	18.5	All impacted Engineering and S&MA organizations, shall assess trade recommendation packages prior to presentation to the CECB or Project CCB.	CD				
372	MSFC Derived	18.6	The trade study team shall present the trade recommendation package to the CECB or Project CCB for decision.	CD				
373	MSFC Derived	18.7	The trade decision shall be documented in the technical baseline and considered final unless otherwise directed by the CECB or Project CCB.	CD				
374	MSFC Derived	18.8	Proposed re-opening or initiation of trade studies shall require approval by the CECB or Project CCB and be justified in a decision package.	CD				
375	MSFC Derived	18.9	Acceptable justification to reopen a trade study shall be based on one of the following criteria: a. The existing design has been found not to meet, or has a significant risk of not meeting, its requirements. b. The requirements have changed.	CD				
Chapter 19. New Technology Management								
376	MSFC Derived	19.1	The scope of this section includes the following capabilities that are considered to be TD: a. Any design option that has not been flight qualified or has evidence of questionable flight performance. b. Any flight qualified option that is being deployed in an environment or manner with no relevant successful flight history.	CD				
377	MSFC Derived	19.2	Programs/projects shall determine when new technology is sufficiently mature so that it no longer requires special consideration as a technology subject to the requirements of this section.	CD				
378	MSFC Derived	19.3	New technologies shall not be used unless the benefit is assessed to be worth the risk over mature technology solutions.	CD				
379	MSFC Derived	19.4	New technology management shall be integrated with the program/project risk management and trade study requirements.	CD				
380	MSFC Derived	19.5	As part of risk identification, the program/project shall identify any new technologies that are required in the initial system technical baseline configuration.	CD				
381	MSFC Derived	19.6	As the configuration matures throughout the development process, all design decisions shall be assessed for any additional risk that is introduced into the system, including technology maturation/integration risks.	CD				
382	MSFC Derived	19.7	Agency New Technology requirements shall be addressed by reporting the risks and mitigation activities driven by maturing new technologies.	CD				
Chapter 20. Modeling and Simulations								
383	MSFC Derived	20.1	M&S Producers and Users shall jointly categorize M&S.	CD				
384	MSFC Derived	20.1.1	Categorization shall be consistent with software classifications as described in NPR 7150.2, Appendix D.	CD				
385	NPR 7150.2: 3.4.6 (partial)	20.1.2	M&S required to perform qualification of flight software or flight equipment, or used to make a decision (the consequence of which impacts human safety or program/project-defined mission success criteria if the decision proves incorrect, and whose degree of influence in the decision is moderate, significant, or controlling, per NASA-STD-7009 Appendix A.2), shall be classified as Critical M&S.	CD				
386	MSFC Derived	20.2	M&S Producers and Users shall jointly define M&S acceptability criteria for intended use.	CD				
387	MSFC Derived	20.2.1	At a minimum, M&S shall comply with requirements indicated in NPR 7150.2, Appendix C for the categorization assigned in 20.1.1	CD				
388	MSFC Derived	20.3	M&S Producers and Users shall jointly determine credibility criteria of M&S results.	CD				
389	NPR 7150.2: 3.4.6 (partial)	20.3.1	Critical M&S shall comply with NASA-STD-7009.	CD				
390	MSFC Derived	20.4	M&S Producers and Users shall jointly determine CM and Data/Document Management (DM) requirements for M&S and M&S results.	CD				
391	MSFC Derived	20.5	M&S Producers shall provide indicated developmental and/or operational artifacts for accreditation and/or credibility assessments.	CD				
392	MSFC Derived	20.6	M&S Users shall assess/approve acceptability for use of M&S for the intended use.	CD				
393	NPR 7150.2: 3.4.6 (partial)	20.6.1	Critical M&S shall be formally accredited for their intended use.	CD				
394	MSFC Derived	20.7	M&S Users shall assess/approve adequacy of M&S results for credibility.	CD				
Chapter 21. Reviews								
395	MSFC Derived	21.1.1	(Programs/projects implement the requirements contained in MPR 7123.1.) The reviews shall include cost, schedule, risk, and technical data.	CD				
396	NPR 7120.5: 2.2.5	21.1.2	For all MSFC programs and for projects with LCC greater than $250 million, the MSFC Program/Project Manager shall include SRB participation in the following reviews; SRR, SDR/MDR, PDR, CDR, System Integration Review (SIR), Operations Readiness Review (ORR), and Program Implementation Review (PIR).	CD, OCE				
397	MSFC Derived	21.2	Programs/projects shall ensure adequate resources to support externally initiated reviews, including, but not limited to, the following: a. Program/project independent LCRs, including support to the governing PMC and Decision Authority at KDPs in the project life cycle. b. Audit of compliance with MSFC's applicable requirements and principles for space flight projects. c. MSFC assessment of progress in dispositioning risks in preparation for launch. d. MSFC assessment of project-specific significant risks. e. MSFC oversight at key milestones in the life cycle of project commitments to the sponsor.	CD				
398	MSFC Derived	21.2.1	The Center Director shall validate launch readiness for assigned programs/projects.	CD				

Ref. No.	NPR No. and Section or MSFC Derived	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	Approvals Required for Tailoring	Program/Project Compliance			Approval Signatures for Tailoring
					Program/ Project Documentation	Comply? (Full, Tailored, or NA)	Rationale for Decisions, Comments, Waiver/Deviations	
399	MSFC Derived	21.3	Programs/projects in collaboration with line organizations shall conduct periodic management reviews of in-house and contracted activities to assess technical, cost, and schedule performance.	CD				
400	MSFC Derived	21.5	The Review Plan shall be reviewed and concurred with by the MSFC Chief Engineer's Office, but the program/project Delegated Governing Authority (DGA) has final approval.	CD				
401	MSFC Derived	21.6	The program/project implementing chief engineer and the CSO shall assign mandatory reviewer organizations from Engineering, and S&MA, as required to support LCRs.	CD				
402	MSFC Derived	21.7	Mandatory review organizations shall review all review items against the review entrance and success criteria that are affected by that organization's discipline responsibility.	CD				
403	MSFC Derived	21.8	Mandatory review organizations shall assign reviewers who were not involved in the development of the review item and did not review the item for release into the review.	CD				
404	MSFC Derived	21.9	Mandatory reviewing organizations shall submit the following responses to the review: a. A list of review items reviewed by the organization b. Review discrepancies, if any, found by the organization c. Concurrence sheet that the review, upon discrepancy resolution, meets each review entrance and success criterion with respect to the organizational discipline responsibility, or rationale to support a non-concurrence.	CD				
405	MSFC Derived	21.10	The Program/Project Manager shall establish a budget and acquisition mechanism for independent reviewers.	CD				
Chapter 22. Earned Value Management (EVM)								
406	NPR 7120.5: 2.2.8, 2.2.8.1	22.1	In-house design and development tasks with expected costs in excess of $20M shall implement an EVM system that complies with the guidelines in ANSI/EIA-748, Standard for Earned Value Management Systems.	CD, OCE				
407	NPR 7120.5: 2.2.8.2	22.2	For programs/projects requiring EVM (i.e. projects in phases C and D, and programs at the discretion of the MDAA, with a life-cycle cost greater than $20 million and Phase E project modifications, enhancements, or upgrades with an estimated development cost greater than $20 million), the program/project shall support the MD conducted pre-approval integrated baseline review as part of their preparations for KDP C to ensure that the program/project's work is properly linked with its cost, schedule, and risk and that the management processes are in place to conduct program/project-level EVM.	CD, OCE				
Chapter 23. Managing Product Data Throughout the Life-Cycle								
408	MSFC Derived	23.1	The Center CIO provides tools/applications for programs/projects to use to manage their product related data. The tools currently available include the Enhanced Integrated Collaborative Environment (ICE-E) Windchill and SharePoint.	Program/ Project Chief Engineer				
409	MSFC Derived	23.2	The program/project may use Center provided tools, or they may use MD/Agency provided tools when such usage will save cost, satisfy stakeholder needs/objectives, or no Center tool/capability exists.	Program/ Project Chief Engineer				
410	MSFC Derived	23.3	It is recommended that programs and projects should consider, and reflect within their program/project planning, the guidance contained in this chapter (see MPR 7120.1) related to establishing a product data management process early in the lifecycle, defining product and data architectures, and managing product definition, and other product related data.	Program/ Project Chief Engineer				
Chapter 29. MSFC Information Technology and Institutional Infrastructure Program and Project Management Requirements								
411	NPR 7120.7 (NID 7120-99): 1.2.2.a(1) (partial)	29.1	All MSFC IT activities that meet the definition of highly specialized IT shall follow the requirements of chapters 1-23 of this document, with tailoring as required and appropriate.	CD, OCE				

C.2 R&T PROGRAM/PROJECT COMPLIANCE MATRIX TEMPLATE

Note: The compliance matrix is to be attached to the Program/Project (P/P) Plan (see 3.4). This compliance matrix template is also available on the MIDL under the P/P Documents link.

Ref. No.	NPR No. & Section or MSFC Derived	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	Approvals Required for Tailoring	Program/Project Compliance			Approval Signatures for Tailoring
					Program/ Project Documentation	Comply? (Full, Tailored, or NA)	Rationale for Decisions, Comments, or Waiver/Deviations	
Chapter 3. MSFC Assessment of Compliance and Governance								
1	MSFC Derived	3.1	MSFC programs/projects/activities shall submit a compliance assessment for MPR 7120.1 to the MSFC Chief Engineer's Office.	CD				
2	MSFC Derived	3.2	The MSFC Chief Engineer's Office shall assess and concur with the program's/project's/activity's compliance assessment (see 3.4 for approval schedule).	CD				
3	MSFC Derived	3.3	The compliance assessment and all waiver/deviation requests (i.e., tailoring) for requirements involving program/project/activity execution in this MPR shall receive the concurrence of the Implementing Chief Engineer, the CSO, and the Program/Project/Activity Manager.	CD				
4	MSFC Derived	3.3.1	The compliance assessment and all waivers and deviations shall also receive the concurrence of the Director of the MSFC Office responsible for managing the program/project/activity and the Engineering Director. The Directors may choose to delegate their concurrence authority down to a lower level, for specific programs, projects, or activities, provided that the compliance assessment does not include any Agency-level waivers/deviations.	CD				
5	MSFC Derived	3.3.2	For those programs, projects, and activities governed by the CMC (and those with Agency-level waiver/deviation), the compliance assessment and the waiver/deviation shall also receive the concurrence of the Associate Director, Technical, prior to review and approval by the Center Director, or designee.	CD				
6	MSFC Derived	3.3.3	Approvals for waivers and deviations to requirements involving program/project/activity execution shall be documented by the approvals of the appropriate approving authorities on the FA or Program/Project Plan and the associated compliance matrix.	CD				
7	NPR 7120.8: 3.11	3.3.4	Program/Project/Activity Managers shall obtain approval for waivers and deviations to requirements involving program/project/activity execution from the appropriate Agency-level authorities, in those cases where the approval authority has been retained at the Agency-level.	CD, OCE				
8	MSFC Derived	3.4	The completed compliance matrix shall be attached to the FA for space flight projects and SSP in Formulation, and/or to the Program Plan, or Project Plan, for programs or projects entering or in Implementation, and be submitted to OCE. The compliance assessment is approved along with the applicable agreement/planning document to which it is attached. For space flight projects and SSP the FA/compliance assessment is approved at MCR and SDR. For uncoupled, loosely coupled, and tightly-coupled programs, the Program Plan/compliance assessment is approved at SDR. For space flight projects, the Project Plan/compliance assessment is approved at SRR. For SPP, the Program Plan/compliance assessment is approved at SRR. For R&T Programs, the Program Plan/compliance assessment is approved at Formulation Review (FR). For TD Projects, the project plan/compliance assessment is approved at FR. For R&T Portfolio Projects, the project plan/compliance assessment is approved at FR. For activities, the compliance assessment is approved when the activity plan is approved by the appropriate Center governing authority.	CD				
9	MSFC Derived	3.5	Programs/projects/activities shall identify significant customization of best practices or guidance within their planned documentation.	CD				
10	MSFC Derived	3.6	The implementing chief engineer shall concur with the customization used by the program/project/activity.	CD				
11	MSFC Derived	3.7	The Center Director and Program/Project/Activity Manager shall establish a Category/Mission Type 1, 2, 3, 4, or 5 in accordance with Table 3-1 for each MSFC project and activity.	CD				
12	NPR 7120.8: 3.1.3, 4.1.1.3, 5.1.1.3	3.10	All Center programs, projects, and Mission Type 4 activities shall be reviewed by the MSFC CMC, in accordance with MPR 7120.4, unless the governance has been specifically delegated down to the Directorate/Office level.	CD, OCE				
Chapter 4. Common Center Processes for all Programs/Projects								
4.1 Knowledge Management and Infusion of Lessons Learned								
13	MSFC Derived from NPD 7120.6: 5.d(4)(d)	4.1.1	Individuals or groups shall identify discrete, actionable observations that may have application to future projects.	CD				
14	MSFC Derived from NPD 7120.6: 5.d(4)(d)	4.1.7	Program/project/activity managers shall ensure review of LL (referred by LLC) for knowledge infusion throughout the program/project life cycle.	CD				
4.2 Technical Standards								
15	NPR 7120.10, 3.1.1, 3.1.2, 3.3.1	4.2.1.1	Programs/projects/activities, in conjunction with the appropriate Technical Authority, shall select technical standards for use as program/project and contract requirements, giving preference to outcome-based, performance standards (as opposed to prescriptive, process-based design standards), according to the following order of priority: a. Standards imposed by legal requirements (e.g. regulations). b. Mandatory NASA Technical Standards (i.e. those imposed by NASA directives). c. VCS, domestic and international. d. Other Government (Non-NASA) Standards. e. Other NASA Technical Standards (i.e. those not imposed by NASA directives). f. MSFC Technical Standards.	CD, OCE				
16	NPR 7120.10, 3.3.b	4.2.1.2	Programs/projects/activities, in conjunction with the appropriate Technical Authority, shall evaluate those standards listed as "NASA-endorsed technical standards" for use as program/project and contract requirements.	CD, OCE				
17	NPR 7120.10, 3.1.2	4.2.1.3	Use of alternate standards shall be invoked through the program/project/activities technical requirements documents at the discretion of the implementing chief engineer and/or CSO.	CD, OCE				

Ref. No.	NPR No. & Section or MSFC Derived	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	Approvals Required for Tailoring	Program/Project Compliance			Approval Signatures for Tailoring
					Program/ Project Documentation	Comply? (Full, Tailored, or NA)	Rationale for Decisions, Comments, or Waiver/Deviations	
18	NPR 7120.10, 3.2.1	4.2.1.4	When tailoring requirements in technical standards, programs/projects/activities shall document the changes with traceability to the original requirements, and obtain approval from the appropriate Technical Authority.	CD, OCE				
19	NPR 7120.10, 3.2.1.c, 3.3.1.d	4.2.1.5	Programs/projects/activities shall identify, assess, and document the impact of changes to technical standards being used as program/project and contract requirements.	CD, OCE				
20	NPR 7120.10, 3.1.3	4.2.1.6	Program/project/activities managers shall ensure review of LL (referred by LLC) for applicability to current technical standards applications (see 4.1).	CD, OCE				
4.3 Software Engineering								
21	NPR 7150.2, P.2.1, P.2.3 (SWE-001)	4.3.1	All MSFC software development, maintenance, retirement, operations, management, acquisition, and assurance activities shall comply with requirements in NPR 7150.2. *Note: The software engineering requirements in NPR 7150.2 , and this MPR, section 4.3, are not applicable to software development, maintenance, operations, management, acquisition, and assurance activities started before September 27, 2004 (i.e., existing systems and subsystems . including any maintenance to products whose initial development started before September 27, 2004. The NASA Engineering Network, Software Engineering Community has the following references and aids: NASA-HDBK-2203, NASA Software Engineering Handbook, Software Classification Tool, Safety Critical Assessment Tool, and Compliance Matrices by Class. Compliance Matrices are located in software document repository at: https://nen.nasa.gov/web/software/documents.*	CD, OCE				
22	NPR 7150.2, 1.2.4 (SWE-005)	4.3.3	MSFC organizations responsible for software development, maintenance, retirement, operations, management, acquisition, or assurance activities shall establish, document, execute, and maintain their software processes.	CD, OCE				
23	NPD 7120.4, 1.f(4), NPR 2210.1	4.3.8	Programs/projects/activities releasing software shall follow the requirements in NPR 2210.1. *Note: NPR 2210.1addresses the release of software created by or for NASA to external entities for commercial, industrial, educational, and other Governmental purposes, with appropriate restrictions on the use and redistribution of the software. The responsibilities of programs/projects are summarized in section 1.8 of NPR 2210.1.*	CD, OCE				
24	MSFC Derived	4.3.10	Programs/projects/activities requesting relief from requirements in NPR 7150.2 for which the approval authority has been retained at the Agency-level, shall obtain concurrence of the Associate Director, Technical, prior to requesting approval from the Agency-level authorities.	CD				
4.4 Office of Safety and Mission Assurance Requirements								
25	MSFC Derived	4.4.2	PPA Manager and CSO utilize the OSMA requirements trace matrix to assess the OSMA requirements and their applicability, and ensure that the applicable requirements are implemented on their project, or relief is properly requested and approved.	CD				
26	MSFC Derived	4.4.3	For those PPA governed at the Directorate (or higher) level, the OSMA applicability assessment shall receive the concurrence of the Director, Safety Mission Assurance Directorate. The SMA Director may choose to delegate concurrence authority down to a lower level, for specific PPA's.	CD				
27	MSFC Derived	4.4.4	For requests for relief from OSMA requirements involving PPA execution, for which the approval authority is retained at the Agency or Center Director level, the PPA Managers shall obtain concurrence of the SMA Director, prior to requesting approval from the higher-level authorities.	CD				
28	MSFC Derived	4.4.5	For those PPA governed by the CMC, PPA Managers shall report a summary of OSMA applicability assessment to the Associate Director, Technical for concurrence.	CD				
29	MSFC Derived	4.4.6	For requests for relief from Agency requirements involving program/project/activity execution, for which the approval authority has been retained at the Agency-level, the Program/Project/Activity Managers shall obtain concurrence of the Associate Director, Technical, prior to requesting approval from the Agency-level authorities.	CD				
30	MSFC Derived	4.4.7	For requests for relief from Agency requirements involving program/project/activity execution, for which the approval authority is the MSFC Center Director, the Program/Project/Activity Managers shall obtain concurrence of the Associate Director, Technical, prior to approval of the Center Director, or designee.	CD				
Chapter 24. General Research and Technology (R&T) Program/Project Management Requirements								
31	NPR 7120.8 P.2.b	24.2.1	(R&T programs, projects, and activities shall be managed using chapters 1-23 in lieu of chapters 24-27, when: ...) The R&T is directly funded by a space flight program/project; and the space flight mission's success and schedule are directly tied to the success of the R&T, or ...	CD, OCE				
32	MSFC Derived	24.2.2	(R&T programs, projects, and activities shall be managed using Chapters 1-23 in lieu of Chapters 24-27, when: ...) The R&T is a large scale (i.e. LCC > $250 million) development project.	CD				
33	NPR 7150.2, P.2.1	24.3	Software engineering activities for R&T programs and projects shall be performed in accordance with NPR 7150.2. This includes all software acquisition, development, maintenance, retirement, operations, and management of the software throughout the entire software lifecycle.	CD, OCE				
34	MSFC Derived	24.4	R&T programs, projects, and activities for which MSFC has management responsibility shall assess the seventeen systems engineering processes, as described in MPR 7123.1, to determine applicability of each process for their particular R&T program, project, or activity, complete the compliance matrix for those that are determined applicable, present the assessment and compliance results for approval by the Director, Engineering Directorate, who will invoke the EMC as necessary, and follow the requirements in MPR 7123.1 for those processes determined applicable.	CD				
35	MSFC Derived	24.5	All R&T development efforts with TRL levels greater than 5 shall be managed as TD Projects.	CD				
36	MSFC Derived	24.6	R&T Portfolio Projects shall be limited to TRL levels 1 through 5.	CD				
37	NPR 7120.8 3.10.1	24.8	Anyone on the NASA team (including the Program and Project Leads) who receives allegations of R&T misconduct that may have occurred within or outside NASA (on NASA sponsored R&T) shall notify the NASA Inspector General and Center Management.	CD, OCE				
Chapter 25. Research and Technology (R&T) Program Life Cycle Requirements								
38	NPR 7120.8 3.3.1.1	25.1	R&T programs for which MSFC has management responsibility shall follow the NASA life cycle as shown in Figure 25-1.	CD, OCE				
39	NPR 7120.8 3.3.1.1	25.1.1	The R&T Program Lead shall formulate and implement the R&T Program, including the minimum set of reviews, technical data, and planning specified in this chapter, assign TD Project Leads and R&T Portfolio Project Leads to manage their respective projects (in coordination with the applicable Center Directors), and manage any project formulation activities that are required while in the Program's Formulation Phase.	CD, OCE				
40	NPR 7120.8 3.1.3	25.2	The R&T Program Lead shall conduct reviews required by the governing PMC, the CMC, the Acquisition Strategy Planning (ASP) meeting, the Acquisition Strategy Meeting (ASM), the Procurement Strategy Meeting (PSM), and the Special Independent Assessments.	CD, OCE				

Ref. No.	NPR No. & Section or MSFC Derived	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	Approvals Required for Tailoring	Program/Project Compliance			Approval Signatures for Tailoring
					Program/ Project Documentation	Comply? (Full, Tailored, or NA)	Rationale for Decisions, Comments, or Waiver/Deviations	
41	NPR 7120.8 3.1.4	25.3	For R&T Programs, the governing PMC and the DA for each KDP shall be as defined in Table 25-1.	CD, OCE				
42	NPR 7120.8 3.3.1.1	25.3.1	R&T Programs shall produce the required technical data and plannning as documented in Table 25-2. *Note: Table 25-2 includes products data/planning required by NPR 7120.8 and those added by MSFC (shown in green).*	CD, OCE				
43	NPR 7120.8 3.3.1.6.1	Table 25-2	(R&T Program technical data/planning shall be …) Formulation Authorization Document (FAD) (Baseline at KDP 0)	CD, OCE				
44	NPR 7120.8 3.3.3.1.2	Table 25-2	(R&T Program technical data/planning shall be …) Program Commitment Agreement (PCA) (Baseline at FR)	CD, OCE				
45	NPR 7120.8 3.3.3.2.2	Table 25-2	(R&T Program technical data/planning shall be …) R&T Program Plan (Baseline at FR)	CD, OCE				
46	NPR 7120.8 3.3.3.1.3.e	Table 25-2	(R&T Program technical data/planning shall be …) Interagency and International Agreements (Baseline at FR)	CD, OCE				
47	NPR 7120.8 3.3.1.5	Table 25-2	(R&T Program technical data/planning shall be …) Gap analysis (literature search) (Baseline at FR)	CD, OCE				
48	NPR 7120.8 3.3.3.3, 3.4.1	Table 25-2	(R&T Program technical data/planning shall be …) TOR (Baseline at FR)	CD, OCE				
49	MSFC Derived	Table 25-2	(R&T Program technical data/planning shall be …) Systems Engineering Applicability Assessment (EMC approved) (Baseline at FR)	CD				
50	NPR 7120.8 3.3.5.2.h	Table 25-2	(R&T Program products shall be …) Documentation (from subordinate projects) of performance against plan/baseline, including status/closure of formal actions from previous KDP. (Summary at FR, SR)	CD, OCE				
51	NPR 7120.8 3.3.5.2.d, 3.3.5.2.g, & 3.3.5.2.j	Table 25-2	(R&T Program products shall be …) Plans for work to be accomplished during next life cycle phase (from subordinate projects). (Plan at FR, SR)	CD, OCE				
52	NPR 7120.8 3.3.1.6.1	25.4.1	The R&T Program Lead shall create the R&T Program FAD using the template provided in Appendix C of NPR 7120.8 as guidance.	CD, OCE				
53	NPR 7120.8 3.3.1.6.2	25.4.1.1	At a minimum, the R&T Program FAD shall: a. Contain a statement of purpose for the proposed R&T Program and define its relationship to the Agency's vision and mission, as defined by NPD 1001.0, NASA Strategic Plan, and its alignment with NASA and/or MSFC technology roadmaps. b. Establish the scope of work to be accomplished to at least the project level prior to completion of the Pre-Formulation. c. Provide initial constraints, including resources, schedule, and participating organizations within and external to NASA, including international partnerships. d. Identify the Program Lead who will manage the Formulation effort. e. Define the approach, resources, and reviews required to conduct R&T Program formulation and implementation.	CD, OCE				
54	NPR 7120.8 3.3.3.1.2, 3.3.3.1.4	25.5.1	The Program Lead shall create the R&T PCA, using the template provided in Appendix D of NPR 7120.8 as guidance, and update it every two years (or as changes warrant).	CD, OCE				
55	NPR 7120.8 3.3.3.1.3	25.5.1.1	As a minimum, an R&T PCA shall: a. Define the broad R&T Program objectives and its relationship to the Agency's vision and mission, as defined by NPD 1001.0, NASA Strategic Plan, and its alignment with NASA and/or MSFC technology roadmaps. b. Summarize the technical performance metrics with goals and minimum thresholds needed to achieve the R&T Program objectives. c. Identify the Program Lead who will manage the implementation effort. d. Identify schedule, cost, safety, and risk factors. e. Explain the involvement of R&T Program participants within and external to NASA, including international partnerships and a listing of the specific agreements to be concluded. f. Specify the independent reviews that will be performed during the life cycle of the R&T Program. g. Define any optional KDPs (KDP II, III, IV, etc.) required by the Program DA during Implementation (the Program DA may determine that optional KDPs are not needed).	CD, OCE				
56	NPR 7120.8 3.3.3.2.2, 3.3.3.2.7, 3.3.3.2.8	25.5.2	The Program Lead shall create the R&T Program Plan, using the template provided in Appendix E of NPR 7120.8 as guidance, update it every two years (or as required), and ensure it is consistent with the PCA.	CD, OCE				
57	NPR 7120.8 3.3.3.2.3	25.5.2.1	As a minimum, an R&T Program Plan shall: a. Define the R&T Program goals and specific objectives with clear traceability to the Agency's	CD, OCE				
58	NPR 7120.8 3.3.3.7, 3.3.3.8, 3.3.3.9	25.5.3	If an R&T Program contains elements that include hardware used for flight (piloted or unpiloted), flight control software, wind tunnel testing, or systems that could result in potential harm to personnel or property, the Program Lead shall ensure that an SMA Plan and a Risk Management Plan exist that address the applicable hazards.	CD, OCE				
59	NPR 7120.8 3.3.3.7	25.5.3.1	The S&MA Plan shall identify and document program element-specific SMA roles, responsibilities, and relationships with appropriate HQ and/or Center- SMA organizations. The SMA Plan also addresses specific critical SMA disciplines, including system safety/hazard analysis per NPR 8715.3 and NPR 8705.2; quality assurance per NPD 8730.5; SMA compliance verification, audit, and reviews per NPR 8705.6; reliability and maintainability per NPD 8720.1; software safety and assurance per NASA-STD-8719.13 and NASA-STD-8739.8; parts and material quality assurance per NPR 8735.1; contract quality assurance functions per NPR 8735.2; and other applicable NASA safety and mission success requirements	CD, OCE				
60	NPR 7120.8 3.3.3.3	25.6.1	Prior to KDP I, an FR shall be conducted to include the milestone technical data and planning maturity matrix requirements provided in Table 25-2.	CD, OCE				
61	NPR 7120.8 3.3.3.3,	25.6.1.2	The FR shall consist of the following data: a. The R&T Program Plan	CD, OCE				
62	NPR 7120.8 3.3.5.2	25.7.1	During R&T Program Implementation, the Program Lead shall: a. Update the R&T Program Plan, as appropriate.	CD, OCE				
63	NPR 7120.8 3.3.5.2	25.7.1	i. Review and approve annual project budget submission inputs and prepare annual R&T Program budget submissions. j. Conduct R&T Program completion activities for each project in accordance with the project life cycle. k. Support any reviews, KDPs, or IAs required. l. Perform any DA functions, as required or delegated by the DA.					

Ref. No.	NPR No. & Section or MSFC Derived	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	Approvals Required for Tailoring	Program/Project Compliance			Approval Signatures for Tailoring
					Program/ Project Documentation	Comply? (Full, Tailored, or NA)	Rationale for Decisions, Comments, or Waiver/Deviations	
64	NPR 7120.8 3.3.5.3	25.7.2	The Program Lead shall document any optional KDPs (if determined necessary per Program DA's discretion) in the R&T PCA and R&T Program Plan.	CD, OCE				
65	NPR 7120.8 3.5.2	25.8.1	If the Research Director is assigned to MSFC, the MSFC Research Director shall create a Cross-Program Research Plan that encompasses all the R&T Portfolio Projects within his/her purview, using the template provided in Appendix F of NPR 7120.8 as guidance.	CD, OCE				
66	NPR 7120.8 3.5.3	25.8.2	As a minimum, a Cross-Program Research Plan shall: a. Define the Cross-Program Research goals and specific objectives with clear traceability to	CD, OCE				
67	NPR 7120.8 3.5.4.1	25.8.3	The Program Lead shall ensure the Program Plan reflects the delegation of R&T Portfolio Project management authority to the MSFC Research Director.	CD, OCE				
68	NPR 7120.8 3.5.4.2	25.8.4	The MSFC Research Director shall ensure the Cross-Program Research Plan reflects the delegation of R&T Portfolio Project management authority from the Program Lead.	CD, OCE				
69	NPR 7120.8 3.5.6	25.8.5	The MSFC Research Director shall use the R&T Program Requirements and the R&T Program Life Cycle with changes specified in Table 25.8-1 as a guideline for managing Cross-Program Research.	CD, OCE				
Chapter 26. Technology Development (TD) Project Life Cycle Requirements								
70	NPR 7120.8 4.1.2.1	26.1	TD projects for which MSFC has management responsibility shall follow the TD Project life cycle as shown in Figure 26-1.	CD, OCE				
71	NPR 7120.8 4.1.2.1	26.1.1	TD Project Lead shall formulate and implement the TD Project, including the minimum set of reviews, technical data, and planning specified in this chapter.	CD, OCE				
72	NPR 7120.8 4.1.1.3	26.2	The TD Project Lead shall support reviews required by the governing PMC, the CMC, the ASP meeting, the ASM, the Procurement Strategy Meeting (PSM)Strategic Acquisition Planning, and Special Independent Assessments.	CD, OCE				
73	NPR 7120.8 4.1.1.5	26.3	For TD Projects, the governing PMC and the DA for each KDP shall be as defined in Table 26-1.	CD, OCE				
74	NPR 7120.8 4.1.2.1	26.3.1	TD Projects shall produce the required technical data and planning as documented in Table 26-2. *Note: Table 26-2 includes technical data, planning, and reviews required by NPR 7120.8 and those added by MSFC. MSFC added data/reviews are applicable for TRL greater than 5, and are shown in green text (required) or blue (potentially applicable review). For additional guidance on applicability see the MSFC Customization Spreadsheet (available on the MIDL under the Project Specific Documentation page). The TD Project may customize the entrance/exit/success criteria and degree of formality of the reviews, or combine reviews; provided that they include the minimum data content necessary to accomplish the objectives of each review and satisfy the success criteria that is applicable for that particular TD project, as indicated in MPR 7123.1.*	CD, OCE				
75	NPR 7120.8 4.2.4	Table 26-2	(TD Project technical data/planning shall be …) TD Project Formulation Authorization Document (FAD) (Baseline at KDP A)	CD, OCE				
76	NPR 7120.8 4.2.5.e	Table 26-2	(TD Project technical data/planning shall be …) Partnerships and inter-agency and international agreements (Baseline at SRR, FR/PDR)	CD, OCE				
77	NPR 7120.8 4.3.6.9	Table 26-2	(TD Project technical data/planning shall be …) Environmental compliance documentation (see NPR 8580.1 and MPR 8500.1) (Final at FR)	CD, OCE				
78	NPR 7120.8 4.6.2.1	Table 26-2	(TD Project technical data/planning shall be …) Final Report from Closeout Review (Mission Report) (Final at DRR/COR)	CD, OCE				
79	NPR 7120.8 4.3.6.2	Table 26-2	(TD Project technical data/planning shall be …) TD Project Plan (Baseline at FR/PDR)	CD, OCE				
80	MSFC Derived	Table 26-2	(TD Project technical data/planning shall be …) Systems Engineering Applicability Assessment (EMC approved) (Baseline at SRR)	CD				
81	NPR 7120.8 4.5.1.3	Table 26-2	(TD Project technical data/planning shall be …) Documentation of performance against plans for work to be accomplished during next implementation phase, including performance against baselines and status/closure of formal actions from previous KDP (Summary at FR/PDR, SIR, FRR, DR)	CD, OCE				
82	NPR 7120.8 4.5.1.1	Table 26-2	(TD Project technical data/planning shall be …) Schedule, work breakdown structure and allocation of resources (Baseline at FR/PDR)	CD, OCE				
83	NPR 7120.8 4.2.4	26.4.1	The TD Project Lead shall create an R&T Project FAD, using the template provided in Appendix G of NPR 7120.8 as guidance.	CD, OCE				
84	NPR 7120.8 4.2.5	26.4.1.1	As a minimum, an R&T Project FAD shall: a. Contain a statement of purpose for the proposed project and define its relationship to the Program's strategic goals and objectives, and its alignment with NASA and/or MSFC technology roadmaps. b. Establish the scope of work to be accomplished. c. Identify the TD Project Lead. d. Identify the management process for the project. e. Provide initial constraints, including resources, schedule and project participants within and external to NASA, including international partnerships. f. Define the approach, resources, and reviews required to conduct project formulation and implementation. g. Identify optional KDP B if required by the DA during Formulation or identify optional KDP B is not needed.	CD, OCE				
85	NPR 7120.8 4.3.1.2	26.5.2	The TD Project Lead shall complete the CDF form (NF 1739) if any NASA-owned equipment purchased on the project has an acquisition value of $500,000 or greater per item, has an estimated useful life of two years or more, and has a planned use on another project.	CD, OCE				
86	NPR 7120.8 4.3.2.1	26.5.3	The Project Lead shall identify the customers/beneficiaries who will benefit from the TD Project. The customers/beneficiaries may include space flight projects, another R&T Program, another Government agency, the aeronautics community, or the U.S. aerospace industry.	CD, OCE				
87	NPR 7120.8 4.3.2.2	26.5.4	The TD Project Lead shall define specific points of contacts (e.g., working groups, advisory committees, integrated product teams, technology infusion liaisons) that are capable of representing the customer/beneficiary's requirements (e.g., technology needs, technology prioritization, key performance parameters, and technology maturity) for TD.	CD, OCE				

Ref. No.	NPR No. & Section or MSFC Derived	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	Approvals Required for Tailoring	Program/Project Compliance			Approval Signatures for Tailoring
					Program/ Project Documentation	Comply? (Full, Tailored, or NA)	Rationale for Decisions, Comments, or Waiver/Deviations	
88	NPR 7120.8 4.3.3.1	26.5.5	The TD Project Lead shall define customer/beneficiary requirements/objectives, credible technology needs, and key performance parameters. Credible technology needs are derived from sources such as the customer/beneficiary's mission concept studies or design reference missions (DRMs), technology roadmaps and associated system analysis, or technology gap analysis. This derivation should be consistent with the overall R&T program goals and objects, not duplicative of existing TD efforts, and include an assessment of the maturity level of each needed technology that identifies both the current TRL and a desired, target TRL goal that is acceptable to the customer/beneficiary. The derivation should also include assessment of Key Performance Parameters (KPPs) that identify the minimum threshold performance levels necessary to meet the customer/beneficiary's mission requirements, and an assessment of any heritage elements. The initial derivation of technology needs is done at the system concept level (during formulation) and is later, iteratively refined (during implementation) down through the WBS (in conjunction with overall architectural studies and end-item system design) to provide greater granularity to the definition of needed technologies and associated technical performance requirements for key parameters. Refer to MSFC-HDBK-3173 for additional, detailed guidance and best practices, relative to TD project formulation, implementation, and evaluation.	CD, OCE				
89	NPR 7120.8 4.3.3.2	26.5.6	The TD Project Lead shall ensure the customer/beneficiary is involved in these assessments and the results should be consistent with the customer/beneficiary's technology infusion plan. Examples of customer/beneficiary involvement include working with product integration teams and technical points of contact/liaisons from NASA space flight programs/projects, the aeronautics community, other NASA-focused technology projects, and other commercial partners, to identify gaps/shortfalls in existing technologies, and to review and assess the TD project's overall TD plans and technical success criteria for compatibility with the customer/beneficiary's technology infusion plans.	CD, OCE				
90	NPR 7120.8 4.3.4.1	26.5.7	The TD Project Lead shall ensure that appropriate analyses and studies are conducted to justify technology selections.	CD, OCE				
91	NPR 7120.8 4.3.4.2	26.5.8	The TD Project Lead shall perform an assessment (gap analysis) of related TD activities in other NASA programs, other Government agencies, and the commercial sector to eliminate unnecessary duplication of effort. This assessment is typically based on a literature search and technical coordination/communication with points of contact in other NASA programs, other Government agencies, and the commercial sector. This assessment should include (as a minimum) a listing of identified technology needs with rationale for each, confirming that duplicative TD efforts are not currently existing in these other areas, and include consideration of any related TD efforts that were tried but failed.	CD, OCE				
92	NPR 7120.8 4.3.5.1, 4.3.5.2, 4.3.5.3	26.5.9	TD Project Lead shall establish and document Key Performance Parameters (KPPs) for each task or deliverable, and ensure that they are reviewed annually by the customer/beneficiary to verify that they are still aligned with mission requirements.	CD, OCE				
93	NPR 7120.8 4.3.6.2 4.3.6.4 4.3.6.5	26.5.10	The TD Project Lead shall create a TD Project Plan, using the template provided in Appendix H of NPR 7120.8 as guidance, and ensure it is updated (as required) and maintained consistent with the R&T Program Plan.	CD, OCE				
94	NPR 7120.8 4.3.6.3	26.5.10.1	As a minimum, a TD Project Plan shall: a. State the specific project objectives, performance goals, and their relationship to the program objectives and goals, and their alignment with NASA and/or MSFC technology	CD, OCE				
95	NPR 7120.8 4.3.6.6	26.5.10.2	The TD Project Lead shall ensure the applicable Center Director (or designee responsible for committing workforce and facilities) is added as a concurrence signature, to the TD Project Plan, for each Center at which the project resides.	CD, OCE				
96	NPR 7120.8 4.3.6.7	26.5.11	For TD Projects proposing the construction of new or modification to existing NASA owned facilities using Construction of Facilities (CoF) funding, the TD Project Lead shall complete a preliminary business case analysis.	CD, OCE				
97	NPR 7120.8 4.3.6.8	26.5.12	For TD Projects proposing the acquisition of new aircraft, the TD Project Lead shall coordinate with the Office of Strategic Infrastructure and prepare a business case analysis which will be approved by the MDAA and the AA for the Office of Strategic Infrastructure.	CD, OCE				
98	NPR 7120.8 4.3.6.10, 4.3.6.11	26.5.13	If a TD Project contains elements that include hardware used for flight (piloted or unpiloted), flight control software, wind tunnel testing, or systems that could result in potential harm to personnel or property, the Project Lead shall ensure that a SMA Plan and a Risk Management Plan exist that address the applicable hazards.	CD, OCE				
99	NPR 7120.8 4.3.6.10	26.5.13.1	The S&MA Plan shall identify and document project -specific SMA roles, responsibilities, and relationships with appropriate HQ and/or Center-level SMA organizations. The SMA Plan also addresses specific critical SMA disciplines, including system safety/hazard analysis per NPR 8715.3 and NPR 8705.2; quality assurance per NPD 8730.5; SMA compliance verification, audit, and reviews per NPR 8705.6; reliability and maintainability per NPD 8720.1; software safety and assurance per NASA-STD-8719.13 and NASA-STD-8739.8; parts and material quality assurance per NPR 8735.1; contract quality assurance functions per NPR 8735.2; and other applicable NASA safety and mission success requirements.	CD, OCE				
100	NPR 7120.8 4.3.6.9	26.5.14	The TD Project Lead shall ensure that proposals and plans for subordinate activities/tasks include documentation of environmental compliance, environmental permit considerations, and NEPA evaluation.	CD, OCE				
101	MSFC Derived	26.6.1	During Formulation phase, an internal MSFC System Requirements Review and Preliminary Design Review shall be conducted for TD projects with TRL greater than 5, using the guidance on entrance, exit, and success criteria, and the minimum data content required to accomplish the objectives of the review and satisfy the applicable success criteria, as described in MPR 7123.1. *Note: The SRR and PDR does not require an external component and may be conducted internal to the TD Project. The TD Project may customize the entrance/exit/success criteria guidance and the degree of formality of the review, as appropriate; provided that they address the minimum data content necessary to accomplish the objectives of the review and satisfy the*	CD				
102	NPR 7120.8 4.1.2.3, 4.3.4.3.1	26.6.2	Prior to KDP C, a FR shall be conducted per the milestone technical data and planning maturity matrix requirements provided in Table 26-2 and minimum review content in 26.6.2.2 below. FR may be conducted as a part of Preliminary Design Review.	CD, OCE				

Ref. No.	NPR No. & Section or MSFC Derived	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	Approvals Required for Tailoring	Program/Project Compliance			Approval Signatures for Tailoring
					Program/ Project Documentation	Comply? (Full, Tailored, or NA)	Rationale for Decisions, Comments, or Waiver/Deviations	
103	MSFC Derived	26.6.2.2	The FR shall consist of the following data: a. Summary of the data that was reviewed in the System Requirements Review and results of that review including plans to correct any deficiencies found. b. The TD Project Plan c. SMA Plan, if required (see above) d. Risk Management Plan, if required (see above) e. Terms of Reference (ToR) f. Stakeholder expectations and customer/beneficiary requirements/objectives. g. Technical performance requirements, technical success criteria, and technical performance measures. h. Verification/Validation Plan (i.e. process by which technologies will be verified and validated for compliance with the project requirements/objectives). i. Results of EMC approved applicability assessment for the seventeen system engineering processes. j. Integrated Master Schedule k. Summary of initial overall technology maturity assessment for the project. l. Gap Analysis of related TD activities, including failures experienced in the same or similar development efforts, in other NASA programs, other Government agencies, and the commercial sector. m. Documentation summarizing performance against baseline plan (for technical, schedule, and cost performance), including status/closure of formal actions from previous KDP, and plans for work to be accomplished during next life cycle phase.	CD				
104	NPR 7120.8 4.5.1.1	26.7.1	The TD Project Lead shall establish a WBS, in accordance with Appendix K of NPR 7120.8, a project schedule with milestones for each element in the WBS, and an allocation of the project's available resources necessary to achieve each milestone. The milestones should be chosen at intervals sufficient to demonstrate steady progress towards achieving the overall KPPs for the project.	CD, OCE				
105	NPR 7120.8 4.5.1.3	26.7.2	The TD Project Lead shall track progress against a baseline plan. The WBS, the project schedule, and the allocation of resources to milestones constitute the baseline plan for assessing technical, schedule, and cost performance	CD, OCE				
106	NPR 7120.8 4.5.1.4	26.7.3	The TD Project Lead shall provide immediate written notice and a recovery plan to the Program Lead and MDAA or MSOD, if the implementation costs of the project are estimated to exceed the baseline cost by 15 percent or more, or if a schedule milestone is estimated to be delayed six months or more, for development project (or single contracts) exceeding $250M LCC.	CD, OCE				
107	NPR 7120.8 4.5.3.1	26.7.4	The TD Project Lead shall conduct TD Project status reviews annually to assess both progress towards the KPPs and the maturity of the technology. In addition, status reviews may be called by the MDAA, MSOD, or Program Lead at any time to determine the need to modify or end the project.	CD, OCE				
108	NPR 7120.8 4.5.3.1	26.7.4.1	The TD Project Lead shall provide (to the R&T Program), documentation summarizing performance against baseline plan (for technical, schedule, and cost performance), including status/closure of formal actions from previous KDP, and plans for work to be accomplished during next life cycle phase. This includes documentation of progress towards achieving the overall KPPs (goals and minimum thresholds) for the project.	CD, OCE				
109	NPR 7120.8 4.1.1.3 4.5.3.1	26.7.5	The TD Project Lead shall periodically report the status of project performance to the CMC in accordance with MPR 7120.4.	CD, OCE				
110	MSFC Derived	26.7.6	During implementation, an internal MSFC CDR, Design Certification Review, System Acceptance Review (or Pre-Ship Review), and FRR (as a minimum) shall be conducted for TD projects with TRL greater than 5, using the guidance on entrance, exit, and success criteria, and the minimum data content required to accomplish the objectives of the review and satisfy the applicable success criteria, as described in MPR 7123.1. *Note: These reviews do not require an external component and may be conducted internal to the TD Project. The TD Project may customize the entrance/exit/success criteria guidance and the degree of formality of these reviews, as appropriate; provided that they address the minimum data content necessary to accomplish the objectives of each review and satisfy the success criteria that is applicable for that particular TD project, as indicated in MPR 7123.1. The DCR may be combined with the SAR. The DCR/SAR may be considered a final Pre-Ship Review at which all requirements and the as-built configuration will be verified. The FRR may be conducted as part of a larger FRR, provided that all requirements, the as-built configuration, and the system interfaces have been verified and the MSFC Center Director is briefed on the state of flight readiness prior to the larger review. For some TD Projects, other technical reviews (such as MCR, SIR, ORR, PLAR, etc…) may be applicable, depending on specific characteristics of the technology end item under development, and its ultimate mission/flight application (i.e. ground-based development vs. flight mission, human vs. robotic mission, ELV vs. suborbital flight, etc…).*	CD				
111	NPR 8715.3, 3.14.5.1	26.7.7	Test Readiness Reviews shall be conducted (as required) for any hazardous tests, in accordance with MWI 8715.17 and ED-OWI-004.	CD, OSMA				
112	NPR 7120.8 4.6.2.1	26.8.1	The TD Project Lead shall conduct a closeout review of the project's accomplishments and/or failures, including an independent assessment of the final TRL and other maturity measures, and/or remaining issues. A final report is required for the Closeout Review.	CD, OCE				
113	NPR 7120.8 4.6.2.1	26.8.2	The TD Project Lead shall document LL, in accordance with MPR 7120.1, MSFC Engineering and Program/Project Management Requirements.	CD, OCE				
114	NPR 7120.8 4.6.3.1 4.6.3.2	26.8.3	The TD Project Lead shall ensure that sufficient data is archived, in accordance with NPR 1441.1, so that future users can assess the technology maturity (e.g., TRL) and incorporate the technology into system designs.	CD, OCE				
115	NPR 7120.8 4.7.1.2	26.9.1	The TD Project Lead shall ensure TRLs and/or other measures of technology maturity that are important to the customer/beneficiary are used in conjunction with KPPs to assess maturity throughout the project life cycle. When a TD Project uses a measure of maturity other than TRLs, the measurement system should map back to TRLs. See the table in Appendix F for a description of each TRL level.	CD, OCE				
116	NPR 7120.8 4.7.1.3	26.9.2	The TD Project Lead shall provide data, thru the Program Lead, to an independent group for their assessment of the project's maturity assessment.	CD, OCE				
117	NPR 7120.8 4.8.1	26.10.1	Portions or elements of TD Projects may be accomplished at different Centers. The TD Project Lead shall flow down requirements for this work sufficiently to ensure requirements are met at the TD Project level.	CD, OCE				

Ref. No.	NPR No. & Section or MSFC Derived	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	Approvals Required for Tailoring	Program/Project Compliance			Approval Signatures for Tailoring
					Program/ Project Documentation	Comply? (Full, Tailored, or NA)	Rationale for Decisions, Comments, or Waiver/Deviations	
Chapter 27. R&T Portfolio Project Life Cycle Requirements								
118	NPR 7120.8 5.2.1.1	27.1	R&T Portfolio Projects for which MSFC has management responsibility shall follow the NASA life cycle as shown in Figure 27-1 and Figure 27-2.	CD, OCE				
119	NPR 7120.8 5.2.1.1	27.1.1	R&T Portfolio Project Lead shall formulate and implement the R&T Portfolio Project, including the minimum set of reviews, technical data, and planning specified in this chapter.	CD, OCE				
120	NPR 7120.8 5.1.1.3	27.2	The R&T Portfolio Project Lead shall support reviews required by the governing PMC, the CMC, the ASP meeting, the ASM, the Procurement Strategy Meeting (PSM)Strategic Acquisition Planning, and Special Independent Assessments.	CD, OCE				
121	NPR 7120.8 5.1.1.5	27.3	For R&T Portfolio Projects, the governing PMC and the DA for each KDP shall be as defined in Table 27-1 and Table 27-2.	CD, OCE				
122	NPR 7120.8 5.2.1.1	27.3.1	R&T Portfolio Projects shall produce the required technical data and planning as documented in Table 27-3. *Note: Table 27-3 includes data/planning required by NPR 7120.8 and those added by MSFC (shown in green).*	CD, OCE				
123	NPR 7120.8 5.2.2.3	Table 27-3	(R&T Portfolio Project technical data/planning shall be …) R&T Portfolio Project Formulation Authorization Document (FAD) (Baseline at KDP A)	CD, OCE				
124	NPR 7120.8 5.2.2.4.e	Table 27-3	(R&T Portfolio Projecttechnical data/planning shall be …) Partnerships and inter-agency and international agreements (Baseline at FR)	CD, OCE				
125	NPR 7120.8 5.2.3.8	Table 27-3	(R&T Portfolio Project technical data/planning shall be …) Environmental compliance documentation (see NPR 8580.1 and MPR 8500.1) (Final at FR)	CD, OCE				
126	NPR 7120.8 5.2.5.7.3	Table 27-3	(R&T Portfolio Project technical data/planning shall be …) Proposal Solicitation Document (Final at Portfolio Cycle FR)	CD, OCE				
127	NPR 7120.8 5.2.5.7.3	Table 27-3	(R&T Portfolio Projecttechnical data/planning shall be …) Peer Review Panel's Evaluation of Proposals (Final at Portfolio Cycle Peer Review)	CD, OCE				
128	NPR 7120.8 5.2.5.7.3	Table 27-3	(R&T Portfolio Project technical data/planning shall be …) Proposal Selection Document (approved by the Selection Official) (Final at Portfolio Cycle Peer Review)	CD, OCE				
129	NPR 7120.8 5.2.5.7.4	Table 27-3	(R&T Portfolio Projecttechnical data/planning shall be …) Annual Progress Report (for the particular Research Investigation) (Final at Portfolio Cycle Status Review)	CD, OCE				
130	NPR 7120.8 5.2.5.7.7 5.2.6.2	Table 27-3	(R&T Portfolio Project technical data/planning shall be …) Final archive of data and publishing of research results (Final at Closure/Transfer of Technology)	CD, OCE				
131	NPR 7120.8 5.2.3.3.1	Table 27-3	(R&T Portfolio Project technical data/planning shall be …) R&T Portfolio Project Plan (Baseline at FR)	CD, OCE				
132	MSFC Derived	Table 27-3	(R&T Portfolio Project products shall be …) Systems Engineering Applicability Assessment (EMC approved) (Baseline at FR)	CD				
133	NPR 7120.8 5.2.5.2	Table 27-3	(R&T Portfolio Project technical data/planning shall be …) Plans for work to be accomplished during next implementation life cycle phase (Plan at FR, SR)	CD, OCE				
134	NPR 7120.8 5.2.5.3, 5.2.5.5	Table 27-3	(R&T Portfolio Project technical data/planning shall be …) Documentation of performance against plans for work to be accomplished during next implementation phase, including performance against baselines and status/closure of formal actions from previous KDP (Summary at FR, SR)	CD, OCE				
135	NPR 7120.8 5.2.2.3	27.4.1	The R&T Portfolio Project Lead shall create an R&T Project FAD, using the template in Appendix G of NPR 7120.8 as guidance, or create an appendix to the Cross-Program Research Plan (using Appendix F of NPR 7120.8 as guidance). The R&T Project FAD is approved by the Project DA with concurrence by the Program Lead.	CD, OCE				
136	NPR 7120.8 5.2.2.4	27.4.2	As a minimum, an R&T Portfolio Project FAD shall: a. Contain a statement of purpose for the proposed project and define its relationship to the Program's strategic goals and objectives, and its alignment with NASA and/or MSFC technology roadmaps. b. Establish the scope of work to be accomplished. c. Identify the R&T Portfolio Project Lead. d. Identify the management process for the project. e. Provide initial constraints, including resources, schedule and project participants within and external to NASA, including international partnerships. f. Define the approach, resources, and reviews required to conduct project formulation and implementation. g. Identify optional KDP B, if required by the DA, during Formulation or identify if optional KDP B is not needed.	CD, OCE				
137	NPR 7120.8 5.2.3.2	27.5.2	In coordination with the OCFO, the R&T Portfolio Project Lead shall complete the CDF form (NF 1739) if any NASA-owned equipment purchased on the project has an acquisition value of $500,000 or greater per item, has an estimated useful life of two years or more, and has a planned use on another project.	CD, OCE				
138	NPR 7120.8 5.2.3.3.b(1) NPR 1080.1, 3.1.3.2	27.5.3	The R&T Portfolio Project Lead shall establish project specific R&T goals and objectives, as well as specific research investigation areas needed to accomplish overall goals/objectives, derived from (and consistent with) the NASA/MSFC roadmaps, and Agency vision and mission.	CD, OCE				
139	NPR 7120.8 5.2.3.3.b(2)&(3) 5.2.5.7.b&c. NPR 1080.1, 3.1.3.2,& 3.1.3.3	27.5.4	The R&T Portfolio Project Lead shall establish project level technical requirements needed to implement the overall project goals/objectives and define how those requirements flow down into the specific research investigation areas, including identification of the technical performance measures and technical success criteria that will be used for evaluating progress of research investigations throughout the portfolio life cycle. Project level technical requirements are to be consistent with the overall project goals/objectives, identify the technical scope to be accomplished in each research area and the interrelationships between the different research areas, and include factors such as relevance to Agency's mission, utility of data to be collected, objectivity in the research/data collection process, and the integrity of the resulting data.	CD, OCE				
140	NPR 7120.8 5.2.5.7.d.	27.5.5	The R&T Portfolio Project Lead shall create technology maturity assessment documentation that defines the maturity level of each of the project's research investigation areas and identifies both the current TRL and a desired, target TRL goal that is needed to satisfy the R&T goals/objectives and justify continued funding of the research investigation.	CD, OCE				
141	NPR 7120.8 5.2.3.3.1, 5.2.3.3.3. 5.2.3.3.4	27.5.6	The R&T Portfolio Project Lead shall create the R&T Portfolio Project Plan, using the template provided in Appendix I of NPR 7120.8 as guidance, or create an appendix to the Cross-Program Research Plan (using Appendix F of NPR 7120.8 as guidance), update it as required and ensure it is maintained consistent with the R&T Program Plan.	CD, OCE				
142	NPR 7120.8 5.2.3.3.2	27.5.6.1	As a minimum, an R&T Portfolio Project Plan shall: a. State the area of specialty of the R&T Portfolio Project, the R&T Portfolio Project's	CD, OCE				

Ref. No.	NPR No. & Section or MSFC Derived	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	Approvals Required for Tailoring	Program/Project Compliance			Approval Signatures for Tailoring
					Program/ Project Documentation	Comply? (Full, Tailored, or NA)	Rationale for Decisions, Comments, or Waiver/Deviations	
143	NPR 7120.8 5.2.3.3.5	27.5.7	The R&T Portfolio Project Lead shall ensure the applicable Center Director (or designee responsible for committing workforce and facilities) is added as a concurrence signature, to the R&T Portfolio Project Plan, for each Center at which the project resides.	CD, OCE				
144	NPR 7120.8 5.2.3.6	27.5.8	For R&T Portfolio Projects proposing the construction of new or modification to existing NASA owned facilities using Construction of Facilities (CoF) funding, the R&T Portfolio Project Lead shall complete a preliminary business case analysis.	CD, OCE				
145	NPR 7120.8 5.2.3.7	27.5.9	For R&T Portfolio Projects proposing the acquisition of new aircraft, the R&T Portfolio Project Lead shall coordinate with the Office of Strategic Infrastructure and prepare a business case analysis which will be approved by the MDAA and the AA for the Office of Strategic Infrastructure.	CD, OCE				
146	NPR 7120.8 5.2.3.8	27.5.10	The R&T Portfolio Project Lead shall ensure that proposals and plans for subordinate activities/tasks include documentation of environmental compliance, environmental permit considerations, and NEPA evaluation.	CD, OCE				
147	NPR 7120.8 5.2.3.9, 5.2.3.10	27.5.11	If an R&T Portfolio Project contains elements that include hardware used for flight (piloted or unpiloted), flight control software, wind tunnel testing, or systems that could result in potential harm to personnel or property, the Project Lead shall ensure that a SMA Plan and a Risk Management Plan exist that address the applicable hazards.	CD, OCE				
148	NPR 7120.8 5.2.3.9	27.5.11.1	The S&MA Plan shall identify and document program element-project specific SMA roles, responsibilities, and relationships with appropriate HQ and/or Center- SMA organizations. The SMA Plan also addresses specific critical SMA disciplines, including system safety/hazard analysis per NPR 8715.3 and NPR 8705.2; quality assurance per NPD 8730.5; SMA compliance verification, audit, and reviews per NPR 8705.6; reliability and maintainability per NPD 8720.1; software safety and assurance per NASA-STD-8719.13 and NASA-STD-8739.8; parts and material quality assurance per NPR 8735.1; contract quality assurance functions per NPR 8735.2; and other applicable NASA safety and mission success requirements.	CD, OCE				
149	NPR 7120.8 5.2.3.5	27.6.1	Prior to KDP C, a FR shall be conducted to include the milestone technical data and planning maturity matrix requirements provided in Table 5-3.	CD, OCE				
150	MSFC Derived	27.6.1.2	The FR shall consist of the following data: a. The R&T Portfolio Project Plan b. SMA Plan, if required (see above) c. Risk Management Plan, if required (see above) d. Terms of Reference (ToR) e. Stakeholder expectations and customer/beneficiary requirements/objectives. f. Technical performance requirements, technical success criteria, and technical performance measures. g. Verification/Validation pProcess by which research and technologies will be verified and validated for compliance with the project requirements/objectives. h. Results of EMC approved applicability assessment for the seventeen system engineering processes. i. Integrated Master Schedule j. Documentation summarizing performance against baseline plan (for technical, schedule, and cost performance), including status/closure of formal actions from previous KDP, and plans for work to be accomplished during next life cycle phase.	CD				
151	NPR 7120.8 5.2.5.2	27.7.1	At a minimum, the R&T Portfolio Project Lead shall establish a WBS, in accordance with Appendix K of NPR 7120.8, a project schedule with milestones for each element in the WBS, and an allocation of the project's available resources necessary to achieve each milestone The milestones should be chosen at intervals sufficient to demonstrate steady progress.	CD, OCE				
152	NPR 7120.8 5.2.5.3	27.7.2	The R&T Portfolio Project Lead shall track progress against a baseline plan. The WBS, the project schedule, and the allocation of resources to milestones constitute the baseline plan for assessing technical, schedule, and cost performance. Note that it is not uncommon to re-baseline R&T Portfolio Projects due to the uncertain nature of research. It is possible that this may occur as a result of periodic assessments.	CD, OCE				
153	NPR 7120.8 5.2.5.5.1	27.7.3.1	The R&T Portfolio Project Lead shall conduct R&T Portfolio Project status reviews annually to assess progress towards the R&T Portfolio Projects goals and for NASA officials to gain better insight into the R&T work being performed. The R&T Portfolio Project status reviews are also utilized by the Program Lead and R&T Portfolio Project Lead to decide whether the R&T Portfolio Project should be continued for another year or transferred/closed for lack of sufficient progress These reviews can also be called by the MDAA, MSOD, or Program Lead at any time to determine the need to modify or end the project. The R&T Portfolio Project status reviews and the R&T Portfolio Cycle status reviews may be combined per R&T Portfolio Project Lead direction.	CD, OCE				
154	NPR 7120.8 5.2.5.3, 5.2.5.5	27.7.3.2	The R&T Portfolio Project Lead shall provide (to the R&T Program), documentation summarizing performance against baseline plan (for technical, schedule, and cost performance), including status/closure of formal actions from previous KDP, and plans for work to be accomplished during next life cycle phase. This includes documentation of progress towards achieving the overall technology maturity goals, technical performance measures, and technical success criteria for the project and research investigation areas.	CD, OCE				
155	NPR 7120.8 5.2.5.7.4 5.2.5.7.5	27.7.4.3	(Portfolio Cycle Status Reviews) The Program Lead and R&T Portfolio Project Lead shall use the status reviews to decide whether each R&T investigation should be continued for another year or transferred/closed for lack of sufficient progress. The status reviews are used to: a. Determine changes in scope that effect subsequent solicitations. b. Provide information to support evaluation of performance, as specified in the R&T Portfolio Project Plan, R&T Program Plan, or Cross-Program Research Plan. c. Determine if the results of any of the R&T investigations are ready to be transitioned to another project or to an organization outside the Agency. d. Determine if any of the R&T investigations should be terminated.	CD, OCE				
156	NPR 7120.8 5.2.5.7.6 5.2.5.7.7	27.7.4.4	Status of publications shall be reported to the Project Lead on an annual basis and final reports are archived in the NASA Scientific and Technical Information System.	CD, OCE				
157	NPR 7120.8 5.1.1.3 5.2.5.5.1	27.7.5	The R&T Portfolio Project Lead shall periodically report the status of project performance to the CMC in accordance with MPR 7120.4.	CD, OCE				
158	NPR 7120.8 5.2.5.7.1 5.2.5.7.3	27.7.6	During implementation, the R&T Portfolio Project Lead shall conduct portfolio life cycle FRs, to assess and approve the proposal solicitation documents, and a peer review of proposals, to competitively select R&T investigations, in accordance with NPR 1080.1.	CD, OCE				

Ref. No.	NPR No. & Section or MSFC Derived	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	Approvals Required for Tailoring	Program/Project Compliance			Approval Signatures for Tailoring
					Program/ Project Documentation	Comply? (Full, Tailored, or NA)	Rationale for Decisions, Comments, or Waiver/Deviations	
159	NPR 8715.3, 3.14.5.1	27.7.7	Test Readiness Reviews shall be conducted, as required for any hazardous tests, in accordance with MWI 8715.17 and ED-OWI-004.	CD, OSMA				
160	NPR 7120.8 5.2.6.2	27.8.1	In the R&T Portfolio Project Transition/Closure Phase, the results of R&T investigations shall be published and archived or transitioned to another project, and the investigations closed out.	CD, OCE				
161	NPR 7120.8 5.2.6.2	27.8.2	The R&T Portfolio Project Lead shall document LL, in accordance with MPR 7120.1, MSFC Engineering and Program/Project Management Requirements.	CD, OCE				
162	NPR 7120.8 5.3.1	27.9.1	Portions or elements of R&T Portfolio Projects may be accomplished at different Centers. The R&T Portfolio Project Lead shall flow down requirements for this work sufficiently to ensure requirements are met at the R&T Portfolio Project level.	CD, OCE				

C.3 MISSION TYPE 4 AND 5 ACTIVITIES COMPLIANCE MATRIX TEMPLATE

Note: The compliance matrix is to be attached to the Activity Plan. This compliance matrix template is also available on the MIDL under the P/P Documents link.

Ref. No.	NPR No. & Section or MSFC Derived	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	Approvals Required for Tailoring	Program/Project Compliance			Approval Signatures for Tailoring
					Program/ Project Documentation	Comply? (Full, Tailored, or NA)	Rationale for Decisions, Comments, Waiver/Deviations	
Chapter 3. MSFC Assessment of Compliance and Governance								
1	**MSFC Derived**	3.1	MSFC programs/projects/activities shall submit a compliance assessment for MPR 7120.1 to the MSFC Chief Engineer's Office.	CD				
2	**MSFC Derived**	3.2	The MSFC Chief Engineer's Office shall assess and concur with the program's/project's/activity's compliance assessment (see 3.4 for approval schedule).	CD				
3	**MSFC Derived**	3.3	The compliance assessment and all waiver/deviation requests (i.e., tailoring) for requirements involving program/project/activity execution in this MPR shall receive the concurrence of the Implementing Chief Engineer, the CSO, and the Program/Project/Activity Manager.	CD				
4	**MSFC Derived**	3.3.1	The compliance assessment and all waivers and deviations shall also receive the concurrence of the Director of the MSFC Office responsible for managing the program/project/activity and the Engineering Director. The Directors may choose to delegate their concurrence authority down to a lower level, for specific programs, projects, or activities, provided that the compliance assessment does not include any Agency-level waivers/deviations.	CD				
5	**MSFC Derived**	3.3.2	For those programs, projects, and activities governed by the CMC (and those with Agency-level waiver/deviation), the compliance assessment and the waiver/deviation shall also receive the concurrence of the Associate Director, Technical, prior to review and approval by the Center Director, or designee.	CD				
6	**MSFC Derived**	3.3.3	Approvals for waivers and deviations to requirements involving program/project/activity execution shall be documented by the approvals of the appropriate approving authorities on the FA or Program/Project Plan and the associated compliance matrix.	CD				
7	**NPR 7120.5: 3.5.1 NPR 7120.8: 3.11**	3.3.4	Program/Project/Activity Managers shall obtain approval for waivers and deviations to requirements involving program/project/activity execution from the appropriate Agency-level authorities, in those cases where the approval authority has been retained at the Agency-level.	CD, OCE				
8	**MSFC Derived**	3.4	The completed compliance matrix shall be attached to the FA for space flight projects and SPP in Formulation, and/or to the Program Plan, or Project Plan, for programs or projects entering or in Implementation, and be submitted to OCE. The compliance assessment is approved along with the applicable agreement/planning document to which it is attached. For space flight projects and SPP the FA/compliance assessment is approved at MCR and SDR. For uncoupled, loosely coupled, and tightly-coupled programs, the Program Plan/compliance assessment is approved at SDR. For space flight projects, the Project Plan/compliance assessment is approved at SRR. For SPP, the Program Plan/compliance assessment is approved at SRR. For R&T Programs, the Program Plan/compliance assessment is approved at Formulation Review (FR). For TD Projects, the project plan/compliance assessment is approved at FR. For R&T Portfolio Projects, the project plan/compliance assessment is approved at FR. For activities, the compliance assessment is approved when the activity plan is approved by the appropriate Center governing authority.	CD				
9	**MSFC Derived**	3.5	Programs/projects/activities shall identify significant customization of best practices or guidance within their planned documentation.	CD				
10	**MSFC Derived**	3.6	The implementing chief engineer shall concur with the customization used by the program/project/activity.	CD				
11	**MSFC Derived**	3.7	The Center Director and Program/Project/Activity Manager shall establish a Category/Mission Type 1, 2, 3, 4, or 5 in accordance with Table 3-1 for each MSFC project and activity.	CD				
12	**NPR 7120.5: 2.3.3 NPR 7120.8: 3.1.3, 4.1.1.3, 5.1.1.3**	3.10	All Center programs, projects, and Mission Type 4 activities shall be reviewed by the MSFC CMC, in accordance with MPR 7120.4, unless the governance has been specifically delegated down to the Directorate/Office level.	CD, OCE				
Chapter 4. Common Center Processes for all Programs/Projects								
4.1 Knowledge Management and Infusion of Lessons Learned								
13	**MSFC Derived from NPD 7120.6: 5.d(4)(d)**	4.1.1	Individuals or groups shall identify discrete, actionable observations that may have application to future projects.	CD				
14	**MSFC Derived from NPD 7120.6: 5.d(4)(d)**	4.1.7	Program/project/activity managers shall ensure review of LL (referred by LLC) for knowledge infusion throughout the program/project life cycle.	CD				
4.2 Technical Standards								
15	**MSFC Derived from NPR 7120.10, 3.1.1, 3.1.2, 3.3.1**	4.2.1.1	Programs/projects/activities, in conjunction with the appropriate Technical Authority, shall select technical standards for use as program/project and contract requirements, giving preference to outcome-based, performance standards (as opposed to prescriptive, process-based design standards), according to the following order of priority: a. Standards imposed by legal requirements (e.g. regulations). b. Mandatory NASA Technical Standards (i.e. those imposed by NASA directives). c. VCS, domestic and international. d. Other Government (Non-NASA) Standards. e. Other NASA Technical Standards (i.e. those not imposed by NASA directives). f. MSFC Technical Standards.	CD				
16	**MSFC Derived from NPR 7120.10, 3.3.b**	4.2.1.2	Programs/projects/activities, in conjunction with the appropriate Technical Authority, shall evaluate those standards listed as "NASA-endorsed technical standards" for use as program/project and contract requirements.	CD				
17	**MSFC Derived from NPR 7120.10, 3.1.2**	4.2.1.3	Use of alternate standards shall be invoked through the program/project/activities technical requirements documents at the discretion of the implementing chief engineer and/or CSO.	CD				
18	**MSFC Derived from NPR 7120.10, 3.2.1**	4.2.1.4	When tailoring requirements in technical standards, programs/projects/activities shall document the changes with traceability to the original requirements, and obtain approval from the appropriate Technical Authority.	CD				

Ref. No.	NPR No. & Section or MSFC Derived	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	Approvals Required for Tailoring	Program/Project Compliance			Approval Signatures for Tailoring
					Program/ Project Documentation	Comply? (Full, Tailored, or NA)	Rationale for Decisions, Comments, Waiver/Deviations	
19	**MSFC Derived from NPR 7120.10, 3.2.1.c, 3.3.1.d**	4.2.1.5	Programs/projects/activities shall identify, assess, and document the impact of changes to technical standards being used as program/project and contract requirements.	CD				
20	**MSFC Derived from NPR 7120.10, 3.1.3**	4.2.1.6	Program/project/activities managers shall ensure review of LL (referred by LLC) for applicability to current technical standards applications (see 4.1).	CD				
4.3 Software Engineering								
21	**NPR 7150.2, P.2.1, P.2.3 (SWE-001)**	4.3.1	All MSFC software development, maintenance, retirement, operations, management, acquisition, and assurance activities shall comply with requirements in NPR 7150.2. *Note: The software engineering requirements in NPR 7150.2 , and this MPR, section 4.3, are not applicable to software development, maintenance, operations, management, acquisition, and assurance activities started before September 27, 2004 (i.e., existing systems and subsystems . including any maintenance to products whose initial development started before September 27, 2004. The NASA Engineering Network, Software Engineering Community has the following references and aids: NASA-HDBK-2203, NASA Software Engineering Handbook, Software Classification Tool, Safety Critical Assessment Tool, and Compliance Matrices by Class. Compliance Matrices are located in software document repository at: https://nen.nasa.gov/web/software/documents.*	CD, OCE				
22	**NPR 7150.2, 1.2.4 (SWE-005)**	4.3.3	MSFC organizations responsible for software development, maintenance, retirement, operations, management, acquisition, or assurance activities shall establish, document, execute, and maintain their software processes.	CD, OCE				
23	**NPD 7120.4, 1.f(4), NPR 2210.1**	4.3.8	Programs/projects/activities releasing software shall follow the requirements in NPR 2210.1. *Note: NPR 2210.1addresses the release of software created by or for NASA to external entities for commercial, industrial, educational, and other Governmental purposes, with appropriate restrictions on the use and redistribution of the software. The responsibilities of programs/projects are summarized in section 1.8 of NPR 2210.1.*	CD, OCE				
24	MSFC Derived	4.3.10	Programs/projects/activities requesting relief from requirements in NPR 7150.2 for which the approval authority has been retained at the Agency-level, shall obtain concurrence of the Associate Director, Technical, prior to requesting approval from the Agency-level authorities.	CD				
4.4 Office of Safety and Mission Assurance Requirements								
25	MSFC Derived	4.4.2	PPA Manager and CSO utilize the OSMA requirements trace matrix to assess the OSMA requirements and their applicability, and ensure that the applicable requirements are implemented on their project, or relief is properly requested and approved.	CD				
26	MSFC Derived	4.4.3	For those PPA governed at the Directorate (or higher) level, the OSMA applicability assessment shall receive the concurrence of the Director, Safety Mission Assurance Directorate. The SMA Director may choose to delegate concurrence authority down to a lower level, for specific PPA's.	CD				
27	MSFC Derived	4.4.4	For requests for relief from OSMA requirements involving PPA execution, for which the approval authority is retained at the Agency or Center Director level, the PPA Managers shall obtain concurrence of the SMA Director, prior to requesting approval from the higher-level authorities.	CD				
28	MSFC Derived	4.4.5	For those PPA governed by the CMC, PPA Managers shall report a summary of OSMA applicability assessment to the Associate Director, Technical for concurrence.	CD				
29	MSFC Derived	4.4.6	For requests for relief from Agency requirements involving program/project/activity execution, for which the approval authority has been retained at the Agency-level, the Program/Project/Activity Managers shall obtain concurrence of the Associate Director, Technical, prior to requesting approval from the Agency-level authorities.	CD				
30	MSFC Derived	4.4.7	For requests for relief from Agency requirements involving program/project/activity execution, for which the approval authority is the MSFC Center Director, the Program/Project/Activity Managers shall obtain concurrence of the Associate Director, Technical, prior to approval of the Center Director, or designee.	CD				
Chapter 28. Mission Type 4 and 5 Activities								
31	**MSFC Derived**	28.1	Mission Type 4 and 5 activities shall have a documented agreement with their parent program/project. *Note: See Activity Agreement Template in Appendix I, for guidance on expected content of agreement which defines the task, requirements, expectations, and constraints on the activity from the parent program/project….*	CD				
32	**MSFC Derived**	28.2	Mission Type 4 and 5 activities shall have a documented plan for implementing the requested task. *Note: See Activity Plan Template in Appendix J, for guidance on expected content of plan which defines the work to be performed by MSFC team for the conduct of this activity. …*	CD				
33	**MSFC Derived**	28.3	Mission Type 4 and 5 activities shall assess applicability of the following technical reviews; SRR, PDR, CDR, SAR or Pre-Ship Review, and FRR, and document the approach for conducting applicable reviews, as described in MPR 7123.1.	CD				
34	**MSFC Derived**	28.4	Mission Type 4 and 5 activities shall assess applicability of the systems engineering processes and document the technical approach for applicable processes in their activity planning, as described in MPR 7123.1. *Note: The activity may customize the SE processes as they determine appropriate to meet their needs.*	CD				
35	**MSFC Derived**	28.5	Mission Type 4 and 5 activities shall report a summary of their agreement, plan, and assessment of technical reviews and systems engineering processes, to the Director of the MSFC office responsible for managing the activity, and the Engineering Director, unless governance has been delegated to a lower level. *Note: The Directors may choose to delegate their governance authority down to a lower level for specific activities, on a case-by-case basis. This delegation may occur at any point in the lifecycle. Selection of an appropriate mission type and governance level should be considered early in the process to enable effective activity and resource planning. The approval of the Director of responsible office and the Engineering Director is typically obtained by briefing the information at the monthly program reviews within the Directorate/Office and to the EMC, but may be obtained through other means.*	CD				
36	**MSFC Derived**	28.6	Mission Type 4 activities shall report a summary of their agreement, plan, and assessment of technical reviews and systems engineering processes, to the Associate Directorate, Technical, and Center Director, or designee, unless governance has been delegated to a lower level. *Note: The Associate Director, Technical may choose to delegate governance authority down to a lower level for specific activities, on a case-by-case basis. The approval of the Associate Director, Technical and the Center Director are typically obtained by briefing the information to the PPMAC and CMC, but may be obtained through other means.*	CD				

APPENDIX D.

RECORDS

D.1 Program/project/activity records are maintained by the responsible manager or their designee in accordance with MPR 1440.2 and NRRS 1441.1, Schedule 8, items 101-110. The exact retention used depends on the type of program/project/activity that generates the records. MPR 7123.1 requires a list of program/project/activity records, retention schedules, custodians, locations, and any other program/project/activity-unique records management requirements, to be established and maintained by the program/project/activity.

Note: These records include, but are not limited to, documentation concerning program/project/activity planning, formulation, and implementation.

D.2 The following records are maintained by the NASA Technical Standards Program Office in accordance with MPR 1440.2 and NRRS 1441.1.

D.2.1 Memoranda and correspondence records for NASA Technical Standards (Engineering) are maintained in accordance with NRRS 8/101[8000]; permanent—cut off records at close of program/project or in 3-year blocks for long term programs/projects. Transfer to the National Archives 7 years after cut off.

D.2.2 NESP meeting minutes for NASA Technical Standards (Engineering) are maintained in accordance with NRRS 8/101[8000]; permanent—cut off records at close of program/project or in 3-year blocks for long term programs/projects. Transfer to the National Archives 7 years after cut off.

D.2.3 Program Action Items for NASA Technical Standards (Engineering) are maintained in accordance with NRRS 8/105 [8000]; temporary, destroy/delete when between 0 and 15 years old. Do not retain longer than life of program/project plus 5 years.

D.2.4 NASA Engineering Technical Standards/Handbooks/Specification/Interim file for NASA Technical Standards (Engineering) are maintained in accordance with NRRS 8/101[8000]; permanent—cut off records at close of program/project or in 3-year blocks for long term programs/projects. Transfer to the National Archives 7 years after cut off.

APPENDIX E.

REFERENCES

E.1 Environmental effects abroad of major Federal actions, EO 12114

E.2 Research Misconduct, 14 CFR, Part 1275

E.3 Unsolicited Proposals, 48 CFR, Federal Acquisition Regulation, Subpart 15.6

E.4 Federal Acquisition Regulation

E.5 NPD 1000.5, “Policy for NASA Acquisition”

E.6 NPD 1001.0, “NASA Strategic Plan”

E.7 NPD 1440.6, “NASA Records Management”

E.8 NPD 8020.7, “Biological Contamination Control for Outbound and Inbound Planetary Spacecraft”

E.9 NPD 8700.1, “NASA Policy for Safety and Mission Success”

E.10 NPD 8720.1, “NASA Reliability and Maintainability (R&M) Program Policy”

E.11 NPD 8730.5,” NASA Quality Assurance Program Policy”

E.12 NPD 8820.2, “Design and Construction of Facilities”

E.13 NPR 1080.1, “Requirements for the Conduct of NASA Research and Technology (R&T)”

E.14 NPR 2190.1, “NASA Export Control Program”

E.15 NPR 2200.2, “Requirements for Documentation, Approval, and Dissemination of NASA Scientific and Technical Information”

E.16 NPR 2810.1, “Security of Information Technology”

E.17 NPR 7120.11, “NASA Health and Medical Technical Authority (HMTA) Implementation”

E.18 NPR 7900.3, “NASA Aircraft Operations Management Manual”

E.19 NPR 8020.12, “Planetary Protection Provisions for Robotic Extraterrestrial Missions”

E.20 NPR 8580.1, “NASA National Environmental Policy Act Management Requirements”

E.21 NPR 8705.2, “Human-Rating Requirements for Space Systems”

E.22 NPR 8705.4, “Risk Classifications for NASA Payloads”

E.23 NPR 8705.5, “Technical Probabilistic Risk Assessment (PRA) Procedures for Safety and Mission Success for NASA Programs and Projects”

E.24 NPR 8705.6, “Safety and Mission Assurance (SMA) Audits, Reviews, and Assessments”

E.25 NPR 8715.3, “NASA General Safety Program Requirements”

E.26 NPR 8715.5, “Range Flight Safety Program”

E.27 NPR 8715.6, “NASA Procedural Requirements for Limiting Orbital Debris”

E.28 NPR 8715.7, “NASA Expendable Launch Vehicle Payload Safety Program”

E.29 NPR 8735.1, “Procedures For Exchanging Parts, Materials, and Safety Problem Data Utilizing the Government-Industry Data Exchange Program and NASA Advisories”

E.30 NPR 8735.2, “Management of Government Quality Assurance Functions for NASA Contracts”

E.31 NPR 8820.2, “Facility Project Requirements”

E.32 NPR 9250.1, “Property, Plant, and Equipment and Operating Materials and Supplies”

E.33 MPR 2190.1, “MSFC Export Control Program”

E.3 MPD 2800.1, “Management of Information Technology Systems and Services at MSFC”

E.35 MPD 8500.1, “MSFC Environmental Management Policy”

E.36 MPR 1050.2, “Procedure for Executing Agreements with Non-MSFC Entities”

E.37 MPR 1600.1, “MSFC Security Program Procedural Requirements”

E.38 MPR 8070.1, “Administration of MSFC Technical Standards and MSFC Standard Data Requirements Descriptions”

E.39 MPR 8500.1, “MSFC Environmental Engineering and Occupational Health Program”

E.0 MPR 8500.2, “MSFC Environmental Management System (EMS)”

E.41 MPR 8823.1, “Design Control of Facilities”

E.42 MWI 5000.1, “Initiating Procurement Requisitions”

E.43 MWI 5115.1, “Processing Unsolicited Proposals”

E.44 MWI 7120.6, “Program, Project and Institutional Risk Management”

E.45 MWI 8715.17, “Hazardous Operations Readiness Review Program”

E.46 MGM 7120.3, “MSFC Data Management Guidance”

E.47 MGM 8040.1, “MSFC Configuration Management Guidance”

E.48 MCP 8070.2, “(MSFC) Technical Authority Implementation Plan”

E.49 NASA-NTSP-1, “NASA Technical Standards Program (NTSP) Operating Procedures, Processes, and Systems”

E.50 NASA-STD-8719.13, “NASA Software Safety Standard”

E.51 NASA-STD 8719.14, “Process for Limiting Orbital Debris”

E.52 NASA-STD-8739.8, “Software Assurance Standard,” MC-06, “MSFC Technical Standards Document Control Board”

E.53 NASA-HDBK-2203, NASA Software Engineering Handbook

E.54 MSFC-HDBK-3173, “Project Management and Systems Engineering Handbook”

E.55 MSFC-PLAN-3204, “Marshall Space Flight Center Software Engineering Improvement Plan”

E.56 MSFC-STD-555, “MSFC Engineering Documentation Standard”

E.57 MSFC-STD-3528, “MSFC Computer-Aided Design Standard”

E.58 ED-OWI-004, "Test Program Control"

E.59 QD-QA-031, "Evaluation/Audits of Contractors, Vendors, Distributors, and Other Suppliers"

E.60 QD-QE-017, "Program/Project Quality Plan Development"

E.61 STD/MA-MSD, "Earned Value Management System (EVMS) Description"

E.62 STD/MA-PRP, "Project Plan"

E.63 STD/SE-VVC, "Verification/Validation Compliance (VVC) Assessment"

E.64 Grant and Cooperative Agreement Manual (GCAM) (formerly NPR 5800.1,)

E.65 NASA/SP-2007-6105, "NASA Systems Engineering Handbook,"
Available at http://nodis3.gsfc.nasa.gov/OCE_rep/OCE_list.cfm

E.66 NASA/SP-2010-3403, "NASA Schedule Management Handbook,"
Available at http://nodis3.gsfc.nasa.gov/OCE_rep/OCE_list.cfm

E.67 NASA/SP-2010-3404, "NASA Work Breakdown Structure Handbook,"
Available at http://nodis3.gsfc.nasa.gov/OCE_rep/OCE_list.cfm

E.68 NASA Standing Review Board Handbook,
Available at http://nodis3.gsfc.nasa.gov/OCE_rep/OCE_list.cfm

E.69 VJ-NASA08-RP005, Modeling & Simulation Verification, Validation, & Accreditation Recommended Practices Guide, Available at Systems Engineering SharePoint site: https://sharepoint.msfc.nasa.gov/sites/Engineering/ED01/SE/SitePages/Home.aspx, under Knowledge Base, SE Assessment Task, Product Verification, Handouts and Reference.

E.70 Guidebook for Proposers to NASA Research Announcements,
Available at http://www.hq.nasa.gov/office/procurement/nraguidebook

E.71 NASA Online Directives Information System (NODIS) Library,
http://nodis3.gsfc.nasa.gov/

E.72 Lessons Learned Information System (LLIS) http://llis.nasa.gov/llis/search/home.jsp

E.73 NEN https://nen.nasa.gov/web/nen

E.74 ANSI/EIA-748, Standard for Earned Value Management Systems

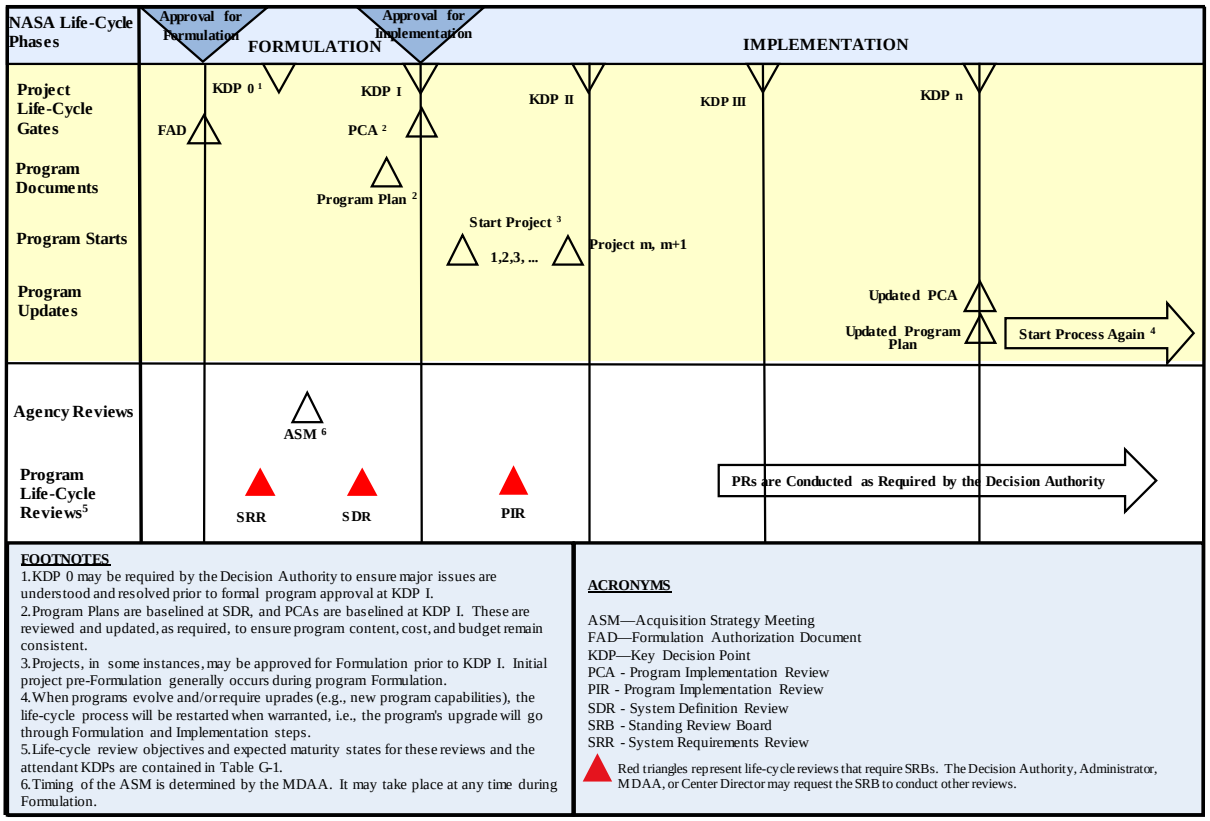
E.75 SAE/EIA-649, Configuration Management Standard

E.76 SAE/EIA 649-2, Configuration Management Requirements for NASA Enterprises

E.77 IT Strategy, Policy and Integration Office website, https://cio.msfc.nasa.gov/by_org/IS20

APPENDIX F.

SPACE FLIGHT PROGRAM AND PROJECT LIFE-CYCLES



FOOTNOTES

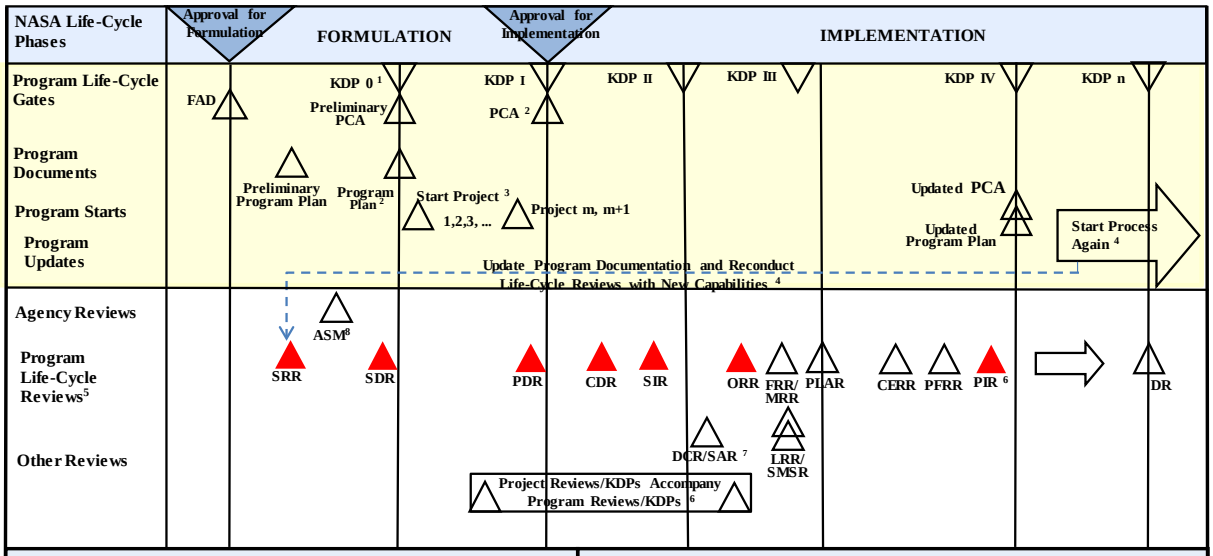
1. KDP 0 may be required by the Decision Authority to ensure major issues are understood and resolved prior to formal program approval at KDP I.
2. Program Plans are baselined at SDR, and PCAs are baselined at KDP I. These are reviewed and updated, as required, to ensure program content, cost, and budget remain consistent.
3. Projects, in some instances, may be approved for Formulation prior to KDP I. Initial project pre-Formulation generally occurs during program Formulation.
4. When programs evolve and/or require uprades (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.
5. Life-cycle review objectives and expected maturity states for these reviews and the attendant KDPs are contained in Table G-1.
6. Timing of the ASM is determined by the MDAA. It may take place at any time during Formulation.

ACRONYMS

ASM—Acquisition Strategy Meeting
FAD—Formulation Authorization Document
KDP—Key Decision Point
PCA - Program Implementation Review
PIR - Program Implementation Review
SDR - System Definition 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 F-1 NASA Program Life-Cycle UCLC



FOOTNOTES

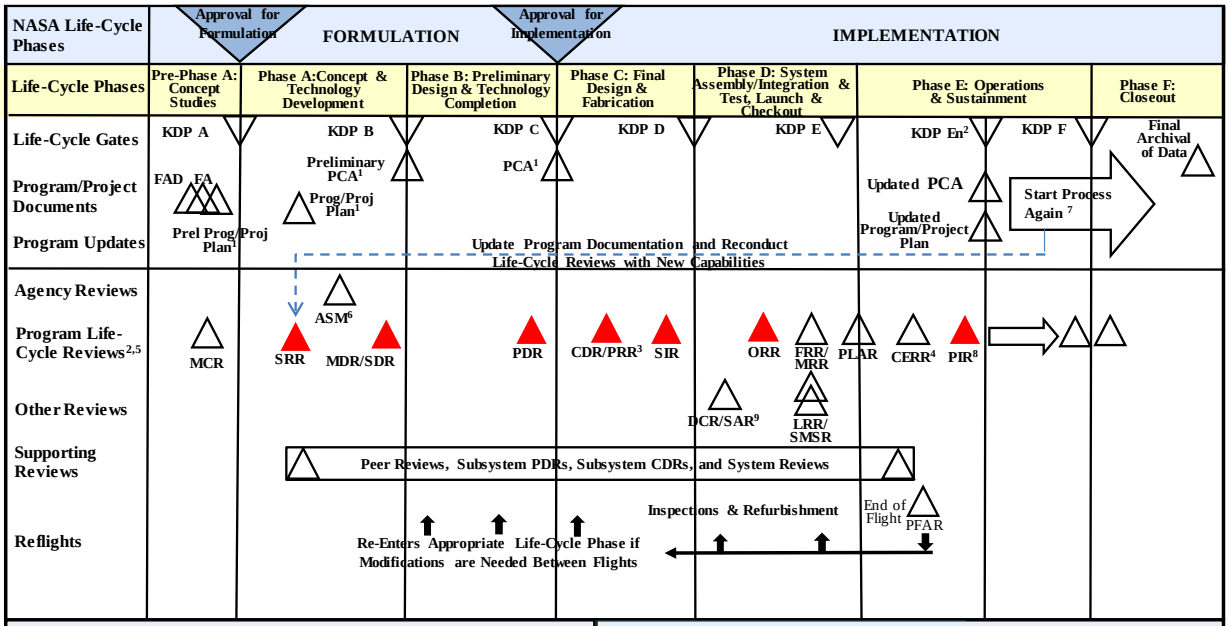
1. KDP 0 may be required by the Decision Authority to ensure major issues are understood and resolved prior to formal program approval at KDP I.
2. Program Plans are baselined at SDR, and PCAs are baselined at KDP I. These are reviewed and updated, as required, to ensure program content, cost, and budget remain consistent.
3. Projects are usually approved for Formulation prior to KDP I.
4. When programs evolve and/or require uprades (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.
5. Life-cycle review objectives, expected maturity states for these reviews, and the attendant KDPs are contained in Table G-2.
6. Tightly-Coupled program reviews generally differ from the reviews of other program types because they are conducted to ensure the overall integration of all program elements (i.e., projects). Once the program is in operations, PIRs are conducted as required by the Decision Authority.
7. DCR is a MSFC added technical review. SAR generally applies to human space flight.
8. Timing of the ASM is determined by the MDAA. It may take place at any time during Formulation

ACRONYMS

ASM - Acquisition Strategy Meeting
CDR - Critical Design Review
CERR - Critical Events Readiness Review
DCR - Design Certification Review
DR - Decommissioning Review
FAD - Formulation Authorization Document
FRR - Flight Readiness Review
KDP - Key Decision Point
LRR - Launch Readiness 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
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 F-2 NASA Program Life-Cycle TC Program



FOOTNOTES

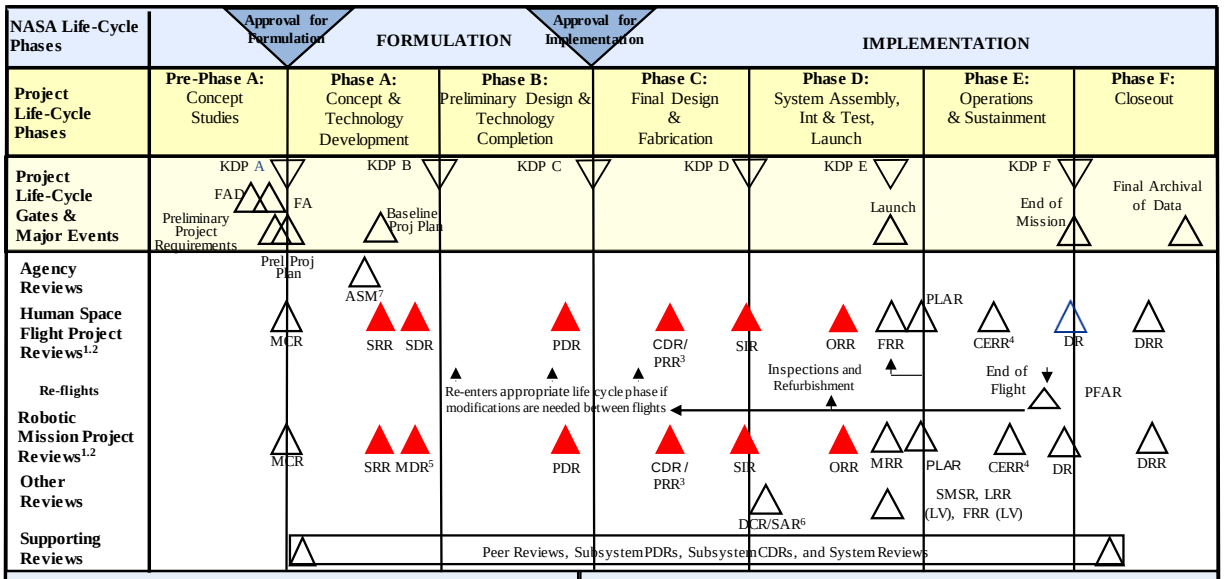
1. Program Plans and PCAs are baselined at KDP C. These are reviewed and updated, as required, to ensure program content, cost, and budget remain consistent. Program and Project Plans may be combined if approved by the MDAA.
2. Flexibility is allowed to the timing, number, and content of reviews as long as the equivalent information is provided at each KDP and the approach is fully documented in the Program/Project Plans(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 G-3.
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-cyle 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. DCR is a MSFC added technical review. SAR generally applies to human space flight.

ACRONYMS

ASM -Acquisition Strategy Meeting
CDR - Critical Design Review
CERR - Critical Events Readiness Review
DCR - Design Certification 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 F-3 NASA SPP Program Life-Cycle



FOOTNOTES

1. Flexibility is allowed as 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 Project Plan.
2. Life-Cycle review objectives and expected maturity states for these reviews and the attendant KDPs are contained in G-3.
3. PRR is needed only when there are multiple copies of systems. It does not require an SRB. Timing is notional.
4. CERRs are established at the discretion of program offices.
5. For robotic missions, the SRR and the MDR may be combined.
6. DCR is a MSFC added technical reiew. SAR generally applies to human space flight.
7. Timing of the ASM is determined by the MDAA. It may take place at any time during Phase A.

ACRONYMS

ASM—Acquisition Strategy Meeting
CDR—Critical Design Review
CERR—Critical Events Readiness Review
DCR— Design Certification 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
LV—Launch Vehicle
MCR—Mission Concept Review
MDR—Mission Definition Review
MRR—Mission Readiness Review
ORR—Operational Readiness Review
PDR—Preliminary Design Review
PFAR—Post-Flight Assessment 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 F-4 NASA Project Life-Cycle

APPENDIX G.

LIFE-CYCLE REVIEW OBJECTIVES AND EXPECTED MATURITY STATES FOR PROGRAMS AND PROJECTS

KDP Review	Associated Lifecycle 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; to assess the credibility of the program's estimated budget and schedule.	Overall KDP 0: Program addresses critical NASA needs and can likely be achieved as conceived.
KDP I	SDR	To evaluate the proposed program requirements/ architecture and allocation of requirements to initial projects; to assess the adequacy of project pre-Formulation efforts; to determine whether the maturity of the program's definition and associated plans are sufficient to begin implementation.	Overall KDP I: 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; proposed projects are feasible within available resources; and the program's risks 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; to assess performance with respect to expectations; to determine the program's ability to execute the implementation plan with acceptable risk within cost and schedule constraints.	Overall KDP II to KDP n: Program still meets Agency needs and is continuing to meet Agency commitments as planned.

Table G-1 LCR Objectives and Expected Maturity State for Uncoupled and Loosely Coupled Programs

KDP Review	Associated Lifecycle Review	LCR Objectives	Overall Expected Maturity State at KDP
KDP 0	SRR	KDP 0 may be required by the Decision Authority to ensure major issues are understood and resolved prior to formal program approval at KDP I.	Overall KDP 0 Expected State: 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.	Overall KDP I: 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; 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.	Overall KDP II Expected Maturity: Program is still on plan; the risk is commensurate with the projects' payload classifications; and the program is ready for AI&T with acceptable risk within Agency Baseline Commitment.
	SIR	To evaluate the readiness of the program, including its projects and supporting infrastructure, to begin system assembly, integration and test, 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.	Overall KDP III Expected State: Program ready for launch and early operations with acceptable risk, within Agency commitments.
	FRR/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 Ops 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 to transfer responsibility to the operations organization.	PLAR Expected State: Project 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 ready to conduct critical mission activity with acceptable risk.
	PFAR	To evaluate how well mission objectives were met during a human spaceflight mission; and 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; actions necessary to mitigate or resolve these anomalies are in place; and lessons learned identified and documented.
KDP IV to KDP n-1	PIR	To evaluate the program's continuing relevance to the Agency's Strategic Plan; to assess performance with respect to expectations; to determine the program's ability to execute the implementation plan with acceptable risk within cost and schedule constraints.	Overall KDP IV to KDP n-1: 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 spaceflight systems and other program/project assets.	Overall KDP n Expected State: Program decommissioning is consistent with program objectives, and program is ready for final analysis and archival of mission and science data and safe disposal of its assets.

Table G-2 LCR Objectives and Expected Maturity State for TC Programs

KDP Review	Associated Lifecycle 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.	Overall KDP A Expected Maturity: 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.	Overall KDP B Expected State: Proposed mission/system architecture is credible and responsive to program requirements and constraints including resources; and 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	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.	
	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/schedule baselines developed during Formulation; to assess compliance of the preliminary design with applicable requirements; to determine if the project is sufficiently mature to begin Phase C.	Overall KDP C Expected Maturity: 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.	Overall KDP D Expected Maturity: 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 Agency Baseline Commitment.
	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 assembly, integration and test; to evaluate whether the remaining project development can be completed within available resources; to 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 lifecycle.	Overall KDP E Expected State: Project and all supporting systems are ready for safe, successful launch/early operations with acceptable risk, w/in Agency Baseline Commitment.
	FRR/MRR	To evaluate the readiness of the project and all project and supporting systems for a safe and successful launch and flight/mission.	
NA	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 ready to conduct mission operations with acceptable risk, w/in Agency B/L Commitment.
	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 lifecycle.	Mission CERR Expected State: Project ready to conduct critical mission activity with acceptable risk.
	PFAR	To evaluate how well mission objectives were met during a human spaceflight mission; 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; and lessons learned identified and documented.
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 spaceflight systems and other project assets; to determine if the project is appropriately prepared to begin Phase F.	Overall KDP F Expected State: 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.

Table G-3 LCR Objectives and Expected Maturity State for Projects and SPP

APPENDIX H.

MSFC COMPLIANCE MATRIX

Note: Tables in Appendix H merely reflect the requirements that are contained in this Directive, and show (for traceability) the corresponding source (parent) requirements. The Appendix does not establish any new requirements.

NPR	Section	Requirement Statement	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	MSFC Compliance		Other Associated Documents
					Comply? (Full, Tailored, or NA)	Rationale for Decisions, Comments, Waiver/Deviations	
NPR 7120.5E	1.1.2	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.	P.1	P.1 PURPOSE To establish the Center management procedural requirements for programs, projects, and activities to implement the provisions of Agency requirements in NPD 7120.4, NPR 7120.5, NPD 7120.6, NPR 7120.7 (NID 7120.99), NPR 7120.8, NPR 7120.10, NPR 7123.1, and NPR 7150.2.	Full		
			2.1	2.1 This MPR implements the Agency's requirements for MSFC engineering and program/project management per Figure 2-1.			
			2.2	2.2 All MSFC programs, projects, and activities shall follow the applicable requirements as described in Table 2-1. Chapters 1-23 are applicable for: 1. All current and future MSFC-managed space flight programs and projects and the MSFC-managed, subordinate activities that fall under them, including: 1a. All MSFC spacecraft, launch vehicles, and instruments developed for space flight programs and projects, 1b. All MSFC research and TDs that are: (1) directly funded by and to be incorporated into a space flight program/project, and (2) the space flight mission's success and schedule are directly tied to the success of the research and TD, or (3) the research and TD is a large scale (i.e. life-cycle cost (LCC) greater than $250 million) development project, 1c. All MSFC critical technical facilities specifically developed, or significantly modified for space flight systems, and ground systems that are in direct support of space flight operations.			
NPR 7120.5E	1.1.3	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.	NA	NA, Agency level requirement (on MDAA)	NA	1.1.3 does not need to be flowed down into MPR 7120.1. MSFC and MSFC programs/projects are not responsible for producing this plan and we have no role to play in ensuring it is provided by the MDAA. MPR 7120.1 already	
NPR 7120.5E	2.1.1	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. 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.	P.2	P.2 APPLICABILITY a. This Marshall Procedural Requirements (MPR) applies to Center personnel, programs, projects, and activities, including contractors and resident agencies to the extent specified in their respective contracts or agreements. ("Contractors," for purposes of this paragraph, include contractors, grantees, Cooperative Agreement recipients, Space Act Agreement partners, or other agreement parties.) b. This MPR applies to the Michoud Assembly Facility. e. This MPR applies to all Center organizations that manage space flight programs, projects, and the MSFC-managed subordinate activities that fall under them (including spacecraft, launch vehicles, instruments developed for space flight programs and projects, research and TDs funded by and to be incorporated into space flight programs and projects, critical technical facilities specifically developed or significantly modified for space flight systems, and ground systems that are in direct support of space flight operations). Specific requirements are flowed down by the program or project to the activities under them to the extent necessary for the program or project to ensure compliance and mission success. f. This MPR applies to reimbursable space flight program/projects performed for non-NASA sponsors. i. This MPR applies to activities managed by MSFC, which come under a program or project	Full		
			2.2	2.2 All MSFC programs, projects, and activities shall follow the applicable requirements as described in Table 2-1. Chapters 1-23 are applicable for: 1. All current and future MSFC-managed space flight programs and projects and the MSFC-managed, subordinate activities that fall under them, including: 1a. All MSFC spacecraft, launch vehicles, and instruments developed for space flight programs and projects, 1b. All MSFC research and TDs that are: (1) directly funded by and to be incorporated into a space flight program/project, and (2) the space flight mission's success and schedule are directly tied to the success of the research and TD, or (3) the research and TD is a large scale (i.e. life-cycle cost (LCC) greater than $250 million) development project, 1c. All MSFC critical technical facilities specifically developed, or significantly modified for space flight systems, and ground systems that are in direct support of space flight operations.			
			2.7	2.7 All MSFC defined Mission Type 4 and 5 activities shall follow the common requirements in Chapters 1-4 and the activity specific requirements in Chapter 28			
			Chapter 28	CHAPTER 28. MISSION TYPE 4 AND 5 ACTIVITIES These are activities that are in response to a request for support from program/projects outside of MSFC and are managed under the requirements flowed down to them from the parent program or project requesting the support. These activities are not subject to the full project management requirements of MPR 7120.1, but are subject to the requirements from the parent program/project, specific requirements of this chapter and other applicable chapters as specified in 2.7. Specific requirements are flowed down to the activity (from the parent program or project) in accordance with the Center level documentation of the parent program/project, to the extent necessary to ensure compliance and mission success (as determined by the parent program or project). The parent program/project may impose requirements from NPR 7120.5, NPR 7120.7, or NPR 7120.8. These activities are categorized as Mission Type 4 and 5 (see 4.1, Table 4-1).			

NPR	Section	Requirement Statement	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	MSFC Compliance: Comply? (Full, Tailored, or NA)	MSFC Compliance: Rationale for Decisions, Comments, Waiver/Deviations	Other Associated Documents
NPR 7120.5E	2.1.4.1	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; 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. 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.	3.7	3.7 The Center Director and Program/Project/Activity Manager shall establish a Category/Mission Type 1, 2, 3, 4, or 5 in accordance with Table 3-1 for each MSFC project and activity. *Note: NASA has established three Project categories based on life cycle cost. MSFC defines Mission Types to further subdivide the three project categories, and adds a fourth and fifth type for Center level governance of activities under a program/project managed outside of MSFC, for which MSFC has responsibility for a portion of the work managed by the outside program/project. The NASA Associate Administrator (AA) will approve the final project categorization for projects falling under categories 1, 2, and 3. The Decision Authority and governing PMC for each project category/type and type 4 and 5 activities are shown in Table 3-1. For all programs, the Decision Authority is the NASA AA, and the Governing Program Management Council (PMC) is the Agency PMC.* *Note: Activities in support of MSFC-managed programs/projects will follow the requirements of this MPR, as a part of the MSFC-managed program/project (i.e., separate products, reviews and reporting is not required). Mission Type 4and 5 activities in support of programs/projects managed outside of MSFC are subject to requirements as flowed down to them from the parent program/project. In addition, such activities are subject to the requirements in specific chapters*	Full		
			3.8	3.8 The Center Director and Program/Project Manager shall establish a Risk Classification for each MSFC payload project according to Table 3-2. *Note: Risk classification is negotiated in the formulation phase during the development of the Program Plan and becomes formal when Plan is signed. NASA has established four project risk classifications based on factors such as cost, priority, national significance, complexity, and*			
			3.9	3.9 The Center Director and Program/Project Manager shall approve any deviations from the guidelines in Appendix B of NPR 8705.4 for the established risk classification, for each MSFC payload project.			
			3.10	3.10 All Center programs, projects, and Mission Type 4 activities shall be reviewed by the MSFC CMC, in accordance with MPR 7120.4, unless the governance has been specifically delegated down to the Directorate/Office level.			
NPR 7120.5E	2.1.4.2	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.	NA	NA, Agency level requirement (on MDAA)	NA	2.1.4.2 does not need to be flowed down into MPR 7120.1. MSFC and MSFC programs/projects have no role to play in implementing it, nor do they have any responsibility to ensure compliance.	
NPR 7120.5E	2.2.1	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.	5.1	5.1 Programs and Projects for which MSFC has management responsibility shall follow the appropriate NASA life cycle as shown in Appendix F. UCLC programs follow the life cycle shown in Figure F-1. TC programs follow the life cycle shown in Figure F-2, SPP follow the life cycle shown in Figure F-3, and projects follow the life cycle shown in Figure F-4.	Full		
			5.4	5.4 As programs, projects, and activities are implemented, they will be impacted by external forces (budget modifications, schedule and/or requirements changes) and internal situations (technical challenges, new requirements). When this occurs, programs, projects, and activities shall revisit the formulation phase to ensure program/project/activity planning is consistent with schedule commitments and resource availability.			
			5.4.1	5.4.1 PCAs, Program/Project Plans, and other planning data shall be modified as needed by programs, projects, and activities when impacted by external forces (as described in 5.4).			
NPR 7120.5E	2.2.2	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 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.)	5.2	5.2 Programs/projects for which MSFC has management responsibility shall follow the MSFC Systems Engineering processes as documented in MPR 7123.1 with respect to the 17 system engineering processes, the development of control plans in accordance with specified Data Requirement Description/Documents (DRDs), and the conduct of LCRs. *Note: The output products and control plans associated with the 17 processes are specified in applicable DRDs that are structured to indicate the Center policy and the option to accept a contractor's document that meets or exceeds the DRD intent.*	Full		MPR 7123.1, MSFC-HDBK-3173
			8.1	8.1 During program/project formulation, each program/project shall develop a preliminary WBS and accompanying dictionary.	Full		
			8.2	8.2 During program/project implementation, each program/project shall develop a final WBS and accompanying dictionary.	Full		
			8.3	8.3 Programs/projects shall ensure the WBS and WBS dictionary are developed in accordance with the templates for the standard Level 2 element names and content descriptions found in NPR 7120.5, Appendices G and H. The NASA WBS Handbook contains additional guidance which programs/projects may use to establish the WBS and accompanying dictionary. *Note: The NASA WBS Handbook (NASA/SP-2010-3404) is available at https://nen.nasa.gov/web/pm/evm, under the Document Repository folder, in the EVM Reference Guides sub-folder.*	Full		
			8.4	8.4 Programs/projects shall develop the WBS and WBS dictionary to the level necessary to implement and verify the work.	Full		
			8.5	8.5 Each program's/project's WBS and WBS dictionary shall be approved by OSAC, for structure and completeness at WBS level 2, and by the MSFC OCFO at WBS level 1, for assignment of WBS numbers. *Note: Any conflicts will be resolved at the MSFC CMC, and by implementing the NASA Work Breakdown Structure Handbook (NASA/SP-2010-3404).*	Full		
			14.10	14.10 Programs/projects execute SE&I using MSFC processes as documented in MPR 7123.1, and associated handbooks, guidance, and best practices documentation.	Full		MPR 7123.1
NPR 7120.5E	2.2.3	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.	5.12.2.1	5.12.2.1 The Program Manager shall work with the MDAA and the Decision Authority to develop and approve the Program's FAD in accordance with NPR 7120.5, Appendix E, to include the approved cost and schedule margins.	Full		
			5.12.3	5.12.3 The PCA shall be developed and updated in accordance with NPR 7120.5, Appendix D.	Full		
			5.12.4	5.12.4 The program plan shall be developed, updated, and approved in accordance with NPR 7120.5, Appendix G.	Full		
			5.12.5	5.12.5 Program plan concurrence shall be obtained from the SMA Directorate, Engineering Directorate, Office of Procurement, Office of the Chief Financial Officer, and other affected direct report offices.	Full		
			5.13.2.1	5.13.2.1 The Project Manager shall work with the MDAA and the Decision Authority to develop and approve the Project's FAD in accordance with NPR 7120.5, Appendix E, to include the approved cost and schedule margins.	Full		
			5.13.3	5.13.3 Project plan preparation and approval shall be in accordance with NPR 7120.5, Appendix H.	Full		
			5.13.6	5.13.6 FA preparation and approval shall be in accordance with NPR 7120.5, Appendix F.	Full		
			10.3	10.3 Programs/projects shall prepare both a preliminary and a final acquisition plan per NPR 7120.5, Appendices G and H. *Note: The final plan identifies the major/critical procurements that will utilize the ARM process for identification of potential issues needing special attention. The program/project acquisition team obtains input from MSFC organizations in areas of SMA, health, environmental protection, information technology, export control, and security.*	Full		

NPR	Section	Requirement Statement	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	MSFC Compliance: Comply? (Full, Tailored, or NA)	MSFC Compliance: Rationale for Decisions, Comments, Waiver/Deviations	Other Associated Documents
NPR 7120.5E	2.2.4	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.	5.1	5.1 Programs and Projects for which MSFC has management responsibility shall follow the appropriate NASA life cycle as shown in Appendix F. UCLC programs follow the life cycle shown in Figure F-1. TC programs follow the life cycle shown in Figure F-2, SPP follow the life cycle shown in Figure F-3, and Projects follow the life cycle shown in Figure F-4. *Note: See Chapter 21 for more information on LCC and participation by Standing Review Board (SRB).*	Full		
			5.2	5.2 Programs/projects for which MSFC has management responsibility shall follow the MSFC Systems Engineering processes as documented in MPR 7123.1 with respect to the 17 system engineering processes, the development of control plans in accordance with specified Data Requirement Description/Documents (DRDs), and the conduct of LCC. *Note: The output products and control plans associated with the 17 processes are specified in applicable DRDs that are structured to indicate the Center policy and the option to accept a contractor's document that meets or exceeds the DRD intent.*	Full		MPR 7123.1
			21.1, 21.1.1	21.1 Programs/projects implement the technicalreview requirements contained in MPR 7123.1 and the following additional requirements. 21.1.1 The reviews shall include cost, schedule, risk, and technical data.	Full		MPR7123.1
			21.2	21.2 Programs/projects shall ensure adequate resources to support externally initiated reviews, including, but not limited to, the following: a. Program/project independent life CRs, including support to the governing PMC and Decision Authority at KDPs in the project life cycle. b. Audit of compliance with MSFC's applicable requirements and principles for space flight projects. c. MSFC assessment of progress in dispositioning risks in preparation for launch. d. MSFC assessment of project-specific significant risks. e. MSFC oversight at key milestones in the life cycle of project commitments to the sponsor.	Full		
			21.3	21.3 Programs/projects in collaboration with line organizations shall conduct periodic management reviews of in-house and contracted activities to assess technical, cost, and schedule performance.	Full		
			21.4	21.4 Line organizations shall conduct peer reviews periodically as part of the design process.	Full		
			21.5	21.5 The Review Plan shall be reviewed and concurred with by the MSFC Chief Engineer's Office, but the program/project Delegated Governing Authority (DGA) has final approval.	Full		
			21.6	21.6 The program/project implementing chief engineer and the CSO shall assign mandatory reviewer organizations from Engineering, and SMA, as required to support LCRs.	Full		
			21.7	21.7 Mandatory review organizations shall review all review items against the review entrance,exit, and success criteria that are affected by that organization's discipline responsibility.	Full		
			21.8	21.8 Mandatory review organizations shall assign reviewers who were not involved in the development of the review item and did not review the item for release into the review. 21.8.1 In key areas of concern, independent reviewers shall be appointed by Engineering and SMA who are independent of the program/project advocacy chain, from outside MSFC.	Full		
			21.9	21.9 Mandatory reviewing organizations shall submit the following responses to the review: a. A list of review items reviewed by the organization b. Review discrepancies, if any, found by the organization c. Concurrence sheet that the review, upon discrepancy resolution, meets each review entrance and exit, and success criterion with respect to the organizational discipline responsibility, or rationale to support a non-concurrence.	Full		
			21.10	21.10 The program/project Manager shall establish a budget and acquisition mechanism for independent reviewers.	Full		
NPR 7120.5E	2.2.5	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 for further guidance on the review processes conducted by the SRB.)	5.5	5.5 The SRB or IRT shall be convened by the Convening Authorities shown in Table 5.5-1.	Full		
			5.5.3.5	5.5.3.5 All MSFC programs and projects will include the participation of independent reviewers, as well as Engineering/SMA Technical Authorities and line management within the standard review team and review board structure, per MPR 7120.1 and MSFC-HDBK-3173. Independent assessment is a normal part of all MSFC program/project reviews, regardless of whether or not an SRB or IRT is convened.	Full		
			21.1.2	21.1.2 For all MSFC programs and for projects with LCC greater than $250 million, the MSFC Program/Project Manager shall include SRB participation in the following reviews; SRR, SDR/MDR, PDR, CDR, SIR, ORR, and PIR. *Note: See SRB Handbook.*	Full		
			21.10	21.10 The program/project Manager shall establish a budget and acquisition mechanism for independent reviewers.	Full		
NPR 7120.5E	2.2.5.1	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.	5.5.3.6, and 5.5.4	5.5.3.6 The Review Manager will ensure that the SRB/IRT Chair and the SRB/IRT members are properly vetted for conflicts of interest (personal, organizational, and positional) per the process documented in section 3.2 of the NASA SRB Handbook. 5.5.4 When a candidate is to be nominated to serve as SRB or IRT Chair for a program/project assigned to MSFC, the MSFC responsible organization (of the potential nominee) shall provide a formal document (thru their organization chain of command with appropriate signatures), to the Review Manager, which provides the following information about the nominee: 5.5.4.1 Person's name/organization 5.5.4.2 Current work assignment 5.5.4.3 Rationale/data that demonstrates independence/objectivity. a. Lack of any conflict of interest b. No past association with the program/project c. No personal, organizational, or positional conflicts of interest d. OGE 450 form that is currently on file, up-to-date, and reviewed by MSFC Chief Counsel, for a personal, organizational, or positional conflict of interest for civil servants e. Appropriate clearance (if applicable) *Note: See appendix C of the SRB Handbook for more details on conflict of interest vetting.* 5.5.4.4 Rationale of past experience that qualifies the nominee for this task. a. Past experience with significant similar reviews (as reviewer, leader, or chairperson) b. Experience in the leadership of a team(s) managing the schedule and content of work. 5.5.4.5 Commitment for the duration of the program/project review cycle.	Full		
NPR 7120.5E	2.2.5.2	2.2.5.2 The portion of the LCR 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.	5.5	5.5 The SRB or IRT shall be convened by the Convening Authorities shown in Table 5.5-1.	Full		
			5.5.3.7	5.5.3.7 The Review Manager (in conjunction with the SRB/IRT Chair) will produce the Terms of Reference (ToR) which documents the vetting of SRB/IRT membership for conflicts of interest and establishes the expectations for how the SRB/IRT will conduct the actual independent reviews.	Full		
			5.5.3.8	5.5.3.8 The Review Manager will provide the ToR to the Associate Director, Technical, for concurrence, and to the Center Director, or designee, for approval, prior to approval of the other Convening Authorities.	Full		
NPR 7120.5E	2.2.5.3	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.	5.6	5.6 The Center Director (or designee), the Program/Project Manager and the SRB (or IRT) chair shall assess the readiness to conduct an LCR (typically 30-90 days prior to the start of the LCR) by reviewing the entrance data package and reporting the results to the decision authority.	Full		

NPR	Section	Requirement Statement	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	MSFC Compliance: Comply? (Full, Tailored, or NA)	MSFC Compliance: Rationale for Decisions, Comments, Waiver/Deviations	Other Associated Documents
NPR 7120.5E	2.2.6	2.2.6 In preparation for these LCRs, the program or project **shall** generate the appropriate documentation per 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.	5.12.2.2	5.12.2.2 UCLC program products shall be as documented in Table 5.12-1.	Full		
			5.12.2.3	5.12.2.3 Tightly coupled program products shall be as documented in Table 5.12-3.	Full		
			5.12.2.4	5.12.2.4 SPP products shall be as documented in Table 5.12-5.	Full		
			5.12.6.1	5.12.6.1 UCLC program control plans shall be as documented in Table 5.12-2.	Full		
			5.12.6.2	5.12.6.2 Tightly coupled program control plans shall be as documented in Table 5.12-4.	Full		
			5.12.6.3	5.12.6.3 SPP control plans shall be as documented in Table 5.12-6. *Note: Control plan "how to" information is located in the MSFC-HDBK-3173, Project Management and Systems Engineering Handbook, as well as, QD-QE-017, MGM 8040.1, MGM 7120.3, MWI 7120.6, and Chapter 23 of this document. Plans without "how to" documentation are to be developed in accordance with guidance issued by the program/project's implementing chief engineer. Note: A template for the development of a SEMP is described in MPR 7123.1.*	Full		MSFC-HDBK-3173, QD-QE-017, MGM 8040.1, MGM 7120.3, and MWI 7120.6
			5.13.2	5.13.2 Project products shall be as documented in Table 5.13-1.	Full		
			5.13.4	5.13.4 Project control plans shall be as documented in Table 5.13-2. Unless otherwise required, the control plans may be separate plans or included as sections in the project plan. *Note: Control plan "how to" information is located in the MSFC-HDBK-3173, Project Management and Systems Engineering Handbook, as well as QD-QE-017, MGM 8040.1, MGM 7120.3, and MWI 7120.6. Plans without "how to" documentation are to be developed in accordance with guidance issued by the program/project's implementing chief engineer. Note: A template for the development of a SEMP is described in MPR 7123.1.*	Full		MSFC-HDBK-3173, QD-QE-017, MGM 8040.1, MGM 7120.3, and MWI 7120.6
			CH16	MWI 7120.6 contains requirements for programs/projects to develop a risk management process that includes RIDM and CRM, document it in a Risk Management Plan, and designate a Risk Manager to facilitate the implementation of the risk management process.	Full		MWI 7120.6
NPR 7120.5E		**Table I-1 Uncoupled and Loosely Coupled Program Milestone Products and Control Plans Maturity Matrix**					
NPR 7120.5E	Table I-1	1. FAD [Baseline at SRR]	Table 5.12-1	(UC/LC products shall be …) FAD (baseline at SRR)	Full		
NPR 7120.5E	Table I-1	2. PCA [Baseline at KDP I]	Table 5.12-1	(UC/LC products shall be …) PCA (baseline at SDR)	Full		
NPR 7120.5E	Table I-1	3. Program Plan [Baseline at SDR]	Table 5.12-1	(UC/LC products shall be …) Program Plan (baseline at SDR)	Full		
NPR 7120.5E	Table I-1	3.a. Mission Directorate requirements and constraints [Baseline at SRR]	Table 5.12-1	(UC/LC products shall be …) Mission Directorate requirements & constraints (baseline at SRR)	Full		
NPR 7120.5E	Table 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]	Table 5.12-1	(UC/LC products shall be …) Traceability of program-level requirements on projects to the Agency strategic goals & MD requirements and constraints (baseline at SDR)	Full		
NPR 7120.5E	Table I-1	3.c. Documentation of driving ground rules and assumptions on the program [Baseline at SDR]	Table 5.12-1	(UC/LC products shall be …) Documentaiton of driving ground rules & program assumptions (baseline at SDR)	Full		
NPR 7120.5E	Table I-1	4. Interagency and international agreements [Baseline at SDR]	Table 5.12-1	(UC/LC products shall be …) Interagency and International Agreements (baseline at SDR)	Full		
NPR 7120.5E	Table I-1	5. ASM minutes	Table 5.12-1	(UC/LC products shall be …) ASM Minutes (final at SDR)	Full		
NPR 7120.5E	Table I-1	6. Risk mitigation plans and resources for significant risks	Table 5.12-1	(UC/LC products shall be …) Risk mitigation plans & resources for significant risks (initial at SRR)	Full		
NPR 7120.5E	Table I-1	7. Documented Cost and Schedule Baselines [Baseline at SDR]	Table 5.12-1	(UC/LC products shall be …) Documented cost & schedule baselines (Baseline at SDR)	Full		
NPR 7120.5E	Table I-1	8. Documentation of Basis of Estimate (cost and schedule) [Baseline at SDR]	Table 5.12-1	(UC/LC products shall be …) Documentation of BOE-cost & schedule (baseline at SDR)	Full		
NPR 7120.5E	Table I-1	9. Documentation of performance against plan/baseline, including status/closure of formal actions from previous KDP	Table 5.12-1	(UC/LC products shall be …) Documentation of performance against plan/baseline, including status/closure of formal actions from previous KDP (summary at SRR, SDR, PIR)	Full		
NPR 7120.5E	Table I-1	10. Plans for work to be accomplished during Implementation	Table 5.12-1	(UC/LC products shall be …) Plans for work to be accomplished during next life cycle phase (Plan at SDR, PIR)	Full		
NPR 7120.5E		**Program Plan Control Plans**					
NPR 7120.5E	Table I-1	1. Technical, Schedule, and Cost Control Plan [Baseline at SDR]	Table 5.12-2	(UC/LC control plans shall be …) Technical, Schedule, and Cost Control Plan (Baseline at SDR)	Full		
NPR 7120.5E	Table 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]	Table 5.12-2	(UC/LC control plans shall be …) S&MA Plan (Baseline at SDR) (see NPDs 8730.5 and 8720.1, NPRs 8715.3, 8705.2, 8705.6 and 8735.2, and NASA STDs 8719.13 and 8739.8)	Full		
NPR 7120.5E	Table I-1	3. Risk Management Plan [Baseline at SDR] [per NPR 8000.4]	Table 5.12-2	(UC/LC control plans shall be …) Risk Management Plan (Baseline at SDR) (see NPR 8000.4)	Full		
NPR 7120.5E	Table I-1	4. Acquisition Plan [Baseline at SDR]	Table 5.12-2	(UC/LC control plans shall be …) Acquisition Plan (Baseline at SDR)	Full		
NPR 7120.5E	Table I-1	5. Technology Development Plan [Baseline at SDR] [per NPD 7500.2 and NPR 7500.1]	Table 5.12-2	(UC/LC control plans shall be …) Technology Development Plan (Baseline at SDR) (see NPD 7500.2 and NPR 7500.1)	Full		
NPR 7120.5E	Table I-1	6. Systems Engineering Management Plan [Baseline at SDR]	Table 5.12-2	(UC/LC control plans shall be …) SEMP (Baseline at SDR)	Full		
NPR 7120.5E	Table I-1	7. Product Data and Life-Cycle Management Plan [Initial at SDR] [per NPR 7120.9]	N/A	NPR 7120.9 PDLM has been cancelled. Chapter 23 retained as guidance for including product data management planning within normal CM/DM planning.	Full		
NPR 7120.5E	Table I-1	8. Review Plan [Baseline at SRR]	Table 5.12-2	(UC/LC control plans shall be …) Review Plan (Baseline at SRR)	Full		
NPR 7120.5E	Table I-1	9. Environmental Management Plan [Baseline at SDR] [per NPR 8580.1]	Table 5.12-2	(UC/LC control plans shall be …) Environmental Management Plan (Baseline at SDR) (see NPR 8580.1)	Full		
NPR 7120.5E	Table I-1	10. Configuration Management Plan [Baseline at SDR]	Table 5.12-2	(UC/LC control plans shall be …) CM Plan (Baseline at SDR)	Full		
NPR 7120.5E	Table I-1	11. Security Plan [Baseline at SDR] [per NPD 1600.2 and NPRs 1600.1, 1040.1, and 2810.1]	Table 5.12-2	(UC/LC control plans shall be …) Security Plan (Baseline at SDR) (see NPD 1600.2, NPRs 1600.1, 1040.1, 2810.1, and MPR 1600.1)	Full		
NPR 7120.5E	Table I-1	12. Threat Summary [Baseline at SDR]	Table 5.12-2	(UC/LC control plans shall be …) Threat Summary (Baseline at SDR) (Contact Systems Engineering Office in MSFC Chief Engineer Office for additional information on applicability and approval requirements for these products which is determined on a case-by-case basis for each program/project)	Full		
NPR 7120.5E	Table I-1	13. Technology Transfer (formerly Export) Control Plan [Baseline at SDR] [per NPR 2190.1]	Table 5.12-2	(UC/LC control plans shall be …) Export Control Plan (Baseline at SDR) ([see MPR 2190.1)	Full		
			Table 5.12-2	(UC/LC control plans shall be …) Technology Transfer Plan (Baseline at SDR) ([see NPR 2190.1)	Full		
NPR 7120.5E	Table I-1	14. Education Plan [Baseline at SDR]	Table 5.12-2	(UC/LC control plans shall be …) Education Plan (Baseline at SDR)	Full		
NPR 7120.5E	Table I-1	15. Communications Plan [Baseline at SDR]	Table 5.12-2	(UC/LC control plans shall be …) Communication Plan (Baseline at SDR)	Full		
NPR 7120.5E	Table I-1	16. Knowledge Management Plan [Baseline at SDR] [per NPD 7120.4 and NPR 7120.6]	Table 5.12-2	(UC/LC control plans shall be …) Lessons Learned Plan (Baseline at SDR) (see NPD 7120.4 and NPD 7120.6])	Full	At MSFC, the Lesson's Learned Plan is used to capture the intent of the Knowledge Management Plan. Refer to MSFC specific project plan template.	
NPR 7120.5E		**Table I-2 Tightly Coupled Program Milestone Products Maturity Matrix**					
NPR 7120.5E	Table I-2	1. FAD [Baseline at SRR]	Table 5.12-3	(TC products shall be …) FAD (baseline at SRR)	Full		
NPR 7120.5E	Table I-2	2. PCA [Baseline at PDR]	Table 5.12-3	(TC products shall be …) PCA (baseline at PDR)	Full		

NPR	Section	Requirement Statement	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	MSFC Compliance		Other Associated Documents
					Comply? (Full, Tailored, or NA)	Rationale for Decisions, Comments, Waiver/Deviations	
NPR 7120.5E	Table I-2	3. Program Plan [Baseline at SDR]	Table 5.12-3	(TC Products shall be …) Program Plan (baseline at SDR)	Full		
NPR 7120.5E	Table I-2	3.a. Mission Directorate requirements and constraints [Baseline at SRR]	Table 5.12-3	(TC products shall be …) Mission Directorate requirements & constraints (Baseline at SRR)	Full		
NPR 7120.5E	Table 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]	Table 5.12-3	(TC products shall be …) Traceability of program-level requirements on projects to the Agency strategic goals & MD requirements and constraints (baseline at SDR)	Full		
NPR 7120.5E	Table I-2	3.c. Documentation of driving ground rules and assumptions on the program [Baseline at SDR]	Table 5.12-3	(TC products shall be …) Documentation of driving ground rules & program assumptions (baseline at SDR)	Full		
NPR 7120.5E	Table I2	4. Interagency and international agreements [Baseline at SDR]	Table 5.12-3	(TC products shall be …) Interagency and International Agreements (baseline at SDR)	Full		
NPR 7120.5E	Table I-2	5. ASM minutes	Table 5.12-3	(TC products shall be …) ASM Minutes (final at SDR)	Full		
NPR 7120.5E	Table I-2	6. Risk mitigation plans and resources for significant risks	Table 5.12-3	(TC products shall be …) Risk mitigation plans & resources for significant risks (initial at SRR)	Full		
NPR 7120.5E	Table I-2	7. Documented Cost and Schedule Baselines [Baseline at SDR]	Table 5.12-3	(TC products shall be …) Documented cost & schedule baselines (Baseline at PDR)	Full		
NPR 7120.5E	Table I-2	8. Documentation of Basis of Estimate (cost and schedule) [Baseline at PDR]	Table 5.12-3	(TC products shall be …) Documentation of BOE-cost & schedule (baseline at PDR)	Full		
NPR 7120.5E	Table I-2	9. Joint Cost and Schedule Confidence Level and supporting documentation [Baseline at PDR]	Table 5.12-3	(TC products shall be …) JCL & supporting documentation (baseline at PDR)	Full		
NPR 7120.5E	Table I-2	10. Shared Infrastructure, Staffing, and Scarce Material Requirements and Plans	Table 5.12-3	(TC products shall be …) Shared infrastructure, staffing, and scarce material requirements & plans (Initial at SRR)	Full		
NPR 7120.5E	Table I-2	11. Documentation of performance against plan/baseline, including status/closure of formal actions from previous KDP	Table 5.12-3	(TC products shall be …) Documentation of performance against plan/baseline, including status/closrue of formal actions from previous KDP (summary at all except SRR)	Full		
NPR 7120.5E	Table I-2	12. Plans for work to be accomplished during next life-cycle phase	Table 5.12-3	(TC products shall be …) Plans for work to be accomplished during next life cycle phase (plan at SRR, PDR, CDR, ORR, and DR)	Full		
NPR 7120.5E		**Table I-3 Tightly Coupled Program Plan Control Plans Maturity Matrix**					
NPR 7120.5E	Table I-3	1. Technical, Schedule, and Cost Control Plan [Baseline at SDR]	Table 5.12-4	(TC control plans shall be …) Technical, Schedule, and Cost Control Plan (Baseline at SDR)	Full		
NPR 7120.5E	Table 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]	Table 5.12-4	(TC control plans shall be …) S&MA Plan (Baseline at SDR) (see NPDs 8730.5 and 8720.1, NPRs 8715.3, 8705.2, 8705.6 and 8735.2, and NASA Stds 8719.13 and 8739.8)	Full		
NPR 7120.5E	Table I-3	3. Risk Management Plan [Baseline at SDR] [per NPR 8000.4]	Table 5.12-4	(TC control plans shall be …) Risk Management Plan (Baseline at SDR) (see NPR 8000.4)	Full		
NPR 7120.5E	Table I-3	4. Acquisition Plan [Baseline at SDR]	Table 5.12-4	(TC control plans shall be …) Acquisition Plan (Baseline at SDR)	Full		
NPR 7120.5E	Table I-3	5. Technology Development Plan [Baseline at SDR] [per NPD 7500.2 and NPR 7500.1]	Table 5.12-4	(TC control plans shall be …) Technology Development Plan (Baseline at SDR) (see NPD 7500.2 and NPR 7500.1)	Full		
NPR 7120.5E	Table I-3	6. Systems Engineering Management Plan [Baseline at SDR]	Table 5.12-4	(TC control plans shall be …) SEMP (Baseline at SDR)	Full		
NPR 7120.5E	Table I-3	7. Product Data and Life-Cycle Management Plan [Initial at SDR] [per NPR 7120.9]	N/A	NPR 7120.9 PDLM has been cancelled. Chapter 23 retained as guidance for including product data management planning within normal CM/DM planning.	Full		
NPR 7120.5E	Table I-3	8. Verification and Validation Plan [Baseline at PDR]	Table 5.12-4	(TC control plans shall be …) V&V Plan (Baseline at PDR)	Full		
NPR 7120.5E	Table I-3	9. Information Technology Plan [Baseline at SDR] [per NPDs 2200.1 and 1440.6 and NPRs 2200.2, 1441.1, and 2810.1]	Table 5.12-4	(TC control plans shall be …) IT Plan (Baseline at SDR) (see NPDs 2200.1 and 1440.6 and NPRs 2200.2, 1441.1, and 2810.1)	Full		
NPR 7120.5E	Table I-3	10. Review Plan [Baseline at SRR]	Table 5.12-4	(TC control plans shall be …) Review Plan (Baseline at SRR)	Full		
NPR 7120.5E	Table I-3	11. Missions Operations Plan [Baseline at ORR]	Table 5.12-4	(TC control plans shall be …) Mission Operations Plan (Baseline at ORR)	Full		
NPR 7120.5E	Table I-3	12. Environmental Management Plan [Baseline at PDR] [per NPR 8580.1]	Table 5.12-4	(TC control plans shall be …) Environmental Management Plan (Baseline at PDR) (see NPR 8580.1)	Full		
NPR 7120.5E	Table I-3	13. Integrated Logistics Support Plan [Baseline at PDR] [per NPD 7500.1]	Table 5.12-4	(TC control plans shall be …) Integrated Logistics Support Plan (Baseline at PDR) (see NPD 7500.1)	Full		
NPR 7120.5E	Table I-3	14. Science Data Management Plan [Baseline at ORR] [per NPD 2200.1 and NPRs 2200.2, 1441.1, and 8020.12]	Table 5.12-4	(TC control plans shall be …) Science Data Management Plan (Baseline at ORR) (see NPD 2200.1 and NPRs 2200.2, 1441.1, and 8020.12)	Full		
NPR 7120.5E	Table I-3	15. Configuration Management Plan [Baseline at SDR]	Table 5.12-4	(TC control plans shall be …) CM Plan (Baseline at SDR)	Full		
NPR 7120.5E	Table I-3	16. Security Plan [Baseline at PDR] [per NPD 1600.2 and NPRs 1600.1, 2810.1, and 1040.1]	Table 5.12-4	(TC control plans shall be …) Security Plan (Baseline at PDR) (see NPD 1600.2 NPRs 1600.1, 2810.1, 1040.1, and MPR 1600.1)	Full		
NPR 7120.5E	Table I-3	17. Threat Summary [Baseline at PDR]	Table 5.12-4	(TC control plans shall be …) Threat Summary (Baseline at PDR) (Contact Systems Engineering Office in MSFC Chief Engineer Office for additional information on applicability and approval requirements for these products which is determined on a case-by-case basis for each program/project)	Full		
NPR 7120.5E	Table I-3	18. Technology Transfer (formerly Export) Control Plan [Baseline at PDR] [per NPR 2190.1]	Table 5.12-4	(TC control plans shall be …) Export Control Plan (Baseline at PDR) (see MPR 2190.1)	Full		
			Table 5.12-4	(TC control plans shall be …) Technology Transfer Plan (Baseline at PDR) (see NPR 2190.1)	Full		
NPR 7120.5E	Table I-3	19. Education Plan [Baseline at PDR]	Table 5.12-4	(TC control plans shall be …) Education Plan (Baseline at PDR)	Full		
NPR 7120.5E	Table I-3	20. Communications Plan [Baseline at PDR]	Table 5.12-4	(TC control plans shall be …) Communications Plan (Baseline at PDR)	Full		
NPR 7120.5E	Table I-3	21. Knowledge Management Plan [Baseline at SDR] [per NPD 7120.4 and NPR 7120.6]	Table 5.12-4	(TC control plans shall be …) Lessons Learned Plan (Baseline at SDR) (see NPD 7120.4 and NPD 7120.6)	Full	At MSFC, the Lesson's Learned Plan is used to capture the intent of the Knowledge Management Plan. Refer to MSFC specific project plan template.	
NPR 7120.5E		**Table I-4 Project Milestone Products Maturity Matrix**					
NPR 7120.5E		**Headquarters and Program Products**					
NPR 7120.5E	Table I-4	1. FAD [Baseline at MCR]	Table 5.13-1	(Project products shall be …) FAD (Baseline at MCR)	Full		
NPR 7120.5E	Table I-4	2. Program Plan [Baseline at MCR]	Table 5.13-1	(Project products shall be …) Program Plan (Baseline at MCR)	Full		
NPR 7120.5E	Table I-4	2.a. Applicable Agency strategic goals [Baseline at MCR]	Table 5.13-1	(Project products shall be …) Applicable Agency strategic goals (Baseline at MCR)	Full		
NPR 7120.5E	Table 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]	Table 5.13-1	(Project products shall be …) Documentation of program-level requirements and constraints on the project (from Program Plan) and stakeholder expectations, including mission objectives/goals and mission success criteria (Baseline at SRR)	Full		
NPR 7120.5E	Table I-4	2.c. Documentation of driving mission, technical, and programmatic ground rules and assumptions [Baseline at SDR/MDR]	Table 5.13-1	(Project products shall be …) Documentation of driving mission, technical, and programmatic ground rules and assumptions (Baseline at SDR/MDR)	Full		
NPR 7120.5E	Table I-4	3. Partnerships and interagency and international agreements [Baseline U.S. partnerships and agreements at SDR/MDR; Baseline International agreements at PDR]	Table 5.13-1	(Project products shall be …) Partnerships and inter-agency and international agreements (Baseline at SDR/MDR for US partnerships & agreements; Baseline at PDR for international agreements)	Full		
NPR 7120.5E	Table I-4	4. ASM minutes	Table 5.13-1	(Project products shall be …) ASM Minutes (final at SRR)	Full		
NPR 7120.5E	Table I-4	5. NEPA compliance documentation per NPR 8580.1	Table 5.13-1	(Project products shall be …) NEPA compliance documentation (Baseline at PDR) (see NPR 8580.1)	Full		
NPR 7120.5E	Table I-4	6. Mishap Preparedness and Contingency Plan [Baseline at SMSR] [per NPR 8621.1]	Table 5.13-1	(Project products shall be …) Mishap preparedness and contingency plan (Baseline at MRR/FRR(SMSR)) (see NPR 8621.1)	Full		
NPR 7120.5E		**Project Technical Products**					
NPR 7120.5E	Table I-4	1. Concept Documentation [Approve at MCR]	Table 5.13-1	(Project products shall be …) Concept documentation (Approve at MCR)	Full		
NPR 7120.5E	Table I-4	2. Mission, Spacecraft, Ground, and Payload Architectures [Baseline mission and spacecraft architecture at SRR; Baseline ground and payload architectures at SDR/MDR]	Table 5.13-1	(Project products shall be …) Mission, spacecraft, ground, and payload architectures (Baseline mission and spacecraft architecture at SRR; Baseline ground and payload architectures at SDR/MDR)	Full		

NPR	Section	Requirement Statement	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	MSFC Compliance		Other Associated Documents
					Comply? (Full, Tailored, or NA)	Rationale for Decisions, Comments, Waiver/Deviations	
NPR 7120.5E	Table I-4	3. Project-Level, System, and Subsystem Requirements [Baseline project-level and system-level requirements at SRR; Baseline subsystem requirements at PDR]	Table 5.13-1	(Project products shall be …) Project level, system, and subsystem requirements (Baseline project-level and system-level requirements at SRR; Baseline subsystem requirements at PDR)	Full		
NPR 7120.5E	Table I-4	4. Design Documentation [Baseline Preliminary Design at PDR; Baseline Detailed Design at CDR; Baseline As-built hardware and software at MRR/FRR]	Table 5.13-1	(Project products shall be …) Design documentation (Baseline preliminary design at PDR; Baseline detailed design at CDR; Baseline As-built hardware and software at MRR/FRR)	Full		
NPR 7120.5E	Table I-4	5. Operations Concept [Baseline at PDR]	Table 5.13-1	(Project products shall be …) Ops Concept (Baseline at PDR)	Full		
NPR 7120.5E	Table I-4	6. Technology Readiness Assessment Documentation	Table 5.13-1	(Project products shall be …) Technology readiness assessment documentation (Initial at MCR)	Full		
NPR 7120.5E	Table I-4	7. Engineering Development Assessment Documentation	Table 5.13-1	(Project products shall be …) Engineering development assessment documentation (Initial at MCR)	Full		
NPR 7120.5E	Table I-4	8. Heritage Assessment Documentation	Table 5.13-1	(Project products shall be …) Heritage assessment documentation (Initial at MCR)	Full		
NPR 7120.5E	Table I-4	9. Safety Data Packages [Baseline at CDR] [per NPRs 8715.3, 8735.1, and 8735.2]	Table 5.13-1	(Project products shall be …) Safety data packages (Baseline at CDR) (see NPRs 8715.3 and 8735.2)	Full		
NPR 7120.5E	Table I-4	10. ELV Payload Safety Process Deliverables [Baseline at SIR] [per NPR 8715.7]	Table 5.13-1	(Project products shall be …) ELV Payload Safety Process Deliverables (Baseline at SIR) (see NPR 8715.7)	Full		
NPR 7120.5E	Table I-4	11. Verification and Validation Report [Baseline at MRR/FRR]	Table 5.13-1	(Project products shall be …) V&V Report (Baseline at MRR/FRR)	Full		
NPR 7120.5E	Table I-4	12. Operations Handbook [Baseline at ORR]	Table 5.13-1	(Project products shall be …) Operations Handbook (Baseline at ORR)	Full		
NPR 7120.5E	Table I-4	13. Orbital Debris Assessment Report [Final at SMSR] [per NPR 8715.6]	Table 5.13-1	(Project products shall be …) Orbital Debris Assessment (Final ODAR at MRR/FRR (SMSR)) (see NPR 8715.6)	Full		
NPR 7120.5E	Table I-4	14. End of Mission Plans per NPR 8715.6/NASA-STD 8719.14, App B [Baseline at SMSR]	Table 5.13-1	(Project products shall be …) End of Mission Plans (EOMP) (Baseline at MRR/FRR (SMSR)) (see NPR 8715.6/NASA-STD 8719.14, App B)	Full		
NPR 7120.5E	Table I-4	15. Mission Report	Table 5.13-1	(Project products shall be …) Mission Report (final at DRR)	Full		
NPR 7120.5E		**Project Management, Planning, and Control Products**					
NPR 7120.5E	Table I-4	1. Formulation Agreement [Baseline for Phase A at MCR; Baseline for Phase B at SDR/MDR]	Table 5.13-1	(Project products shall be …) Formulation Agreement (Baseline for Phase A at MCR; Baseline for Phase B at SDR/MDR)	Full		
NPR 7120.5E	Table I-4	2. Project Plan [Baseline at PDR]	Table 5.13-1	(Project products shall be …) Project Plan (Baseline at SRR)	Full	MSFC specifies an earlier maturity for baselining the Project Plan, in order to ensure that Center Management has insight into and endorsement of project planning earlier in the lifecycle in order to avoid unnecessary delays at the end of implementation phase.	
NPR 7120.5E	Table 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]	Table 5.13-1	(Project products shall be …) Plans for work to be accomplished during next implementation life cycle phase (Baseline at PDR for Phase C; Baseline at SIR for Phase D; Baseline at MRR/FRR for Phase E; Baseline at DR for Phase F)	Full		
NPR 7120.5E	Table 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	Table 5.13-1	(Project products shall be …) Documentation of performance against FA or against plans for work to be accomplished during implementation phase, including performance against baselines and status/closure of formal actions from previous KDP (summary at all except SRR)	Full		
NPR 7120.5E	Table I-4	5. Project Baselines [Baseline at PDR]	Table 5.13-1	(Project products shall be …) Project Baseline (Baseline at PDR)	Full		
NPR 7120.5E	Table I-4	5.a. Top technical, cost, schedule and safety risks, risk mitigation plans, and associated resources	Table 5.13-1	(Project products shall be …) Top Technical, cost, schedule, and safety risks, risk mitigation plans and associated resources (Initial at MCR)	Full		
NPR 7120.5E	Table I-4	5.b. Staffing requirements and plans	Table 5.13-1	(Project products shall be …) Staffing requirements and plans (Initial at MCR)	Full		
NPR 7120.5E	Table I-4	5.c. Infrastructure requirements and plans, business case analysis for infrastructure Alternative Future Use Questionnaire (NASA Form 1739), per NPR 9250.1 [Baseline for NF 1739 Section A at SDR/MDR; Baseline for NF 1739 Section B at PDR]	Table 5.13-1	(Project products shall be …) Infrastructure requirements and plans, business case analysis for infrastructure; Capitalization Determination Form (NF 1739) (Baseline for NF 1739/Sect A at SDR/MDR; Baseline for NF 1739/Section B at PDR) (see NPR 9250.1)	Full		
NPR 7120.5E	Table I-4	5.d. Schedule [Baseline Integrated Master Schedule at PDR]	Table 5.13-1	(Project products shall be …) Schedule (Baseline IMS at PDR)	Full		
NPR 7120.5E	Table I-4	5.e. Cost Estimate (Risk-Informed or Schedule-Adjusted Depending on Phase) [Baseline at PDR]	Table 5.13-1	(Project products shall be …) Cost estimate (Rsik informed or schedule-adjusted depending on phase) (Baseline at PDR)	Full		
NPR 7120.5E	Table I-4	5.f. Basis of Estimate (cost and schedule)	Table 5.13-1	(Project products shall be …) BOE (cost & schedule) (Initial at MCR)	Full		
NPR 7120.5E	Table I-4	5.g. Joint Cost and Schedule Confidence Level(s) and supporting documentation [Baseline at PDR]	Table 5.13-1	(Project products shall be …) Confidence levels & supporting documentation (JCL at PDR)	Full		
NPR 7120.5E	Table I-4	5.h. External Cost and Schedule Commitments [Baseline at PDR]	Table 5.13-1	(Project products shall be …) External cost & schedule commitments (Baseline at PDR)	Full		
NPR 7120.5E	Table I-4	5.i. CADRe [Baseline at PDR]	Table 5.13-1	(Project products shall be …) Cost analysis data requirement (Baseline at PDR)	Full		
NPR 7120.5E	Table I-4	6. Decommissioning/Disposal Plan [Baseline at DR]	Table 5.13-1	(Project products shall be …) Decommissioning/Disposal Plan (Baseline at DR)	Full		
NPR 7120.5E		**Table I-5 Project Plan Control Plans Maturity Matrix**					
NPR 7120.5E	Table I-5	1. Technical, Schedule, and Cost Control Plan [Baseline at SDR/MDR]	Table 5.13-2	(Project control plans shall be …) Techncial, schedule, and cost control plan (Baseline at SDR/MDR)	Full		
NPR 7120.5E	Table 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]	Table 5.13-2	(Project control plans shall be …) S&MA Plan (Baseline at SRR) (see NPDs 8730.5 and 8720.1, NPRs 8715.3, 8705.2, 8705.6, and 8735.2, and NASA Stds 8719.13 and 8739.8)	Full		
NPR 7120.5E	Table I-5	3. Risk Management Plan [Baseline at SRR] [per NPR 8000.4]	Table 5.13-2	(Project control plans shall be …) Risk Management Plan (Baseline at SRR) (see NPR 8000.4)	Full		
NPR 7120.5E	Table I-5	4. Acquisition Plan [Baseline at SRR]	Table 5.13-2	(Project control plans shall be …) Acquisition Plan (Baseline at SRR)	Full		
NPR 7120.5E	Table I-5	5. Technology Development Plan (may be part of Formulation Agreement) [Baseline at MCR] [per NPD 7500.2 and NPR 7500.1]	Table 5.13-2	(Project control plans shall be …) Technology Development Plan (Baseline at MCR) (see NPD 7500.2 and NPR 7500.1)	Full		
NPR 7120.5E	Table I-5	6. Systems Engineering Management Plan [Baseline at SRR]	Table 5.13-2	(Project control plans shall be …) SEMP (Baseline at SRR)	Full		
NPR 7120.5E	Table 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]	Table 5.13-2	(Project control plans shall be …) IT Plan (Baseline SDR/MDR) (see NPDs 2200.1 and 1440.6 and NPRs 2200.2, 1441.1, 2800.1, and 2810.1)	Full		
NPR 7120.5E	Table I-5	8. Software Management Plan(s) [Baseline at SDR/MDR] [per NPR 7150.2 and NASA-STD-8739.8]	Table 5.13-2	(Project control plans shall be …) SW Management Plan (Baseline at SDR/MDR) (see NPR 7150.2 and NASA Std 8739.8)	Full		
NPR 7120.5E	Table I-5	9. Verification and Validation Plan [Baseline at PDR]	Table 5.13-2	(Project control plans shall be …) V&V Plan (Baseline at PDR)	Full		
NPR 7120.5E	Table I-5	10. Review Plan [Baseline at SRR]	Table 5.13-2	(Project control plans shall be …) Review Plan (Baseline at SRR)	Full		
NPR 7120.5E	Table I-5	11. Mission Operations Plan [Baseline at ORR]	Table 5.13-2	(Project control plans shall be …) Mission Ops Plan (Baseline at ORR)	Full		
NPR 7120.5E	Table I-5	12. Environmental Management Plan [Baseline at SDR/MDR] [per NPR 8580.1]	Table 5.13-2	(Project control plans shall be …) Evironmental Management Plan (Baseline at SDR/MDR) (see NPR 8580.1)	Full		
NPR 7120.5E	Table I-5	13. Integrated Logistics Support Plan [Baseline at PDR] [per NPD 7500.1]	Table 5.13-2	(Project control plans shall be …) Integrated Logistics Support Plan (Baseline at PDR) (see NPD 7500.1)	Full		
NPR 7120.5E	Table I-5	14. Science Data Management Plan [Baseline at ORR] [per NPD 2200.1 and NPRs 2200.2 and 1441.1]	Table 5.13-2	(Project control plans shall be …) Science Data Management Plan (Baseline at ORR) (see NPD 2200.1, and NPRs 2200.2 and 1441.1)	Full		
NPR 7120.5E	Table I-5	15. Integration Plan [Baseline at PDR]	Table 5.13-2	(Project control plans shall be …) Integration Plan (Baseline at PDR)	Full		
NPR 7120.5E	Table I-5	16. Configuration Management Plan [Baseline at SRR]	Table 5.13-2	(Project control plans shall be …) CM Plan (Baseline at SRR)	Full		

NPR	Section	Requirement Statement	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	MSFC Compliance		Other Associated Documents
					Comply? (Full, Tailored, or NA)	Rationale for Decisions, Comments, Waiver/Deviations	
NPR 7120.5E	Table I-5	17. Security Plan [Baseline at PDR] [per NPD 1600.2 and NPRs 1600.1 and 1040.1]	Table 5.13-2	(Project control plans shall be …) Security Plan (Baseline at PDR) (see NPD 1600.2, NPRs 1600.1, 1040.1, MPR 1600.1)	Full		
NPR 7120.5E	Table I-5	18. Project Protection Plan [Baseline at PDR]	Table 5.13-2	(Project control plans shall be …) Project Protection Plan (Baseline at PDR) (Contact Systems Engineering Office in MSFC Chief Engineer Office for additional information on applicability and approval requirements for these products which is determined on a case-by-case basis for each program/project)	Full		
NPR 7120.5E	Table I-5	19. Technology Transfer (formerly Export) Control Plan [Baseline at PDR] [per NPR 2190.1]	Table 5.13-2	(Project control plans shall be …) Export Control Plan (Baseline at PDR) (see MPR 2190.1)	Full		
			Table 5.13-2	(Project control plans shall be …) Technology Transfer Plan (Baseline at PDR) (see NPR 2190.1)	Full		
NPR 7120.5E	Table I-5	20. Knowledge Management Plan [Baseline at PDR] [per NPD 7120.4 and NPR 7120.6]	Table 5.13-2	(Project control plans shall be …) Lessons Learned Plan (Baseline at PDR) (see NPD 7120.4 and NPD 7120.6)	Full	At MSFC, the Lesson's Learned Plan is used to capture the intent of the Knowledge Management Plan. Refer to MSFC specific project plan template.	
NPR 7120.5E	Table I-5	21. Human Rating Certification Package [Initial at SRR;certified at MRR/FRR] [per NPR 8705.2]	Table 5.13-2	(Project control plans shall be …) Human Rating Certification Pkg (Approve Certification at MRR/FRR) (see NPR 8705.2)	Full		
NPR 7120.5E	Table I-5	22. Planetary Protection Plan [Baseline at PDR] [per NPD 8020.7 and NPR 8020.12]	Table 5.13-2	(Project control plans shall be …) Planetary Protection Plan (Certification at PDR) (see NPD 8020.7 and NPR 8020.12)	Full		
NPR 7120.5E	Table I-5	23. Nuclear Safety Launch Approval Plan [Baseline at SDR/MDR] [per NPR 8715.3]	Table 5.13-2	(Project control plans shall be …) Nuclear Safety Launch Approval Plan (Baseline at SDR/MDR) (see NPR 8715.3)	Full		
NPR 7120.5E	Table I-5	24. Range Safety Risk Management Process Documentation [Baseline at SIR] [per NPR 8715.5]	Table 5.13-2	(Project control plans shall be …) Range Safety Risk Mgt Process Documentation (Baseline at SIR) (see NPR 8715.5)	Full		
NPR 7120.5E	Table I-5	25. Education Plan [Baseline at PDR]	Table 5.13-2	(Project control plans shall be …) Education Plan (Baseline at PDR)	Full		
NPR 7120.5E	Table I-5	26. Communications Plan [Baseline at PDR]	Table 5.13-2	(Project control plans shall be …) Communication Plan (Baseline at PDR)	Full		
NPR 7120.5E		**Table I-6 Single-Project Program Milestone Products Maturity Matrix**					
NPR 7120.5E	Table I-6	1. FAD [Baseline at MCR]	Table 5.12-5	(SPP products shall be …) FAD (Baseline at MCR)	Full		
NPR 7120.5E	Table I-6	2. PCA [Baseline at PDR]	Table 5.12-5	(SPP products shall be …) PCA (Baseline at PDR)	Full		
NPR 7120.5E	Table I-6	3. Traceability of Agency strategic goals and Mission Directorate requirements and constraints to program/project-level requirements and constraints [Baseline at SRR]	Table 5.12-5	(SPP products shall be …) Traceability of Agency strategic goals and Mission Directorate requirements and constraints to program/project-level requirements and constraints (Baseline at SRR)	Full		
NPR 7120.5E	Table I-6	4. Documentation of driving mission, technical, and programmatic ground rules and assumptions [Baseline at SDR/MDR]	Table 5.12-5	(SPP products shall be …) Documentation of driving mission, technical, and programmatic ground rules and assumptions (Baseline at SDR/MDR)	Full		
NPR 7120.5E	Table I-6	5. Partnerships and inter-agency and international agreements [Baseline U.S. partnerships and agreements at SDR/MDR; Baseline international agreements at PDR]	Table 5.12-5	(SPP products shall be …) Partnerships and inter-agency and international agreements (Baseline at SDR/MDR for US partnerships & agreements; Baseline at PDR for international agreements)	Full		
NPR 7120.5E	Table I-6	6. ASM minutes	Table 5.12-5	(SPP products shall be …) ASM Minutes (final at SRR)	Full		
NPR 7120.5E	Table I-6	7. NEPA compliance documentation per NPR 8580.1	Table 5.12-5	(SPP products shall be …) NEPA compliance documentation (Baseline at PDR) (see NPR 8580.1)	Full		
NPR 7120.5E	Table I-6	8. Mishap Preparedness and Contingency Plan [Baseline at SMSR]	Table 5.12-5	(SPP products shall be …) Mishap preparedness and contingency plan (Baseline at MRR/FRR(SMSR)) (see NPR 8621.1)	Full		
NPR 7120.5E		**Single-Project Program Technical Products**					
NPR 7120.5E	Table I-6	1. Concept Documentation	Table 5.12-5	(SPP products shall be …) Concept documentation (Approve at MCR)	Full		
NPR 7120.5E	Table I-6	2. Mission, Spacecraft, Ground, and Payload Architectures [Baseline mission and spacecraft architecture at SRR; baseline ground and payload architectures at SDR/MDR]	Table 5.12-5	(SPP products shall be …) Mission, spacecraft, ground, and payload architectures (Baseline mission and spacecraft architecture at SRR; Baseline ground and payload architectures at SDR/MDR)	Full		
NPR 7120.5E	Table I-6	3. Project-Level, System, and Subsystem Requirements [Baseline project-level and system-level requirements at SRR; baseline subsystem requirements at PDR]	Table 5.12-5	(SPP products shall be …) Project level, system, and subsystem requirements (Baseline project-level and system-level requirements at SRR; Baseline subsystem requirements at PDR)	Full		
NPR 7120.5E	Table I-6	4. Design Documentation [Baseline Preliminary Design at PDR; baseline Detailed Design at CDR; baseline as-built hardware and software at MRR/FRR]	Table 5.12-5	(SPP products shall be …) Design documentation (Baseline preliminary design at PDR; Baseline detailed design at CDR; Baseline As-built hardware and software at MRR/FRR)	Full		
NPR 7120.5E	Table I-6	5. Operations Concept [Baseline at PDR]	Table 5.12-5	(SPP products shall be …) Ops Concept (Baseline at PDR)	Full		
NPR 7120.5E	Table I-6	6. Technology Readiness Assessment Documentation	Table 5.12-5	(SPP products shall be …) Technology readiness assessment documentation (Initial at MCR)	Full		
NPR 7120.5E	Table I-6	7. Engineering Development Assessment Documentation	Table 5.12-5	(SPP products shall be …) Engineering development assessment documentation (Initial at MCR)	Full		
NPR 7120.5E	Table I-6	8. Heritage Assessment Documentation	Table 5.12-5	(SPP products shall be …) Heritage assessment documentation (Initial at MCR)	Full		
NPR 7120.5E	Table I-6	9. Safety Data Packages [Baseline at CDR]	Table 5.12-5	(SPP products shall be …) Safety data packages (Baseline at CDR) (see NPRs 8715.3 and 8735.2)	Full		
NPR 7120.5E	Table I-6	10. ELV Payload Safety Process Deliverables [Baseline at SIR]	Table 5.12-5	(SPP products shall be …) ELV Payload Safety Process Deliverables (Baseline at SIR) (see NPR 8715.7)	Full		
NPR 7120.5E	Table I-6	11. Verification and Validation Report [Baseline at MRR/FRR]	Table 5.12-5	(SPP products shall be …) V&V Report (Baseline at MRR/FRR)	Full		
NPR 7120.5E	Tabel I-6	12. Operations Handbook [Baseline at ORR]	Table 5.12-5	(SPP products shall be …) Operations Handbook (Baseline at ORR)	Full		
NPR 7120.5E	Table I-6	13. Orbital Debris Assessment Report [Final at SMSR] [per NPR 8715.6]	Table 5.12-5	(SPP products shall be …) Orbital Debris Assessment (Final ODAR at MRR/FRR (SMSR)) (see NPR 8715.6)	Full		
NPR 7120.5E	Table I-6	14. End of Mission Plans [Baseline at SMSR] [per NPR 8715.6/NASA-STD-8719.14, App B]	Table 5.12-5	(SPP products shall be …) End of Mission Plans (EOMP) (Baseline at MRR/FRR (SMSR)) (see NPR 8715.6/NASA-STD 8719.14, App B)	Full		
NPR 7120.5E	Table I-6	15. Mission Report	Table 5.12-5	(SPP products shall be …) Mission Report (final at DRR)	Full		
NPR 7120.5E		**Single-Project Program Management, Planning, and Control Products**					
NPR 7120.5E	Table I-6	1. Formulation Agreement [Baseline for Phase A at MCR; baseline for Phase B at SDR/MDR]	Table 5.12-5	(SPP products shall be …) Formulation Agreement (Baseline for Phase A at MCR; Baseline for Phase B at SDR/MDR)	Full		
NPR 7120.5E	Table I-6	2. Program Plan [Baseline at PDR]	Table 5.12-5	(SPP products shall be …) Program Plan (Baseline at SRR) (Program & Project Plans may be combined with approval of the MDAA)	Full	MSFC specifies an earlier maturity for baselining the Project Plan, in order to ensure that Center Management has insight into and endorsement of project planning earlier in the lifecycle in order to avoid unnecessary delays at the end of implementation phase.	

NPR	Section	Requirement Statement	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	MSFC Compliance		Other Associated Documents
					Comply? (Full, Tailored, or NA)	Rationale for Decisions, Comments, Waiver/Deviations	
NPR 7120.5E	Table I-6	3. Project Plan [Baseline at PDR]	Table 5.12-5	(SPP products shall be …) Project Plan (Baseline at SRR) (Program & Project Plans may be combined with approval of the MDAA)	Full	MSFC specifies an earlier maturity for baselining the Project Plan, in order to ensure that Center Management has insight into and endorsement of project planning earlier in the lifecycle in order to avoid unnecessary delays at the end of implementation phase.	
NPR 7120.5E	Table 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]	Table 5.12-5	(SPP products shall be …) Plans for work to be accomplished during next implementation life cycle phase (Baseline at PDR for Phase C; Baseline at SIR for Phase D; Baseline at MRR/FRR for Phase E; Baseline at DR for Phase F)	Full		
NPR 7120.5E	Table 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 of formal actions from previous KDP	Table 5.12-5	(SPP products shall be …) Documentation of performance against FA or against plans for work to be accomplished during implementation phase, including performance against baselines and status/closure of formal actions from previous KDP (summary at all except SRR)	Full		
NPR 7120.5E	Table I-6	6.Project Baselines [Baseline at PDR]	Table 5.12-5	(SPP products shall be …) Project Baseline (Baseline at PDR)	Full		
NPR 7120.5E	Table I-6	6.a. Top technical, cost, schedule and safety risks, risk mitigation plans, and associated resources	Table 5.12-5	(SPP products shall be …) Top Technical, cost, schedule, and safety risks, risk mitigation plans and associated resources (Initial at MCR)	Full		
NPR 7120.5E	Table I-6	6.b. Staffing requirements and plans	Table 5.12-5	(SPP products shall be …) Staffing requirements and plans (Initial at MCR)	Full		
NPR 7120.5E	Table I-6	6.c. Infrastructure requirements and plans, business case analysis for infrastructure Alternative Future Use Questionnaire (NASA Form 1739) [Baseline for NF 1739 Section A at SDR/MDR; Baseline for NF 1739 Section B at PDR] [per NPR 9250.1]	Table 5.12-5	(SPP products shall be …) Infrastructure requirements and plans, business case analysis for infrastructure; Capitalization Determination Form (NF 1739) (Baseline for NF 1739/Sect A at SDR/MDR; Baseline for NF 1739/Section B at PDR) (see NPR 9250.1)	Full		
NPR 7120.5E	Table I-6	6.d. Schedule [Baseline Integrated Master Schedule at PDR]	Table 5.12-5	(SPP products shall be …) Schedule (Baseline IMS at PDR)	Full		
NPR 7120.5E	Table I-6	6.e. Cost Estimate (Risk-Informed or Schedule-Adjusted Depending on Phase) [Risk-informed and schedule-adjusted baseline at PDR]	Table 5.12-5	(SPP products shall be …) Cost estimate (Rsik informed or schedule-adjusted depending on phase) (Baseline at PDR)	Full		
NPR 7120.5E	Table I-6	6.f. Basis of Estimate (cost and schedule)	Table 5.12-5	(SPP products shall be …) BOE (cost & schedule) (Initial at MCR)	Full		
NPR 7120.5E	Table I-6	6.g. Joint Cost and Schedule Confidence Level(s) and supporting documentation [Baseline at PDR]	Table 5.12-5	(SPP products shall be …) Confidence levels & supporting documentation (JCL at PDR)	Full		
NPR 7120.5E	Table I-6	6.h. External Cost and Schedule Commitments [Baseline at PDR]	Table 5.12-5	(SPP products shall be …) External cost & schedule commitments (Baseline at PDR)	Full		
NPR 7120.5E	Table I-6	6.i. CADRe [Baseline at PDR]	Table 5.12-5	(SPP products shall be …) Cost analysis data requirement (Baseline at PDR)	Full		
NPR 7120.5E	Table I-6	7. Decommissioning/Disposal Plan [Baseline at DR]	Table 5.12-5	(SPP products shall be …) Decommissioning/Disposal Plan (Baseline at DR)	Full		
NPR 7120.5E		**Table I-7 Single-Project Program Plan Control Plans Maturity Matrix**					
NPR 7120.5E	Table I-7	1. Technical, Schedule, and Cost Control Plan [Baseline at SDR/MDR]	Table 5.12-6	(SPP control plans shall be …) Techncial, schedule, and cost control plan (Baseline at SDR/MDR)	Full		
NPR 7120.5E	Table I-7	2. Safety and Mission Assurance Plan [Baseline at SRR]	Table 5.12-6	(SPP control plans shall be …) S&MA Plan (Baseline at SRR) (see NPDs 8730.5 and 8720.1, NPRs 8715.3, 8705.2, 8705.6, and 8735.2, and NASA Stds 8719.13 and 8739.8)	Full		
NPR 7120.5E	Table I-7	3. Risk Management Plan [Baseline at SRR]	Table 5.12-6	(SPP control plans shall be …) Risk Management Plan (Baseline at SRR) (see NPR 8000.4)	Full		
NPR 7120.5E	Table I-7	4. Acquisition Plan [Baseline at SRR]	Table 5.12-6	(SPP control plans shall be …) Acquisition Plan (Baseline at SRR)	Full		
NPR 7120.5E	Table I-7	5. Technology Development Plan (may be part of Formulation Agreement) [Baseline at MCR]	Table 5.12-6	(SPP control plans shall be …) Technology Development Plan (Baseline at MCR) (see NPD 7500.2 and NPR 7500.1)	Full		
NPR 7120.5E	Table I-7	6. Systems Engineering Management Plan [Baseline at SRR]	Table 5.12-6	(SPP control plans shall be …) SEMP (Baseline at SRR)	Full		
NPR 7120.5E	Table I-7	7. Product Data and Life-Cycle Management Plan [Initial at SDR/MDR] [per NPR 7120.9]	N/A	NPR 7120.9 PDLM has been cancelled. Chapter 23 retained as guidance for including product data management planning within normal CM/DM planning.	Full		
NPR 7120.5E	Table I-7	8. Information Technology Plan [Baseline at SDR/MDR]	Table 5.12-6	(SPP control plans shall be …) IT Plan (Baseline SDR/MDR) (see NPDs 2200.1 and 1440.6 and NPRs 2200.2, 1441.1, 2800.1, and 2810.1)	Full		
NPR 7120.5E	Table I-7	9. Software Management Plan(s) [Baseline at SDR/MDR]	Table 5.12-6	(SPP control plans shall be …) SW Management Plan (Baseline at SDR/MDR) (see NPR 7150.2 and NASA Std 8739.8)	Full		
NPR 7120.5E	Table I-7	10. Verification and Validation Plan [Baseline at PDR]	Table 5.12-6	(SPP control plans shall be …) V&V Plan (Baseline at PDR)	Full		
NPR 7120.5E	Table I-7	11. Review Plan [Baseline at SRR]	Table 5.12-6	(SPP control plans shall be …) Review Plan (Baseline at SRR)	Full		
NPR 7120.5E	Table I-7	12. Mission Operations Plan [Baseline at ORR]	Table 5.12-6	(SPP control plans shall be …) Mission Ops Plan (Baseline at ORR)	Full		
NPR 7120.5E	Table I-7	13. Environmental Management Plan [Baseline at SDR/MDR]	Table 5.12-6	(SPP control plans shall be …) Evironmental Management Plan (Baseline at SDR/MDR) (see NPR 8580.1)	Full		
NPR 7120.5E	Table I-7	14. Integrated Logistics Support Plan [Baseline at PDR]	Table 5.12-6	(SPP control plans shall be …) Integrated Logistics Support Plan (Baseline at PDR) (see NPD 7500.1)	Full		
NPR 7120.5E	Table I-7	15. Science Data Management Plan [Baseline at ORR]	Table 5.12-6	(SPP control plans shall be …) Science Data Management Plan (Baseline at ORR) (see NPD 2200.1, and NPRs 2200.2 and 1441.1)	Full		
NPR 7120.5E	Table I-7	16. Integration Plan [Baseline at PDR]	Table 5.12-6	(SPP control plans shall be …) Integration Plan (Baseline at PDR)	Full		
NPR 7120.5E	Table I-7	17. Threat Summary [Baseline at PDR]	Table 5.12-6	(SPP control plans shall be …) Threat Summary (Baseline at PDR) (Contact Systems Engineering Office in MSFC Chief Engineer Office for additional information on applicability and approval requirements for these products which is determined on a case-by-case basis for each program/project)	Full		
NPR 7120.5E	Table I-7	18. Configuration Management Plan [Baseline at SRR]	Table 5.12-6	(SPP control plans shall be …) CM Plan (Baseline at SRR)	Full		
NPR 7120.5E	Table I-7	19. Security Plan [Baseline at PDR]	Table 5.12-6	(SPP control plans shall be …) Security Plan (Baseline at PDR) (see NPD 1600.2, NPRs 1600.1, 1040.1, and MPR 1600.1)	Full		
NPR 7120.5E	Table I-7	20. Project Protection Plan [Baseline at PDR]	Table 5.12-6	(SPP control plans shall be …) Project Protection Plan (Baseline at PDR) (Contact Systems Engineering Office in MSFC Chief Engineer Office for additional information on applicability and approval requirements for these products which is determined on a case-by-case basis for each program/project)	Full		
NPR 7120.5E	Table I-7	21. Technology Transfer (formerly Export) Control Plan [Baseline at PDR]	Table 5.12-6	(SPP control plans shall be …) Export Control Plan (Baseline at PDR) (see MPR 2190.1)	Full		
			Table 5.12-6	(SPP control plans shall be …) Technology Transfer Plan (Baseline at PDR) (see NPR 2190.1)	Full		
NPR 7120.5E	Table I-7	22. Knowledge Management Plan [Baseline at PDR]	Table 5.12-6	(SPP control plans shall be …) Lessons Learned Plan (Baseline at PDR) (see NPD 7120.4 and NPD 7120.6)	Full	At MSFC, the Lesson's Learned Plan is used to capture the intent of the Knowledge Management Plan. Refer to MSFC specific project plan template.	

NPR	Section	Requirement Statement	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	MSFC Compliance: Comply? (Full, Tailored, or NA)	MSFC Compliance: Rationale for Decisions, Comments, Waiver/Deviations	Other Associated Documents
NPR 7120.5E	Table I-7	23. Human Rating Certification Package [Initial at SRR; certified at MRR/FRR]	Table 5.12-6	(SPP control plans shall be …) Human Rating Certification Pkg (Approve Certification at MRR/FRR) (see NPR 8705.2)	Full		
NPR 7120.5E	Table I-7	24. Planetary Protection Plan [Baseline at PDR]	Table 5.12-6	(SPP control plans shall be …) Planetary Protection Plan (Certification at PDR) (see NPD 8020.7 and NPR 8020.12)	Full		
NPR 7120.5E	Table I-7	25. Nuclear Safety Launch Approval Plan [Baseline at SDR/MDR]	Table 5.12-6	(SPP control plans shall be …) Nuclear Safety Launch Approval Plan (Baseline at SDR/MDR) (see NPR 8715.3)	Full		
NPR 7120.5E	Table I-7	26. Range Safety Risk Management Process Documentation [Baseline at SIR]	Table 5.12-6	(SPP control plans shall be …) Range Safety Risk Mgt Process Documentation (Baseline at SIR) (see NPR 8715.5)	Full		
NPR 7120.5E	Table I-7	27. Education Plan [Baseline at PDR]	Table 5.12-6	(SPP control plans shall be …) Education Plan (Baseline at PDR)	Full		
NPR 7120.5E	Table I-7	28. Communications Plan [Baseline at PDR]	Table 5.12-6	(SPP control plans shall be …) Communication Plan (Baseline at PDR)	Full		
NPR 7120.5E	2.2.8	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. 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.	CH22	CHAPTER 22. EARNED VALUE MANAGEMENT (EVM) NPR 7120.5 requires programs/projects with lifecycle cost greater than $20 M to perform EVM during phase C and D (and for modifications/enhancements during phase E) with an EVM system that complies with the guidelines in ANSI/EIA-748, Standard for Earned Value Management Systems. *Note: Use of NASA's EVM capability and processes will ensure compliance with the ANSI standard. This capability allows customization to match the individual needs of the program or project, while still meeting the ANSI/EIA-748 guidelines. NASA's EVM Capability Process documentation can be found on the Program and Project Management Community of Practice at https://nen.nasa.gov/web/pm/evm, under the Document Repository folder.* *In addition, the EVM Implementation Guide (2012 2 29), along with NASA/SP-2010-3403, NASA Schedule Management Handbook; and NASA/SP-2010-3404, NASA Work Breakdown Structure (WBS) Handbook, are all available under the EVM Reference Guides sub-folder. These handbooks provide useful guidance and best practices for implementing the EVM, scheduling and WBS requirements in NPR 7120.5.*	Full		
NPR 7120.5E	2.2.8.1	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, a Contract Performance Report (CPR), Integrated Master Schedule (IMS), and a WBS are required deliverables with the appropriate data requirements descriptions (DRDs) included in the contract and/or agreement.	22.1	22.1 In-house design and development tasks with expected costs in excess of $20M shall implement an EVM system that complies with the guidelines in ANSI/EIA-748, Standard for Earned Value Management Systems. *Note: EVM provides one source of input for a Program's/Project's risk management process and supports internal replanning and reporting as necessary per MPR 7120.4, MSFC Center Management Council Process. STD/MA-MSD specifies the requirements for applying EVM requirements to contracts.*	Full		
NPR 7120.5E	2.2.8.2	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.	22.2	22.2 For programs/projects requiring EVM (i.e. projects in phases C and D, and programs at the discretion of the MDAA, with a life-cycle cost greater than $20 million and Phase E project modifications, enhancements, or upgrades with an estimated development cost greater than $20 million), the program/project shall support the MD conducted pre-approval integrated baseline review as part of their preparations for KDP C to ensure that the program/project's work is properly linked with its cost, schedule, and risk and that the management processes are in place to conduct program/project-level EVM.	Full		
NPR 7120.5E	2.2.10	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.	3.1	3.1 MSFC programs/projects/activities shall submit a compliance assessment for MPR 7120.1 to the MSFC Chief Engineer's Office. *Note: A compliance matrix template with minimum required content is found in Appendix C, and is also available on the MIDL under the Program/Project Documents link.*	Full	MPR 7120.1 implements all the rquirements of NPR 7120.5E, as documented in this Center Complance Matrix. Programs/Projects at MSFC will demonstrate their compliance with MPR 7120.1 through the use of the program/project Compliance Matrix in Appendix C of MPR 7120.1, which includes all requirements on the programs/projects, and other responsible parties, associated with program/project execution. The NPR requirements are cross referenced in this MPR through these compliance matrices. Program/projects will attach the MPR compliance matrix to the Formulation Agreement, or Program/Project Plan. Therefore, this approach complies with the requirement in NPR 7120.5E, 2.2.10.	
			3.2	3.2 The MSFC Chief Engineer's Office shall assess and concur with the program's/project's/activity's compliance assessment (see 3.4 for approval schedule).	Full		
			3.3	3.3 The compliance assessment and all waiver/deviation requests (i.e., tailoring) for requirements involving program/project/activity execution in this MPR shall receive the concurrence of the Implementing Chief Engineer, the CSO, and the Program/Project/Activity Manager.	Full		
			3.3.1	3.3.1 The compliance assessment and all waivers and deviations shall also receive the concurrence of the Director of the MSFC Office responsible for managing the program/project/activity and the Engineering Director. The Directors may choose to delegate their concurrence authority down to a lower level, for specific programs, projects, or activities, provided that the compliance assessment does not include any Agency-level waivers/deviations. *Note: The concurrence of the Director of the responsible office and the Engineering Director is typically obtained by briefing the information at the monthly program reviews and to the EMC, but may be obtained through other means.*	Full		
			3.3.2	3.3.2 For those programs, projects, and activities governed by the CMC (and those with Agency-level waiver/deviation), the compliance assessment and the waiver/deviation shall also receive the concurrence of the Associate Director, Technical, prior to review and approval by the Center Director, or designee. *Note: The approval of the Associate Director, Technical, and the Center Director, or designee, is typically obtained by briefing the information to the PPMAC, and the CMC, but may be obtained through other means.*	Full		
			3.3.3	3.3.3 Approvals for waivers and deviations to requirements involving program/project/activity execution shall be documented by the approvals of the appropriate approving authorities on the FA or Program/Project Plan and the associated compliance matrix. *Note: Redundant signatures are not required in the "Approval" column of the Compliance Matrix, if the approval authority is already a required signatory on the FA or Program/Project Plan.*	Full		
			3.3.4	3.3.4 Program/Project/Activity Managers shall obtain approval for waivers and deviations to requirements involving program/project/activity execution from the appropriate Agency-level authorities, in those cases where the approval authority has been retained at the Agency-level. *Note: Programs and projects are required to obtain proper authorization for deviations from this MPR, other requirements documents invoked herein, and the Agency-level source requirements documents, as applicable. MSFC Chief Engineer's Office will assist the Associate Director, Technical, in interpreting applicability of Agency-level source requirements to the specific waiver/deviation case, identifying those Agency requirements for which waiver/deviation approval authority has been delegated to the Center-level and those for which*	Full		
			3.4	3.4 The completed compliance matrix shall be attached to the FA for space flight projects and SSP in Formulation, and/or to the Program Plan, or Project Plan, for programs or projects entering or in Implementation, and be submitted to OCE. The compliance assessment is approved along with the applicable agreement/planning document to which it is attached. For space flight projects and SSP the FA/compliance assessment is approved at MCR and SDR. For uncoupled, loosely coupled, and tightly-coupled programs, the Program Plan/compliance assessment is approved at SDR. For space flight projects, the Project Plan/compliance assessment is approved at SRR. For SPP, the Program Plan/compliance assessment is approved at SRR. For R&T Programs, the Program Plan/compliance assessment is approved at Formulation Review (FR). For TD Projects, the project plan/compliance assessment is approved at FR. For R&T Portfolio Projects, the project plan/compliance assessment is approved at FR. For activities, the compliance assessment is approved when the activity plan is approved by the appropriate Center governing authority. *Note: If compliance status changes, updated versions of the compliance matrix are incorporated into an FA, Program Plan, or Project Plan revision, and resubmitted to OCE. For revisions of this MPR, MSFC programs/projects/activities with an approved compliance assessment may complete a "changes only" matrix which covers all new or changed requirements, in lieu of completing the entire matrix again.*	Full		
			7.8	7.8 Program/project and Center requirements compliance shall be subject to review at regular status and milestone reviews for each project.	Full		

NPR	Section	Requirement Statement	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	MSFC Compliance: Comply? (Full, Tailored, or NA)	MSFC Compliance: Rationale for Decisions, Comments, Waiver/Deviations	Other Associated Documents
NPR 7120.5E	2.3.1	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.	3.7	3.7 The Center Director and Program/Project/Activity Manager shall establish a Category/Mission Type 1, 2, 3, 4, or 5 in accordance with Table 3-1 for each MSFC project and activity. *Note: NASA has established three Project categories based on LCC. MSFC defines Mission Types to further subdivide the three project categories, and adds a fourth and fifth type for Center level governance of activities under a program/project managed outside of MSFC, for which MSFC has responsibility for a portion of the work managed by the outside program/project. The NASA Associate Administrator (AA) will approve the final project categorization for projects falling under categories 1, 2, and 3. The Decision Authority and governing PMC for each project category/type and type 4 and 5 activities are shown in Table 3-1. For all programs, the Decision Authority is the NASA AA, and the Governing PMC is the Agency PMC.* *Note: Activities in support of MSFC-managed programs/projects will follow the requirements of this MPR, as a part of the MSFC-managed program/project (i.e., separate products, reviews and reporting is not required). Mission Type 4and 5 activities in support of programs/projects managed outside of MSFC are subject to requirements as flowed down to them from the parent program/project. In addition, such activities are subject to the requirements in specific chapters of this MPR (see chapter 2).*	Full		
NPR 7120.5E	2.3.1.1	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.	5.10.2	5.10.2 The Program/Project Manager shall coordinate with the MDAA to obtain the NASA AA's approval for all ABCs for tightly-coupled and SPP (regardless of life-cycle cost) 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.	Full		
NPR 7120.5E	2.3.2	2.3.2 … 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.	3.7	3.7 The Center Director and Program/Project/Activity Manager shall establish a Category/Mission Type 1, 2, 3, 4, or 5 in accordance with Table 3-1 for each MSFC project and activity. *Note: NASA has established three Project categories based on LCC. MSFC defines Mission Types to further subdivide the three project categories, and adds a fourth and fifth type for Center level governance of activities under a program/project managed outside of MSFC, for which MSFC has responsibility for a portion of the work managed by the outside program/project. The NASA Associate Administrator (AA) will approve the final project categorization for projects falling under categories 1, 2, and 3. The Decision Authority and governing PMC for each project category/type and type 4 and 5 activities are shown in Table 3-1. For all programs, the Decision Authority is the NASA AA, and the Governing PMC is the Agency PMC.*	Full		
NPR 7120.5E	2.3.3	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.	3.10	3.10 All Center programs, projects, and Mission Type 4 activities shall be reviewed by the MSFC CMC, in accordance with MPR 7120.4, unless the governance has been specifically delegated down to the Directorate/Office level.	Full		MPR7120.4
			5.3	5.3 Program/project managers shall present requests for Center resource requirements to the CMC at KDPs (during formulation and implementation), commensurate with program/project parameters defined in the Formulation Authorization Document (FAD) and Program/Project Plans.	Full		
			5.3.1	5.3.1 Center Director (or designee) shall provide human and other resources to execute the FAD and the Program/Project plan and establish, develop, and maintain the institutional capabilities (processes and procedures, human capital, facilities, aircraft, and infrastructure) required for the execution of programs/projects.	Full		
			5.8	5.8 After the final LCR in a given life cycle phase, the Center Director and the Program Manager (for projects in their program) shall assess the readiness of a program or project to progress to the next phase of the life cycle (per the LCR objectives and expected maturity states in Appendix F), and provide their assessments and recommendations to the MDAA to support the Decision Authority's determination at the KDP.	Full		
			5.8.1	5.8.1 For MSFC managed activities that are not required to have an SRB, the activity manager and the MSFC CMC or the Direct Report of the Directorate/Office (for those activities that do not report to the MSFC CMC) shall assess the readiness of that activity to progress to the next phase at the KDP review.	Full		
			5.12, 5.12.1	5.12 Program Formulation & Implementation; 5.12.1 CMC content for KDP presentations shall be documented per MPR 7120.4.	Full		MPR7120.4
			5.12.7	5.12 Program Formulation & Implementation; 5.12.7 Content for routine performance reports to the CMC shall be in accordance with MPR 7120.4.	Full		MPR7120.4
			5.13, 5.13.1	5.13 Project Formulation & Implementation 5.13.1 CMC content for KDP presentation shall be in accordance with MPR 7120.4.	Full		MPR7120.4
			5.13.5	5.13 Project Formulation & Implementation 5.13.5 Content for routine performance reports to the CMC shall be in accordance with MPR 7120.4.	Full		MPR7120.4
NPR 7120.5E	2.3.4	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. 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.)	21.2	21.2 Programs/projects shall ensure adequate resources to support externally initiated reviews, including, but not limited to, the following: a. Program/project independent LLCs, including support to the governing PMC and Decision Authority at KDPs in the project life cycle.	Full		
			5.7	5.7 The results of each LCR shall be briefed by the SRB or IRT) and the Program/Project Manager to the appropriate management council per Table 3-1.	Full		
			5.8	5.8 After the final LCR in a given life cycle phase, the Center Director and the Program Manager (for projects in their program) shall assess the readiness of a program or project to progress to the next phase of the life cycle (per the LCR objectives and expected maturity states in Appendix F), and provide their assessments and recommendations to the MDAA to support the Decision Authority's determination at the KDP.	Full		
			5.8.1	5.8.1 For MSFC managed activities that are not required to have an SRB or IRT, the activity manager and the MSFC CMC or the Director of the Directorate/Office (for those activities that do not report to the MSFC CMC) shall assess the readiness of that activity to progress to the next phase at the KDP review.	Full		
NPR 7120.5E	2.4.1	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. (See Decision Memorandum template with signature page in the NASA Space Flight Program and Project Management Handbook.)	5.9	5.9 The results of the KDPs shall be documented in a decision memorandum that describes whether the program/project is approved to enter the next phase of the life cycle and the constraints and parameters within which the Agency, the program manager, and the project manager will operate, as well as, any plan changes that can be made without additional approval and any actions resulting from the KDP.	Full		
			5.11	5.11 The approved decision memorandum shall be attached to the Program Plan (if a program), the Project Plan, or the project FA, as appropriate. *Note: The decision memorandum summarizes and records the decisions of the Decision Authority at the KDP. The expectation is to have the decision memorandum signed at the conclusion of the governing PMC KDP meeting. To support the KDP decision process, a draft decision memorandum is submitted to the Decision Authority along with other appropriate supporting material, as described in the NASA Program and Project Management Handbook.*	Full		
NPR 7120.5E	2.4.1.1	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.	5.9	5.9 The results of the KDPs shall be documented in a decision memorandum that describes whether the program/project is approved to enter the next phase of the life cycle and the constraints and parameters within which the Agency, the program manager, and the project manager will operate, as well as, any plan changes that can be made without additional approval and any actions resulting from the KDP. *Note: The NASA Program and Project Management Handbook provides an example of the decision memorandum which illustrates the level and type of information to be documented.*	Full		

NPR	Section	Requirement Statement	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	MSFC Compliance: Comply? (Full, Tailored, or NA)	MSFC Compliance: Rationale for Decisions, Comments, Waiver/Deviations	Other Associated Documents
NPR 7120.5E	2.4.1.2	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.	5.10.1	5.10.1 In addition, the decision memorandum shall also include a management agreement which establishes the parameters and authority for which the Program/Project Manager has control and is accountable to manage within. *Note: The management agreement addresses the cost and schedule (including the UFE or cost margine and schedule margin controlled by the program/project) along with the associated confidence levels, if applicable. It can be viewed as a contract between the Agency and the program or project manager. Significant divergences are documented by changing the Decision Memorandum.*	Full		
NPR 7120.5E	2.4.1.3	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 a Management Agreement addressing the schedule and resources required to complete Formulation.	5.10	5.10 The decision memorandum shall include a total LLC (documented in the form of a target range during formulation, and in the form of an estimated number during implementation) and schedule estimate, which includes the Unallocated Future Expenses (UFE), or cost margin, and schedule margin that is managed above the program/project. *Note: The total Agency life cycle cost estimate (documented in the project's decision memorandum for Implementation at KDP C, for tightly coupled programs at KDP I) becomes the ABC. The ABC is the baseline against which the Agency's performance is measured during the Implementation Phase. For projects with a life cycle cost of $250 million or more, this forms the basis for the Agency's external commitment to the Office of Management and Budget and Congress.*	Full		
NPR 7120.5E	2.4.1.5	2.4.1.5 All projects **shall** document the Agency's life cycle cost estimate and other parameters in the Decision Memorandum for Implementation (KDP C), and this becomes the Agency Baseline Commitment (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 the OMB and Congress.	5.9	5.9 The results of the KDPs shall be documented in a decision memorandum that describes whether the program/project is approved to enter the next phase of the life cycle and the constraints and parameters within which the Agency, the program manager, and the project manager will operate, as well as, any plan changes that can be made without additional approval and any actions resulting from the KDP.	Full		
			5.10	5.10 The decision memorandum shall include a total LLC (documented in the form of a target range during formulation, and in the form of an estimated number during implementation) and schedule estimate, which includes the Unallocated Future Expenses (UFE), or cost margin, and schedule margin that is managed above the program/project. *Note: The total Agency life cycle cost estimate (documented in the project's decision memorandum for Implementation at KDP C, for tightly coupled programs at KDP I) becomes the ABC. The ABC is the baseline against which the Agency's performance is measured during the Implementation Phase. For projects with a life cycle cost of $250 million or more, this forms the basis for the Agency's external commitment to the Office of Management and Budget and Congress.*	Full		
NPR 7120.5E	2.4.1.6	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.	5.10	5.10 The decision memorandum shall include a total LLC (documented in the form of a target range during formulation, and in the form of an estimated number during implementation) and schedule estimate, which includes the UFE and schedule margin that is managed above the program/project. *Note: The total Agency life cycle cost estimate (documented in the project's decision memorandum for Implementation at KDP C, for tightly coupled programs at KDP I) becomes the ABC. The ABC is the baseline against which the Agency's performance is measured during the Implementation Phase. For projects with a life cycle cost of $250 million or more, this forms the basis for the Agency's external commitment to the Office of Management and Budget and*	Full		
NPR 7120.5E	2.4.1.7	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. 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.	5.4	5.4 As programs, projects, and activities are implemented, they will be impacted by external forces (budget modifications, schedule and/or requirements changes) and internal situations (technical challenges, new requirements). When this occurs, programs, projects, and activities shall revisit the formulation phase to ensure program/project/activity planning is consistent with schedule commitments and resource availability.	Full		
			5.4.1	5.4.1 PCAs, Program/Project Plans, and other planning data shall be modified as needed by programs, projects, and activities when impacted by external forces (as described in 5.4).	Full		
			5.4.2	5.4.2 Programs and Category 1 and 2 projects shall be rebaselined if the estimated development cost exceeds the Agency Baseline Commitment (ABC) development cost by 30 percent or more, the NASA AA determines that events external to the Agency make a rebaseline appropriate; or the NASA AA determines that the program or project scope defined in the ABC has been changed or the TC program or project has been interrupted. *Note: "Development cost" includes all project costs from authorization to Implementation through operational readiness at the end of Phase D. When an ABC is rebaselined, the Decision Authority will direct that a Rebaseline Review be conducted by the SRB or as determined by the Decision Authority.*	Full		
NPR 7120.5E	2.4.2	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. .	6.1	6.1 Programs/projects shall manage and design to full LCC constraints.	Full		
			6.2	6.2 As part of seeking authority to proceed, programs/projects, with the involvement of independent cost modeling, shall establish cost predictions and receive cost constraints from NASA sponsors. *Note: The requirement for independent cost modeling may be accomplished by utilizing the MSFC Office of Strategic Analysis and Communications (OSAC) cost modeling experts.*	Full		
			6.3	6.3 Upon establishing feasible cost baselines, programs and projects shall manage to cost constraints and report margin status monthly to the Center Director via the CMC.	Full		
			Table 5.12-1, 5.12.3, 5.12-5, & 5.13-1	(UC/LC & TC Program Milestone Products shall be ...) Documented cost and schedule baselines Documentation of BOE (cost & schedule) (SPP Milestone Product shall be ...) Cost estimate(risk informed or schedule-adjusted depending on the phase) BOE (cost & schedule) (Project Milestone Products shall be ...) Cost Estimate (risk informed or schedule-adjusted depending on phase) BOE (cost & schedule)	Full		
NPR 7120.5E	2.4.3	Tightly coupled programs, 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	6.12	6.12 Tightly coupled programs, SPP, and projects with estimated LCC >$250M shall develop cost and schedule estimates by KDP 0/KDP B using probabilistic analyses to provide a level of confidence that cost and schedule will be within a specified range. *Note: The estimates are to be based upon identified resources by fiscal year. A JCL analysis is not required at KDP 0/KDP B, but may be used in leiu of separate analysis at the program/project manger's decision.*	Full		
NPR 7120.5E	2.4.3.1	2.4.3.1 Tightly coupled programs, 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 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.	6.12	6.12 Tightly coupled programs, SPP, and projects with estimated LCC >$250M shall develop cost and schedule estimates by KDP 0/KDP B using probabilistic analyses to provide a level of confidence that cost and schedule will be within a specified range. *Note: The estimates are to be based upon identified resources by fiscal year. A JCL analysis is not required at KDP 0/KDP B, but may be used in leiu of separate analysis at the program/project manger's decision.*	Full		
NPR 7120.5E	2.4.3.2	2.4.3.2 At KDP 1/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 probabilistic analysis of the coupled cost and/or 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.	6.13	6.13 By KDP I/KDP C, tightly coupled programs, SPP, and projects with estimated LCC > $250M shall develop a JCL analysis, based on the program/project's resource-loaded (i.e. cost-loaded) schedule and approved risks.	Full		
			6.14	6.14 By KDP I/KDP C, TC programs, SPP, and projects with LCC > $250M shall generate a schedule-based JCL analysis (which includes approved risks) that meets the Decision Authority's approved JCL (70%, unless otherwise stated in the FAD). *Note: Loosely coupled and uncoupled programs are not required to develop program cost and schedule confidence levels.*	Full		

NPR	Section	Requirement Statement	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	MSFC Compliance: Comply? (Full, Tailored, or NA)	MSFC Compliance: Rationale for Decisions, Comments, Waiver/Deviations	Other Associated Documents
NPR 7120.5E	2.4.4	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.	NA	NA, Agency level requirement (on MDAA)	NA		
NPR 7120.5E	2.4.4.1	2.4.4.1 Any JCL approved by the Decision Authority at less than 70 percent shall be justified and documented.	5.10.3	5.10.3 For TC and SPP (regardless of life-cycle cost) and projects with an estimated life-cycle cost greater than $250 million, Program/Project Managers shall coordinate with the MDAA to ensure that appropriate justification is documented in the Decision Memorandum, whenever the program/project is funded at less than an equivalent of a 70 percent JCL.	Full		
NPR 7120.5E	2.4.4.1	2.4.4.1 Mission Directorates shall ensure funding for these programs and projects are consistent with the Management Agreement and in no case less than the equivalent of a 50 percent joint confidence level.	NA	NA, Agency level requirement (on MDAA)	NA		
NPR 7120.5E	2.4.5	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.	6.15	6.15 Loosely coupled and uncoupled programs shall provide analysis of the program's risk at each project's KDP B and KDP C or when a project's ABC is rebaselined. *Note: The ABC, or the program or project's LCC estimate including other parameters, is documented in the project's Decision Memorandum for Implementation (KDP C, or KDP I for tightly coupled programs). Loosely coupled and uncoupled programs are not required to develop a JCL analysis.*	Full		
NPR 7120.5E	3.3.1	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.	1.1, 1.1.14	1.1 Center Director (or designee) 1.1.14 Is the overall Engineering and SMA Technical Authority for programs/projects. *Note: This responsibility is delegated from the OCE, and OSMA. Reference MCP 8070.2, MSFC Technical Authority Implementation Plan. MSFC recognizes the HMTA function managed through the OCHMO at NASA HQ. Responsibility for HMTA for Human Spaceflight programs has been delegated by the NASA CHMO to the JSC Chief Medical Officer who appoints an HMTA Delegate. Therefore, for issues related to HMTA requirements, MSFC will work either through the HMTA office at JSC, or directly with OCHMO at HQ, as appropriate. 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, HMTA Implementation, and are further described in MCP 8070.2.*	Full		
			2.2, 6.	2.2 All MSFC programs, projects, and activities shall follow the applicable requirements as described in Table 2-1. 6. All Center programs, projects, and activities. MCP 8070.2 (technical authority and dissenting opinion processes)	Full		
NPR 7120.5E	3.4.1	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.	2.2, 6.	2.2 All MSFC programs, projects, and activities shall follow the applicable requirements as described in Table 2-1. 6. All Center programs, projects, and activities. MCP 8070.2 (technical authority and dissenting opinion processes).	Full		
NPR 7120.5E	3.5.1	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.	3.3	3.3 The compliance assessment and all waiver/deviation requests (i.e., tailoring) for requirements involving program/project/activity execution in this MPR shall receive the concurrence of the Implementing Chief Engineer, the CSO, and the Program/Project/Activity Manager.	Full	Any deviation/waiver to the requirements in MPR 7120.1 will be formally requested/approved through Center processes. For those involving program/project execution, the approvals will be documented on the compliance matrix in Appendix C. Those that require Agency level approval will be submitted to the appropriate office to obtain those approvals. Therefore, this meets the NPR 7120.5 requirement.	
			3.3.1	3.3.1 The compliance assessment and all waivers and deviations shall also receive the concurrence of the Director of the MSFC Office responsible for managing the program/project/activity and the Engineering Director. The Directors may choose to delegate their concurrence authority down to a lower level, for specific programs, projects, or activities, provided that the compliance assessment does not include any Agency-level waivers/deviations. *Note: The concurrence of the Director of the responsible office and the Engineering Director is typically obtained by briefing the information at the monthly program reviews and to the EMC, but may be obtained through other means.*	Full		
			3.3.2	3.3.2 For those programs, projects, and activities governed by the CMC (and those with Agency-level waiver/deviation), the compliance assessment and the waiver/deviation shall also receive the concurrence of the Associate Director, Technical, prior to review and approval by the Center Director, or designee. *Note: The approval of the Associate Director, Technical, and the Center Director, or designee, is typically obtained by briefing the information to the PPMAC, and the CMC, but may be obtained through other means.*	Full		
			3.3.3	3.3.3 Approvals for waivers and deviations to requirements involving program/project/activity execution shall be documented by the approvals of the appropriate approving authorities on the FA or Program/Project Plan and the associated compliance matrix. *Note: Redundant signatures are not required in the "Approval" column of the Compliance Matrix, if the approval authority is already a required signatory on the FA or Program/Project Plan.*	Full		
			3.3.4	3.3.4 Program/Project/Activity Managers shall obtain approval from the appropriate Agency-level authorities, in those cases where the approval authority has been retained at the Agency-level. *Note: Programs and projects are required to obtain proper authorization for deviations from this MPR, other requirements documents invoked herein, and the Agency-level source requirements documents, as applicable. MSFC Chief Engineer's Office will assist the Associate Director, Technical, in interpreting applicability of Agency-level source requirements to the specific waiver/deviation case, identifying those Agency requirements for which waiver/deviation approval authority has been delegated to the Center-level and those for which Agency-level approval is required, and also serve as single focal point for communication back to OCE.*	Full		
			3.4	3.4 The completed compliance matrix shall be attached to the FA for space flight projects and single-project programs in Formulation, and/or to the Program Plan, or Project Plan, for programs or projects entering or in Implementation, and be submitted to OCE. The compliance assessment is approved along with the applicable agreement/planning document to which it is attached. For space flight projects and single-project programs the FA/compliance assessment is approved at MCR and SDR. For uncoupled, loosely coupled, and tightly-coupled programs, the Program Plan/compliance assessment is approved at SDR. For space flight projects, the Project Plan/compliance assessment is approved at SRR. For single-project programs, the Program Plan/compliance assessment is approved at SRR. For R&T Programs, the Program Plan/compliance assessment is approved at Formulation Review (FR). For TD Projects, the project plan/compliance assessment is approved at FR. For R&T Portfolio Projects, the project plan/compliance assessment is approved at FR. For activities, the compliance assessment is approved when the activity plan is approved by the appropriate Center governing authority. *Note: If compliance status changes, updated versions of the compliance matrix are incorporated into an FA, Program Plan, or Project Plan revision, and resubmitted to OCE. For revisions of this MPR, MSFC programs/projects/activities with an approved compliance assessment may complete a "changes only" matrix which covers all new or changed requirements, in lieu of completing the entire matrix again.*	Full		

NPR	Section	Requirement Statement	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	MSFC Compliance: Comply? (Full, Tailored, or NA)	MSFC Compliance: Rationale for Decisions, Comments, Waiver/Deviations	Other Associated Documents
NPR 7120.5E	3.5.5	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.	3.3	3.3 The compliance assessment and all waiver/deviation requests (i.e., tailoring) for requirements involving program/project/activity execution in this MPR shall receive the concurrence of the Implementing Chief Engineer, the CSO, and the Program/Project/Activity Manager.	Full	The PPMAC will direct permanent changes to MSFC Directives where needed. MSFC Chief Engineers Office serve as single flocal point back to OCE for any permanent change requests.	
			3.3.4	3.3.4 Program/Project/Activity Managers shall obtain approval from the appropriate Agency-level authorities, in those cases where the approval authority has been retained at the Agency-level. *Note: Programs and projects are required to obtain proper authorization for deviations from this MPR, other requirements documents invoked herein, and the Agency-level source requirements documents, as applicable. MSFC Chief Engineer's Office will assist the Associate Director, Technical, in interpreting applicability of Agency-level source requirements to the specific waiver/deviation case, identifying those Agency requirements for which waiver/deviation approval authority has been delegated to the Center-level and those for which Agency-level approval is required, and also serve as single focal point for communication back to*	Full		
NPR 7120.5E	3.6.1	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.	P.2.F	F. This MPR applies to reimbursable programs/projects performed for non-NASA sponsors.	Full	This MPR is applicable for reimbursable programs/projects. It flows down the NPR 7120.5 requirements. Any NPR 7120.5 requirements not being followed will be documented in the compliance matrix and appropriate Agency-level approvals obtained. The PPMAC will manage waiver requests with the Office of the Chief Engineer.	
NPR 7120.5E	3.7.1	3.7.1 The International System of Units (commonly known as the Système 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. Public Laws 94-168 and 100-418 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.	5.12.8	5.12.8 Programs shall determine and document an approach that maximizes the use of the International System of Units (commonly known as the System Internationale or SI). *Note: The approach is to be documented in the Program Plan no later than the SDR.*	Full		
			5.13.7	5.13.7 Projects shall determine and document an approach that maximizes the use of SI. *Note: The approach is to be documented in the Project Plan no later than the SDR.*	Full		
NPD 7120.6	5.b	b. **Center Director**s and Mission Directorate Associate Administrators **shall appoint a CKO or point of contact** responsible for overseeing the planning and execution of knowledge activities within their respective organizations and supporting the Agency CKO in planning and implementing the Agency's knowledge system.	1.11.1, 1.11.2	1.11 MSFC Chief Knowledge Officer (CKO) 1.11.1 Oversees the planning and execution of knowledge activities within the Center. 1.11.2 Supports the Agency CKO in planning and implementing the Agency's knowledge system.	Full		
			4.1	4.1 KNOWLEDGE MANAGEMENT AND INFUSION OF LESSONS LEARNED In accordance with NPD 7120.6, the Center Director has appointed a CKO for MSFC. This function is performed by the Associate Director, Technical. The MSFC CKO utilizes the Center LLC, as needed, to coordinate and integrate knowledge management activities across the various program/project and institutional offices at MSFC.	Full		
NPD 7120.6	5.d	d. **Center** and Mission Directorate **CKO**s **and knowledge points of contact** are appointed to facilitate capture and sharing of stories, case studies, and lessons learned; serve as advocates for the knowledge needs of their respective organizations; and support the Agency CKO to ensure the effective implementation of the Agency's knowledge policy. They **shall**:	1.11.2, 1.11.3, 1.11.4	1.11 MSFC Chief Knowledge Officer (CKO) 1.11.2 Supports the Agency CKO in planning and implementing the Agency's knowledge system. 1.11.3 Facilitates efforts to capture and share experiences, case studies, and LL. 1.11.4 Supports Center knowledge management efforts by advocating for needed resources, promoting and influencing Center cultural change, and providing leadership and direction to achieve knowledge management goals.	Full		
NPD 7120.6	5.d(1)	(1) ***Be responsible for overseeing the planning and execution*** of the Center's or Mission Directorate's knowledge management activities.	1.11, 1.11.1	1.11 MSFC Chief Knowledge Officer (CKO) 1.11.1 Oversees the planning and execution of knowledge activities within the Center.	Full		
NPD 7120.6	5.d(2)	(2) ***Build, develop, and support the Center or Mission Directorate's culture*** to enhance the knowledge management effort.	1.11, 1.11.4	1.11 MSFC Chief Knowledge Officer (CKO) 1.11.4 Supports Center knowledge management efforts by advocating for needed resources, promoting and influencing Center cultural change, and providing leadership and direction to achieve knowledge management goals.	Full		
NPD 7120.6	5.d(3)	(3) ***Provide direction to the Center's*** or Mission Directorate's ***goals*** **,** and ***act as an agent of change*** for the organization through leadership, interpersonal skills, and subject matter expertise.	1.11.4	1.11 MSFC Chief Knowledge Officer (CKO) 1.11.4 Supports Center knowledge management efforts by advocating for needed resources, promoting and influencing Center cultural change, and providing leadership and direction to achieve knowledge management goals.	Full		
NPD 7120.6	5.d(4)	(4) ***Develop a knowledge strategy for their respective organizations*** **.** Each organization's knowledge strategy shall consider the following principles:	1.11.6	1.11 MSFC Chief Knowledge Officer (CKO) 1.11.6 Develops and maintains a Center knowledge strategy aligned with NPD 7120.6 and Center needs, and presents the strategy at the annual Agency forum. (See NPD 7120.6 for additional details on CKO responsibilities and Center knowledge strategy requirements.)	Full		
NPD 7120.6	5.d(4)(a)	(a) *The effective use of knowledge is essential to fulfill NASA's vision* . The expertise of NASA's workforce; the patents, records, and artifacts produced; and the Agency's ability to carry out complex projects are forms of knowledge that make it possible to successfully execute the Agency's mission and to create the technological advances that benefit society at large. Knowledge is the cornerstone of NASA's ability to achieve mission success.			Full		
NPD 7120.6	5.d(4)(b)	(b) Like other large, knowledge-intensive organizations, *NASA faces continuous challenges in using what it knows effectively* . These challenges include enabling the identification and flow of knowledge across organizational boundaries; ensuring that knowledge is sound, relevant, comprehensible, and adopted where needed; developing and supporting networks of expertise; preserving knowledge at risk of being lost; and providing means for individuals, teams, and the organization to learn from experiences.			Full		
NPD 7120.6	5.d(4)(c)	(c) *Knowledge management focuses on the policies, processes, and practices that allow the Agency to identify and manage knowledge gained by its workforce in varied forms* . Knowledge management specifically addresses how knowledge is created, retained, shared, and transferred throughout NASA and with its partners and contractors. It involves dynamic contextual learning that supports the effective transfer and utilization of knowledge throughout the Agency. Knowledge management is critical for sustaining and expanding the use of the Agency's intellectual capital across NASA's enterprises and generations, increasing collaboration across barriers, and supporting the workforce in successfully carrying out NASA's missions.			Full		

NPR	Section	Requirement Statement	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	MSFC Compliance: Comply? (Full, Tailored, or NA)	MSFC Compliance: Rationale for Decisions, Comments, Waiver/Deviations	Other Associated Documents
NPD 7120.6	5.d(4)(d)	(d) Each **Center and Mission Directorate's knowledge strategy shall: Identify and capture knowledge critical to NASA's mission**; **assess gaps in knowledge retention and sharing**; and **plan measures to address knowledge management gaps**, using approaches that may include online tools, search/tag/taxonomy tools, case studies and publications, lessons learned/knowledge processes, knowledge networks, or face-to-face activities.	1,11, 1.11.6	1.11 MSFC Chief Knowledge Officer (CKO) 1.11.6 Develops and maintains a Center knowledge strategy aligned with NPD 7120.6 and Center needs, and presents the strategy at the annual Agency forum. (See NPD 7120.6 for additional details on CKO responsibilities and Center knowledge strategy requirements.)	Full		
			4.1	4.1 KNOWLEDGE MANAGEMENT AND INFUSION OF LESSONS LEARNED Observations that originate in LL collection processes are processed into implementable actions (see Figure 24-1). This approach infuses observations into the Center's operational activities by changing policy and procedural documentation, guidelines, best practices, program planning and execution, training, and employee awareness.	Full		
			4.1.1	4.1.1 Individuals or groups shall identify discrete, actionable observations that may have application to future projects. *Note: These observations will be documented during a knowledge capture workshop or a project or discipline LL activity, or the Lessons Learned Information System (LLIS) Form. LL or Knowledge Capture documents containing LL may be uploaded to the NASA LLIS by the originator or by the Center Data Manager (CDM).*	Full		
			4.1.2	4.1.2 The MSFC Distilling Team, led by the CDM for LL, shall clarify and integrate the observations into consistent, clear, and actionable MSFC lessons learned. *Note: The Distilling Team may contact the originator for clarification or additional detail to ensure consistency and completeness of the observation description and recommended action.*	Full		
			4.1.2.1	4.1.2.1 The Distilling Team shall coordinate review of MSFC LL for export control, patent, legal, and public affairs, as warranted.	Full		
			4.1.2.2	4.1.2.2 The Distilling Team shall maintain tracking of LL references, team minutes and metrics.	Full		
			4.1.3	4.1.3 The PPMAC shall serve as the Center LLC.	Full		
			4.1.3.1	4.1.3.1 The chair of the LLC shall ensure adequate committee representation from across Center organizations.	Full		
			4.1.3.2	4.1.3.2 The LLC shall review the MSFC lessons learned recommendations from the MSFC Distilling Team to determine which items warrant changes to existing Center policies, practices, or programs or input into existing Center corrective action processes.	Full		
			4.1.3.3	4.1.3.3 The LLC shall concur upon which MSFC lessons learned are suitable and complete for HDM review and/or documentation as a NASA lessons learned published on the NASA Engineering Network's (NEN) LLIS.	Full		
			4.1.4	4.1.4 If the MSFC LL is to be published on the NEN LLIS, the CDM shall ensure that the LL is complete, formatted, vetted, and ready for HDM review and publishing.	Full		
			4.1.5	4.1.5 The Office of Primary Responsibility (OPR) shall incorporate directed actions into MSFC policy and procedural documentation, best practices, or through existing corrective action and training systems.	Full		
			4.1.6	4.1.6 The CDM, if directed by the LLC, shall ensure the MSFC LL is documented as a NASA LL in the LLIS.	Full		
			4.1.7	4.1.7 Program/project/activity managers shall ensure review of LL (referred by LLC) for knowledge infusion throughout the program/project life cycle.	Full		
NPD 7120.6	5.d(5)	(5) **Share their knowledge strategy at an annual meeting** convened by the NASA CKO for the purpose of promoting greater Agency integration and collaboration.	1.11.6	1.11 MSFC Chief Knowledge Officer (CKO) 1.11.6 Develops and maintains a Center knowledge strategy aligned with NPD 7120.6 and Center needs, and presents the strategy at the annual Agency forum. (See NPD 7120.6 for additional details on CKO responsibilities and Center knowledge strategy requirements.)	Full		
NPD 7120.6	5.d(6)	(6) **Actively promote the role of knowledge and the knowledge management agenda** both inside and outside NASA.	1.11.2, 1.11.4	1.11 MSFC Chief Knowledge Officer (CKO) 1.11.2 Supports the Agency CKO in planning and implementing the Agency's knowledge system. 1.11.4 Supports Center knowledge management efforts by advocating for needed resources, promoting and influencing Center cultural change, and providing leadership and direction to achieve knowledge management goals.	Full		
NPD 7120.6	5.d(7)	(7) **Identify resources, capabilities, and infrastructure necessary to support knowledge management** in organizations.	1.11.4	1.11 MSFC Chief Knowledge Officer (CKO) 1.11.4 Supports Center knowledge management efforts by advocating for needed resources, promoting and influencing Center cultural change, and providing leadership and direction to achieve knowledge management goals.	Full		
NPD 7120.6	5.d(8)	(8) **Align knowledge management practices with Agency needs and policies**.	1.11, 1.11.5	1.11 MSFC Chief Knowledge Officer (CKO) 1.11.5 Aligns Center knowledge management practices with Agency needs and ensures coordination with appropriate offices and authorities for compliance with NASA policy, as well as statutory and regulatory requirements.	Full		
			4.1.2.1	4.1.2.1 The Distilling Team shall coordinate review of MSFC LL for export control, patent, legal, and public affairs, as warranted.	Full		
			4.1.4	4.1.4 If the MSFC LL is to be published on the NEN LLIS, the CDM shall ensure that the lesson learned is complete, formatted, vetted, and ready for HDM review and publishing.	Full		
NPD 7120.6	5.d(9)	(9) **Support and provide information for assessments** conducted by the Agency CKO.	1.11.2	1.11 MSFC Chief Knowledge Officer (CKO) 1.11.2 Supports the Agency CKO in planning and implementing the Agency's knowledge system.	Full		
NPD 7120.6	5.d(10)	(10) **Ensure coordination with** the Office of the Center Chief Information Officer, the Export Administrator, the Office of the Chief Counsel, and other **offices,** as appropriate, *on protecting and managing knowledge consistent with NASA policy, Federal law, and regulations* .	1.11.5	1.11 MSFC Chief Knowledge Officer (CKO) 1.11.5 Aligns Center knowledge management practices with Agency needs and ensures coordination with appropriate offices and authorities for compliance with NASA policy, as well as statutory and regulatory requirements.	Full		
			4.1.2.1	4.1.2.1 The Distilling Team shall coordinate review of MSFC LL for export control, patent, legal, and public affairs, as warranted.	Full		
			4.1.4	4.1.4 If the MSFC LL is to be published on the NEN LLIS, the CDM shall ensure that the LL is complete, formatted, vetted, and ready for HDM review and publishing.	Full		
NPR 7120.8	P.2.b	b. … R&T programs and projects shall be managed using NPR 7120.5 in lieu of this NPR when: 1) the R&T is directly funded by a space flight program/project; and 2) the space flight mission's success and schedule are directly tied to the success of the R&T.	24.2, 24.2.1	24.2 R&T programs, projects, and activities shall be managed using Chapters 1-23 in lieu of Chapters 24-27, when: 24.2.1 The R&T is directly funded by a space flight program/project; and the space flight mission's success and schedule are directly tied to the success of the R&T, or	Full		
NPR 7120.8	3.1.3	3.1.3 The Program Lead shall support reviews required by the governing PMC (section 2.3.2), CMC (section 2.3.3), Strategic Acquisition Planning (section 2.2.3), and Special Independent Assessments (sections 3.4.3, 4.5.2.1, and 5.2.5.6.2).	25.2	25.2 The R&T Program Lead shall conduct reviews required by the governing PMC, the CMC, the ASP meeting, the ASM, the PSM, and the Special Independent Assessments.	Full		
NPR 7120.8	3.1.4	3.1.4 For R&T Programs, the governing PMC and the DA for each KDP shall be as defined in Table 2.3.1.	25.3	25.3 For R&T Programs, the governing PMC and the DA for each KDP shall be as defined in Table 25-1.	Full		
				Table 25-1. Summary of Authorities for R&T Programs			

NPR	Section	Requirement Statement	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	MSFC Compliance: Comply? (Full, Tailored, or NA)	MSFC Compliance: Rationale for Decisions, Comments, Waiver/Deviations	Other Associated Documents
NPR 7120.8	3.3.1.1	The R&T Program shall follow the life cycle in Figure 2.1.1, including the minimum set of reviews and gate products specified in this NPR.	25.1	25.1 R&T programs for which MSFC has management responsibility shall follow the NASA life cycle as shown in Figure 25-1.	Full		
			25..3.1	25.3.1 R&T Programs shall produce the required technical data and planning as documented in Table 25-2.			
				Table 25-2 Required Technical Data and Planning for R&T Programs			
NPR 7120.8	3.3.1.6.1	3.3.1.6.1 The Program Lead shall create the R&T Program FAD using the template provided in Appendix C. The R&T Program FAD is approved by the MDAA or MSOD.	25.4.1	25.4.1 The R&T Program Lead shall create the R&T Program FAD using the template provided in Appendix C of NPR 7120.8 as guidance. *Note: The R&T Program FAD is approved by the MDAA or MSOD with concurrence by the MSFC Center Director (or designee). The FAD may be implemented as an early version of the program plan, provided it contains all the specified information. For programs established through the Announcement of Opportunity (AO) process, the MDAA letter selecting a specific AO proposal serves as the FAD.*	Full		
NPR 7120.8	3.3.1.6.2	3.3.1.6.2 As a minimum, an R&T Program FAD shall: a. Contain a statement of purpose for the proposed R&T Program and define its relationship to the Agency's vision and mission, as defined by NPD 1001.0, NASA Strategic Plan. b. Establish the scope of work to be accomplished. c. Provide initial constraints, including resources, schedule, and participating organizations within and external to NASA, including international partnerships. d. Identify the Program Lead who will manage the Formulation effort. e. Define the approach, resources, and reviews required to conduct R&T Program formulation.	25.4.1.1	25.4.1.1 At a minimum, the R&T Program FAD shall: a. Contain a statement of purpose for the proposed R&T Program and define its relationship to the Agency's vision and mission, as defined by NPD 1001.0, NASA Strategic Plan, and its alignment with NASA and/or MSFC technology roadmaps. b. Establish the scope of work to be accomplished to at least the project level prior to completion of the Pre-Formulation. c. Provide initial constraints, including resources, schedule, and participating organizations within and external to NASA, including international partnerships. d. Identify the Program Lead who will manage the Formulation effort. e. Define the approach, resources, and reviews required to conduct R&T Program formulation and implementation.	Full		
NPR 7120.8	3.3.3.1.2	3.3.3.1.2 The Program Lead shall create the R&T PCA, using the template provided in Appendix D. The R&T PCA is signed by the MDAA or MSOD and approved by the Program DA.	25.5.1	25.5.1 The Program Lead shall create the R&T PCA, using the template provided in Appendix D of NPR 7120.8 as guidance, and update it every two years (or as changes warrant). *Note: The R&T PCA is signed by the MDAA or MSOD and approved by the Program DA with concurrence by the MSFC Center Director.*	Full		
NPR 7120.8	3.3.3.1.3	3.3.3.1.3 As a minimum, an R&T PCA shall: a. Define the broad R&T Program objectives and its relationship to the Agency's vision and mission, as defined by NPD 1001.0, NASA Strategic Plan. b. Summarize the technical performance metrics with goals and minimum thresholds needed to achieve the R&T Program objectives. c. Identify the Program Lead who will manage the implementation effort. d. Identify schedule, cost, safety, and risk factors. e. Explain the involvement of R&T Program participants within and external to NASA, including international partnerships and a listing of the specific agreements to be concluded. f. Specify the independent reviews that will be performed during the life cycle of the R&T Program. g. Define any optional KDPs (KDP II, III, IV, etc.) required by the Program DA during Implementation (the Program DA may determine that optional KDPs are not needed).	25.5.1.1	25.5.1.1 As a minimum, an R&T PCA shall: a. Define the broad R&T Program objectives and its relationship to the Agency's vision and mission, as defined by NPD 1001.0, NASA Strategic Plan, and its alignment with NASA and/or MSFC technology roadmaps. b. Summarize the technical performance metrics with goals and minimum thresholds needed to achieve the R&T Program objectives. c. Identify the Program Lead who will manage the implementation effort. d. Identify schedule, cost, safety, and risk factors. e. Explain the involvement of R&T Program participants within and external to NASA, including international partnerships and a listing of the specific agreements to be concluded. f. Specify the independent reviews that will be performed during the life cycle of the R&T Program. g. Define any optional KDPs (KDP II, III, IV, etc.) required by the Program DA during Implementation (the Program DA may determine that optional KDPs are not needed).	Full		
NPR 7120.8	3.3.3.1.4	3.3.3.1.4 The Program Lead shall update the R&T PCA every two years. Updates may occur more frequently if there have been significant R&T Program changes as determined by the R&T Program Lead, MDAA, or MSOD so that it remains consistent with NPD 1001.0, NASA Strategic Plan, higher level architectures, and budget authority. Each revised R&T PCA is reviewed and approved using the same process as the original.	25.5.1	25.5.1 The Program Lead shall create the R&T PCA, using the template provided in Appendix D of NPR 7120.8 as guidance, and update it every two years (or as changes warrant). *Note: The R&T PCA is signed by the MDAA or MSOD and approved by the Program DA with concurrence by the MSFC Center Director.*	Full		
NPR 7120.8	3.3.3.2.2	3.3.3.2.2 The Program Lead shall create the R&T Program Plan, using the template provided in Appendix E. The R&T Program Plan is signed by the Program Lead and approved by the MDAA or MSOD.	25.5.2	25.5.2 The Program Lead shall create the R&T Program Plan, using the template provided in Appendix E of NPR 7120.8 as guidance, update it every two years (or as required), and ensure it is consistent with the PCA. *Note: The R&T Program Plan is signed by the Program Lead and approved by the MDAA or MSOD with concurrence by the Center Director.*	Full		
NPR 7120.8	3.3.3.2.3	3.3.3.2.3 As a minimum, an R&T Program Plan shall: a. Define the R&T Program goals and specific objectives with clear traceability to the Agency's vision and mission, as defined by NPD 1001.0, NASA Strategic Plan. b. Identify the main customers/beneficiaries and stakeholders of the R&T Program. c. Identify the projects under the R&T Program and identify whether they will be managed as Technology Development Projects or R&T Portfolio Projects. d. Briefly describe the architecture of the R&T Program and its major components. e. Identify the Program Lead who will manage the implementation effort. f. Document the R&T Program requirements/objectives, including performance requirements/objectives, and technical success criteria. g. Provide a schedule of R&T Program activities and events covering the life of the R&T Program. h. Describe the process by which the R&T Program assures compliance with NASA policies and directives, as well as other applicable requirements. i. Briefly describe the budget and acquisition approach to be applied at the R&T Program level toward each project. j. Summarize the risk management approach to be used for the R&T Program. k. Identify the reviews that the R&T Program will conduct and the approach for the related projects, including Independent Assessments, R&T Program status reviews, and others in response to MDAA, MSOD, or governing PMC requirements. l. Identify any optional KDPs (KDP II, III, IV, etc.) required by the Program DA during Implementation (the Program DA may determine that optional KDPs are not needed).	25.5.2.1	25.5.2.1 As a minimum, an R&T Program Plan shall: a. Define the R&T Program goals and specific objectives with clear traceability to the Agency's vision and mission, as defined by NPD 1001.0, NASA Strategic Plan, and alignment with NASA and/or MSFC technology roadmaps. b. Identify the main customers/beneficiaries and stakeholders of the R&T Program and the stakeholder expectations and customer/beneficiary requirements/objectives. c. Identify the projects **under** the R&T Program and identify whether they will be managed as TD Projects or R&T Portfolio Projects. d. Briefly describe the architecture of the R&T Program and its major components. e. Identify the Program Lead who will manage the implementation effort. f. Document the R&T Program requirements/objectives, including performance requirements/objectives, and technical success criteria, and the process by which project requirements/objectives are verified and validated for compliance with the program requirements/objectives. g. Provide an integrated master schedule of R&T Program activities and events covering the life of the R&T Program. *Note: The NASA Schedule Management Handbook (NASA/SP-2010-3403) contains additional guidance and is available at https://nen.nasa.gov/web/pm/evm, under the Document Repository folder, in the EVM Reference Guides sub-folder.* h. Describe the process by which the R&T Program assures compliance with NASA policies and directives, as well as other applicable requirements. i. Briefly describe the budget and acquisition approach to be applied at the R&T Program level toward each project. j. Summarize the R&T Program's approach for implementing safety, mission assurance and risk management requirements and whether separate S&MA and Risk Management Plans will be developed (see 25.5.3). k. Identify the reviews that the R&T Program will conduct and the approach for the related projects, including Independent Assessments, R&T Program status reviews, and others in response to MDAA, MSOD, or governing PMC requirements. l. Identify any optional KDPs (KDP II, III, IV, etc.) required by the Program DA during Implementation (the Program DA may determine that optional KDPs are not needed). m. Identify those R&T Projects that have been designated as part of a Cross-Program Research. n. Document the management responsibility and decision authority for those R&T projects that have been assigned to the Cross-Program Research. *Note: Further description of those R&T projects is documented in the Cross-Program Research Plan, not the R&T Program Plan.* o. Describe the process by which the R&T Program will assure project compliance with environmental requirements in accordance with NPR 8580.1 and MPR 8500.1, including results of the consultation with NASA HQ NEPA Coordinator to evaluate potential for program cost and schedule savings associated with NEPA strategies. p. Summarize the systems engineering processes the program will utilize to develop and flow down R&T requirements/performance measures from the program to the projects, including (as a minimum) requirements definition, and verification/validation. Reference separate SEMP, if applicable.	Full		

NPR	Section	Requirement Statement	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	MSFC Compliance: Comply? (Full, Tailored, or NA)	MSFC Compliance: Rationale for Decisions, Comments, Waiver/Deviations	Other Associated Documents
NPR 7120.8	3.3.3.2.5	3.3.3.2.5 The R&T Program Plan shall identify those R&T Projects that have been designated as part of a Cross-Program Research (see section 3.5).	25.5.2.1.m & n	25.5.2.1 As a minimum, an R&T Program Plan shall: m. Identify those R&T Projects that have been designated as part of a Cross-Program Research. n. Document the management responsibility and decision authority for those R&T projects that have been assigned to the Cross-Program Research. *Note: Further description of those R&T projects is documented in the Cross-Program Research Plan, not the R&T Program Plan.*	Full		
NPR 7120.8	3.3.3.2.6	3.3.3.2.6 The R&T Program Plan shall document that management responsibility and decision authority for those R&T projects have been assigned to the Cross-Program Research. Further description of those R&T projects is documented in the Cross-Program Research Plan, not the R&T Program Plan.					
NPR 7120.8	3.3.3.2.7	3.3.3.2.7 The R&T Program Plan shall be updated every two years, but updates may occur more frequently if there have been significant R&T Program changes, as determined by the Program Lead, MDAA, or MSOD. Each revised R&T Program Plan is reviewed and approved using the same process as the original.	25.5.2	25.5.2 The Program Lead shall create the R&T Program Plan, using the template provided in Appendix E of NPR 7120.8 as guidance, update it every two years (or as required), and ensure it is consistent with the PCA. *Note: The R&T Program Plan is signed by the Program Lead and approved by the MDAA or MSOD with concurrence by the Center Director.*	Full		
NPR 7120.8	3.3.3.2.8	3.3.3.2.8 The Program Lead shall ensure the R&T Program Plan and R&T PCA are consistent. If changes are required, the approval process for the applicable document(s) will be followed.					
NPR 7120.8	3.3.3.3	3.3.3.3 Prior to KDP I, a Formulation Review shall be conducted. The Formulation Review has both an internal and external component. The internal component is an R&T Program review to ensure the R&T Program is ready to proceed to KDP I. The external component is an independent assessment and is performed by PA&E under the direction of the selecting official identified in Table 2.3.1, or the selecting official may assign the IA to a separate organization. The selecting official for the Formulation Review team (see Table 2.3.1) is responsible for the development and approval of the Terms of Reference (ToR) for the Formulation Review. Conflicts during ToR development should be resolved in accordance with section 3.6.	25.6.1	25.6.1 Prior to KDP I, a FR shall be conducted to include the milestone technical data and planning maturity matrix requirements provided in Table 25-2. *Note: The FR has both an internal and external component. The internal component is an R&T Program review to ensure the R&T Program is ready to proceed to KDP I. The external component is an independent assessment and is performed by IPCE, IPAO under the direction of the selecting official identified in Table CH1-1, or the selecting official may assign the IA to a separate organization. The selecting official for the Formulation Review team (see Table CH1-1) is responsible for the development and approval of the ToR.*	Full		
NPR 7120.8	3.3.3.4	3.3.3.4 The Program Lead shall ensure the R&T Program meets environmental requirements in accordance with NPR 8580.1, Implementing the National Environmental Policy Act and Executive Order 12114.	25.6.1.2	25.6.1.2 The FR shall consist of the following data: a. The R&T Program Plan b. The R&T PCA c. SMA Plan, if required (see above) d. Risk Management Plan, if required (see above) e. Compliance to the environmental requirements in accordance with NPR 8580.1, Implementing the NEPA and Executive Order 12114. f. Results of the consultation with NASA Headquarters NEPA Coordinator to evaluate potential for program cost and schedule savings associated with NEPA strategies. g. ToR h. Stakeholder expectations and customer/beneficiary requirements/objectives. i. Technical performance requirements, technical success criteria, technical performance measures, and how they will flow down from the program to the projects. j. Process by which project requirements/objectives are verified and validated for compliance with the program requirements/objectives. k. Results of EMC approved applicability assessment for the seventeen system engineering processes. l. Integrated Master Schedule m. Documentation (from subordinate projects) summarizing performance against baseline plan (for technical, schedule, and cost performance), including status/closure of formal actions from previous KDP, and plans for work to be accomplished during next life cycle phase.	Full		
NPR 7120.8	3.3.3.5	3.3.3.5 The Program Lead shall consult with the NASA Headquarters National Environmental Policy Act (NEPA) Coordinator during R&T Program formulation to evaluate potential for program cost and schedule savings associated with NEPA strategies.					
NPR 7120.8	3.3.3.7	3.3.3.7 If an R&T Program contains elements that include hardware used for flight (piloted or unpiloted), flight control software, wind tunnel testing, or systems that could result in potential harm to personnel or property, the Program Lead shall ensure a Safety and Mission Assurance (SMA) plan is developed. The plan identifies and documents program element-specific SMA roles, responsibilities, and relationships with appropriate Headquarters and/or Center- SMA organizations. The plan should reflect the SMA role in areas such as: 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. In many cases, these plans are already established by Center and/or facility procedures for operations such as wind tunnel tests and flight testing and do not need to be developed by the R&T Program. The R&T Program Plan should be used to document when program elements or other entities will need to develop unique SMA plans. However, these plans should still be stand-alone documents.	25.5.3	25.5.3 If an R&T Program contains elements that include hardware used for flight (piloted or unpiloted), flight control software, wind tunnel testing, or systems that could result in potential harm to personnel or property, the Program Lead shall ensure that a SMA Plan and a Risk Management Plan exist that address the applicable hazards. *Note: In many cases, these plans are already established by Center and/or facility procedures for operations such as wind tunnel tests and flight testing and do not need to be developed by the R&T Program. These plans may be included as part of the R&T Program Plan, provided they contain the necessary information.*	Full		
			25.5.3.1	25.5.3.1 The SMA Plan shall identify and document program element-specific SMA roles, responsibilities, and relationships with appropriate HQ and/or Center- SMA organizations. The S&MA Plan also addresses specific critical SMA disciplines, including system safety/hazard analysis per NPR 8715.3 and NPR 8705.2; quality assurance per NPD 8730.5; SMA compliance verification, audit, and reviews per NPR 8705.6; reliability and maintainability per NPD 8720.1; software safety and assurance per NASA-STD-8719.13 and NASA-STD-8739.8; parts and material quality assurance per NPR 8735.1; contract quality assurance functions per NPR 8735.2; and other applicable NASA safety and mission success requirements. *Note: The plan should reflect the SMA role in areas such as: 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.*	Full		
NPR 7120.8	3.3.3.8	3.3.3.8 If an R&T Program contains elements that include hardware used for flight (piloted or unpiloted), flight control software, wind tunnel testing, or systems that could result in potential harm to personnel or property, the Program Lead shall ensure a risk management plan is developed. In many cases these plans are already established by Center and/or facility procedures for operations such as wind tunnel tests and flight testing and do not need to be developed by the R&T Program.	25.5.3 25.5.3.2	25.5.3 If an R&T Program contains elements that include hardware used for flight (piloted or unpiloted), flight control software, wind tunnel testing, or systems that could result in potential harm to personnel or property, the Program Lead shall ensure that a SMA Plan and a Risk Management Plan exist that address the applicable hazards. Note: In many cases, these plans are already established by Center and/or facility procedures for operations such as wind tunnel tests and flight testing and do not need to be developed by the R&T Program. These plans may be included as part of the R&T Program Plan, provided they contain the necessary information. 25.5.3.2 MWI 7120.6 contains the Center specific requirements for developing the Risk Management Plan.	Full		
NPR 7120.8	3.3.3.9	3.3.3.9 If a risk management plan does not already exist for a program element containing hardware used for flight (piloted or unpiloted), flight control software, wind tunnel testing, or systems that could result in potential harm to personnel or property, the Program Lead shall ensure a stand-alone risk management plan is developed that includes the content shown in NPR 8000.4, Risk Management Procedural Requirements. The R&T Program Plan should be used to document when unique risk plans need to be developed for program elements because existing plans are not sufficient or when no plan exists. However, these plans should still be stand-alone documents.			Full		MWI 7120.6
NPR 7120.8	3.3.5.2	3.3.5.2 During R&T Program Implementation, the Program Lead shall: a. Update the R&T Program Plan, as appropriate. b. Execute the R&T Program Plan. c. Update all required interagency and international agreements, as appropriate. d. Conduct planning, program-level systems engineering, and integration, as appropriate, to support the MD in initiating the project selection process. e. Support the MDAA in the selection of projects, either assigned or through a competitive process. f. Approve R&T Project FADs and Technology Development/R&T Portfolio Project Plans. g. Plan, prepare for, and support R&T Program status reviews, independent assessments, and governing PMC reviews, as appropriate. h. Provide oversight of the projects within the R&T Program and report their status periodically. i. Review and approve annual project budget submission inputs and prepare annual R&T Program budget submissions. j. Conduct R&T Program completion activities for each project in accordance with the project life cycle (see sections 4.6 and 5.2.6). k. Support any reviews, KDPs, or IAs required by this NPR. l. Perform any DA functions, as required by this NPR or delegated by the DA.	25.7.1	25.7.1 During R&T Program Implementation, the Program Lead shall: a. Update the R&T Program Plan, as appropriate. b. Execute the R&T Program Plan. c. Update all required interagency and international agreements, as appropriate. d. Conduct planning, program-level systems engineering, and integration, as appropriate, to support the MD in initiating the project selection process. e. Support the MDAA in the selection of projects, either assigned or through a competitive process. f. Approve R&T Project FADs and TD/R&T Portfolio Project Plans. g. Plan, prepare for, and support R&T Program status reviews, independent assessments, CMC and governing PMC reviews, as appropriate. Independent assessments will be conducted together with the Program Status Reviews, as a single integrated review. Program status reviews may be conducted as part of the status reviews of subordinate projects. h. Provide oversight of the projects within the R&T Program and ensure that status of project performance (for technical, schedule, and cost performance) is reported periodically to the CMC in accordance with MPR 7120.4. Review documentation (from the subordinate projects) summarizing performance against baseline plan (for technical, schedule, and cost performance), including status/closure of formal actions from previous KDP, and plans for work to be accomplished during next life cycle phase, as well as documentation of progress towards the technical success criteria and technical performance measures (goals and minimum thresholds). i. Review and approve annual project budget submission inputs and prepare annual R&T Program budget submissions. j. Conduct R&T Program completion activities for each project in accordance with the project life cycle. k. Support any reviews, KDPs, or IAs required by this NPR. l. Perform any DA functions, as required by this NPR or delegated by the DA.	Full		

NPR	Section	Requirement Statement	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	MSFC Compliance: Comply? (Full, Tailored, or NA)	MSFC Compliance: Rationale for Decisions, Comments, Waiver/Deviations	Other Associated Documents
NPR 7120.8	3.3.5.3	3.3.5.3 Optional KDPs (KDP II, III, IV, etc.) may be added per Program DA discretion during Implementation. The Program Lead shall document any optional KDPs in the R&T PCA and R&T Program Plan. This should include determination of gate products required prior to the optional KDPs. The Program DA may determine that optional KDPs are not needed	25.7.2	25.7.2 The Program Lead shall document any optional KDPs (if determined necessary per Program DA's discretion) in the R&T PCA and R&T Program Plan. *Note: KDP n occurs when the Program DA authorizes an R&T Program to end. The Program DA should coordinate any recommendations of the MDAA or MSOD and the Program Lead and Center Director. The decision of the Program DA to discontinue an R&T Program is documented in written form, including any recommendations relevant to existing contractual relationships, disposal of assets, manpower support, and timeframe of closure process.*	Full		
NPR 7120.8	3.5.2	3.5.2 The Research Director shall create a Cross-Program Research Plan that encompasses all the R&T Portfolio Projects within his/her purview, using the template provided in Appendix F. The Cross-Program Research Plan is signed by the Research Director and approved by the MDAA or MSOD.	25.8.1	25.8.1 If the Research Director is assigned to MSFC, the MSFC Research Director shall create a Cross-Program Research Plan that encompasses all the R&T Portfolio Projects within his/her purview, using the template provided in Appendix F of NPR 7120.8 as guidance. *Note: The Cross-Program Research Plan is signed by the Research Director and approved by the MDAA or MSOD.*	Full		
NPR 7120.8	3.5.3	3.5.3 As a minimum, a Cross-Program Research Plan shall: a. Define the Cross-Program Research goals and specific objectives with clear traceability to the Agency's vision and mission, as defined by NPD 1001.0, NASA Strategic Plan. b. Identify the main customers/beneficiaries and stakeholders of the Cross-Program research. c. Briefly describe the management structure of the Cross-Program Research and associated Portfolio Projects. d. Identify the Research Director who manages the Cross-Program Research. e. Define the selection process for awarding R&T, including the Selection Official. f. Document the Cross-Program Research requirements/objectives, including performance requirements/objectives, technical success criteria, and KPPs. g. Provide a schedule of Cross-Program Research activities and events. h. Describe the process by which the Cross-Program Research ensures compliance with NASA policies and directives, as well as other applicable requirements. i. Briefly describe the budget and acquisition approach to be applied to the Cross-Program Research. j. Define a process for determining openly competed, internally competed, and directed investments. k. Summarize the risk management approach to be used for the Cross-Program Research. l. Include information on the specific programs that are transferring R&T Portfolio Project management to the Research Director. m. Describe the reviews that the Cross-Program Research will conduct, including Formulation Reviews, peer reviews, and other independent assessments, in response to MDAA, MSOD, or governing PMC requirements. n. Define any optional KDPs (KDP II, III, IV, etc.) required by the DA during Implementation or determine that these optional KDPs are not needed.	25.8.2	25.8.2 As a minimum, a Cross-Program Research Plan shall: a. Define the Cross-Program Research goals and specific objectives with clear traceability to the Agency's vision and mission, as defined by NPD 1001.0, NASA Strategic Plan, and alignment with NASA and/or MSFC technology roadmaps. b. Identify the main customers/beneficiaries and stakeholders of the Cross-Program research. c. Briefly describe the management structure of the Cross-Program Research and associated Portfolio Projects. d. Identify the Research Director who manages the Cross-Program Research. e. Define the selection process for awarding R&T, including the Selection Official. f. Document the Cross-Program Research requirements/objectives, including performance requirements/objectives, technical success criteria, and KPPs. g. Provide a schedule of Cross-Program Research activities and events. h. Describe the process by which the Cross-Program Research ensures compliance with NASA policies and directives, as well as other applicable requirements. i. Briefly describe the budget and acquisition approach to be applied to the Cross-Program Research. j. Define a process for determining openly competed, internally competed, and directed investments. k. Summarize the risk management approach to be used for the Cross-Program Research. l. Include information on the specific programs that are transferring R&T Portfolio Project management to the Research Director. m. Describe the reviews that the Cross-Program Research will conduct, including FRs, peer reviews, and other independent assessments, in response to MDAA, MSOD, or governing PMC requirements. n. Define any optional KDPs (KDP II, III, IV, etc.) required by the DA during Implementation or determine that these optional KDPs are not needed.	Full		
NPR 7120.8	3.5.4.1	3.5.4.1 The Program Lead shall ensure the Program Plan reflects the delegation of R&T Portfolio Project management authority to the Research Director.	25.8.3	25.8.3 The Program Lead shall ensure the Program Plan reflects the delegation of R&T Portfolio Project management authority to the MSFC Research Director.	Full		
NPR 7120.8	3.5.4.2	3.5.4.2 The Research Director shall ensure the Cross-Program Research Plan reflects the delegation of R&T Portfolio Project management authority from the Program Lead.	25.8.4	25.8.4 The MSFC Research Director shall ensure the Cross-Program Research Plan reflects the delegation of R&T Portfolio Project management authority from the Program Lead.	Full		
NPR 7120.8	3.5.4.3	3.5.4.3 The MDAA or MSOD is responsible to the Program's DA and Agency PMC for the entire Program regardless of any Cross-Program Research agreement. The Program Lead, and the Research Director if there is a Cross-Program Research agreement, are responsible to the MDAA or MSOD. The Research Director shall support the MDAA or MSOD with any necessary reviews or requirements placed upon the program by the Program DA and Agency PMC.	25.8.5	25.8.5 The MSFC Research Director shall use the R&T Program Requirements and the R&T Program Life Cycle with changes specified in Table 25.8-1 as a guideline for managing Cross-Program Research. *Note: The content of Table 25.8-1 is taken from NPR 7120.8 and included here for clarity/readability.*	Full		
NPR 7120.8	3.5.6	3.5.6 The Research Director shall use the R&T Program Requirements (Chapter 3) and the R&T Program Life Cycle (Figure 2.1.1) with changes specified in Table 3.5.1 as a guideline for managing Cross-Program Research.					
NPR 7120.8	3.6	3.6 Process for Handling Dissenting Opinions 3.6.1 NASA teams must have full and open discussions with all facts made available in order 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. 3.6.2 Unresolved issues of any nature (e.g., programmatic, safety, engineering, acquisition, and accounting) within a team should be quickly elevated to achieve resolution at the appropriate level. At the discretion of the dissenting person(s), a decision may be appealed to the next higher level of management for resolution. Dissenting opinions raised by a Technical Authority (TA) are handled by the process set forth in section 3.7 3.6.3 When appropriate, the concern is documented by including agreed-to facts, discussion of the differing positions with rationale and impacts and the parties' recommendations, approved by the representative of each view, concurred by affected parties, and provided to program/project management and the appropriate TA with notification to the second higher level of management. In cases of urgency, an oral presentation (including the information stated above) with all affected organizations in attendance and with advance notification to the second higher level of management may be utilized with documentation follow-up. 3.6.4 Management's decision/action on the memorandum (or oral presentation) is documented and provided to the dissenter and to the notified managers, and becomes part of the program/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.	2.2, 6.	2.2 All MSFC programs, projects, and activities shall follow the applicable requirements as described in Table 2-1. 6. All Center programs, projects, and activities. MCP 8070.2 (technical authority and dissenting opinion processes).	Full		MCP 8070.2
NPR 7120.8	3.7	3.7 Technical Authority (TA) 3.7.1 NASA has adopted two basic authority processes: the programmatic authority process and the technical authority process. The programmatic authority process is largely described by the roles and responsibilities of the NASA AA, MDAAs (or MSODs), and program and project leads in this document. The technical authority process is established in NPR 7120.5, NASA Space Flight Program and Project Management Requirements. The technical authority process is another means by which NASA maintains the technical integrity of its R&T programs and projects.	2.2, 6.	2.2 All MSFC programs, projects, and activities shall follow the applicable requirements as described in Table 2-1. 6. All Center programs, projects, and activities. MCP 8070.2 (technical authority and dissenting opinion processes)	Full		MCP 8070.2

NPR	Section	Requirement Statement	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	MSFC Compliance: Comply? (Full, Tailored, or NA)	MSFC Compliance: Rationale for Decisions, Comments, Waiver/Deviations	Other Associated Documents
NPR 7120.8	3.9.1	3.9.1 The Program Lead shall handle unsolicited proposals in accordance with 48 CFR, Federal Acquisition Regulation, Subpart 15.6, Unsolicited Proposals; NPR 5100.4, Federal Acquisition Regulation Supplement (NASA/FAR Supplement) [48 CFR 1800-1899], Subpart 1815.6, Unsolicited Proposals; and NPR 5800.1, Grant And Cooperative Agreement Handbook (14 CFR 1260). See NPR 1080.1, NASA Science Management for additional guidance.	24.9.1	24.9.1 MWI 5115.1, Processing Unsolicited Proposals contains the Center specific requirements for handling unsolicited proposals. Note: Refer to 48 CFR, Federal Acquisition Regulation, Subpart 15.6, Unsolicited Proposals; NPR 5100.4, FAR Supplement (NASA/FAR Supplement) [48 CFR 1800-1899], Subpart 1815.6, Unsolicited Proposals; NPR 5800.1, Grant and Cooperative Agreement Handbook (14 CFR 1260), for additional detailed requirements and NPR 1080.1, for additional guidance on unsolicited proposals..	Full		MWI 5115.1
NPR 7120.8	3.10.1	3.10.1 R&T misconduct means fabrication, falsification, or plagiarism in proposing, performing, or reviewing R&T, or in reporting R&T results. R&T misconduct does not include honest error or differences of opinion. The NASA team, including the Program and Project Leads, shall handle allegations of R&T misconduct following processes established in NPR 1080.1, NASA Science Management and 14 CFR Part 1275, Research Misconduct.	24.7.1	24.7.1 NPR 1080.1, Requirements for the Conduct of NASA R&T, provides requirements and standards for research practices which ensure the quality and acceptability (within the scientific community) of the research results. *Note: R&T misconduct means fabrication, falsification, or plagiarism in proposing, performing, or reviewing R&T, or in reporting R&T results. R&T misconduct does not include honest error or differences of opinion. For R&T that is sponsored or conducted by NASA, the accomplishing activity is responsible for compliance with NASA's R&T misconduct policy.*	Full		NPR 1080.1
			24.8	24.8 Anyone on the NASA team (including the Program and Project Leads) who receives allegations of R&T misconduct that may have occurred within or outside NASA (on NASA sponsored R&T) shall notify the NASA Inspector General. *Note: The NASA Inspector General is responsible for R&T misconduct inquiries and investigations and for the preparation and submission of its findings and recommendations in a report to NASA. The cognizant MDAA or MSOD is responsible for implementing any administrative actions that may result from adjudication of research misconduct. NASA's policies and procedures for handling these investigations are published in the Code of Federal Regulations 14 CFR, Part 1275, Research Misconduct.*	Full		
NPR 7120.8	3.11	3.11 Waiver Approval Authority 3.11.1 Waivers to NPR 7120.8 requirements may be granted by the officials shown in Table 3.11.1. 3.11.2 Requests for waivers to NPR 7120.8 requirements are documented and submitted for approval using the NPR 7120.8 Waiver Form shown on the next page. (The form is available electronically on the Polaris Website at https://polaris.nasa.gov). 3.11.3 Evaluation and disposition of all other requirements change requests and waivers shall comply with the following: a. The organizations and the organizational levels that agreed to the establishment of a requirement must agree to the change or waiver of that requirement, unless this has been formally delegated elsewhere. b. The next higher Programmatic Authority and Technical Authority are informed in a timely manner of change requests or waivers that could affect that level.	3.3	3.3 The compliance assessment and all waiver/deviation requests (i.e., tailoring) for requirements involving program/project/activity execution in this MPR shall receive the concurrence of the Implementing Chief Engineer, the CSO, and the Program/Project/Activity Manager.	Full		
			3.3.1	3.3.1 The compliance assessment and all waivers and deviations shall also receive the concurrence of the Director of the MSFC Office responsible for managing the program/project/activity and the Engineering Director. The Directors may choose to delegate their concurrence authority down to a lower level, for specific programs, projects, or activities, provided that the compliance assessment does not include any Agency-level waivers/deviations. *Note: The concurrence of the Director of the responsible office and the Engineering Director is typically obtained by briefing the information at the monthly program reviews and to the EMC, but may be obtained through other means.*	Full		
			3.3.2	3.3.2 For those programs, projects, and activities governed by the CMC (and those with Agency-level waiver/deviation), the compliance assessment and the waiver/deviation shall also receive the concurrence of the Associate Director, Technical, prior to review and approval by the Center Director, or designee. *Note: The approval of the Associate Director, Technical, and the Center Director, or designee, is typically obtained by briefing the information to the PPMAC, and the CMC, but may be obtained through other means.*	Full		
			3.3.3	3.3.3 Approvals for waivers and deviations to requirements involving program/project/activity execution shall be documented by the approvals of the appropriate approving authorities on the FA or Program/Project Plan and the associated compliance matrix. *Note: Redundant signatures are not required in the "Approval" column of the Compliance Matrix, if the approval authority is already a required signatory on the FA or Program/Project Plan.*	Full		
			3.3.4	3.3.4 Program/Project/Activity Managers shall obtain approval from the appropriate Agency-level authorities, in those cases where the approval authority has been retained at the Agency-level. *Note: Programs and projects are required to obtain proper authorization for deviations from this MPR, other requirements documents invoked herein, and the Agency-level source requirements documents, as applicable. The Systems Engineering Office, within the MSFC Chief Engineers Office, will assist the program, project, activity, and the Associate Director, Technical, with identifying applicable Agency-level source requirements for which relief is requested, and compiling the appropriate rationale and supporting information into a standard format suitable for submission by the Associate Director, Technical to the applicable Agency-level authorities. Systems Engineering Office will serve as focal point for communication with OCE, and various other Headquarters Offices, with involvement from Chief Engineer, as Technical Authority for the program/project/activity. For requests for relief involving Office of Safety Mission Assurance (OSMA), MSFC Safety Mission Assurance (SMA) Office will serve as focal point for communication with OSMA.*	Full		
			3.4	3.4 The completed compliance matrix shall be attached to the FA for space flight projects and SPP in Formulation, and/or to the Program Plan, or Project Plan, for programs or projects entering or in Implementation, and be submitted to OCE. The compliance assessment is approved along with the applicable agreement/planning document to which it is attached. For space flight projects and SPP the FA/compliance assessment is approved at MCR and SDR. For uncoupled, loosely coupled, and tightly-coupled programs, the Program Plan/compliance assessment is approved at SDR. For space flight projects, the Project Plan/compliance assessment is approved at SRR. For SPP, the Program Plan/compliance assessment is approved at SRR. For R&T Programs, the Program Plan/compliance assessment is approved at Formulation Review (FR). For TD Projects, the project plan/compliance assessment is approved at FR. For R&T Portfolio Projects, the project plan/compliance assessment is approved at FR. For activities, the compliance assessment is approved when the activity plan is approved by the appropriate Center governing authority. *Note: If compliance status changes, updated versions of the compliance matrix are incorporated into an FA, Program Plan, or Project Plan revision, and resubmitted to OCE. For revisions of this MPR, MSFC programs/projects/activities with an approved compliance assessment may complete a "changes only" matrix which covers all new or changed requirements, in lieu of completing the entire matrix again.*	Full		
NPR 7120.8	4.1.1.3	4.1.1.3 The TD Project Lead shall support reviews required by the governing PMC (section 2.3.2), CMC (section 2.3.3), Strategic Acquisition Planning (section 2.2.3), and Special Independent Assessments (sections 3.4.3 and 4.5.2.1).	26.2	26.2 The TD Project Lead shall support reviews required by the governing PMC, the CMC, the ASP meeting, the ASM, the PSM, and Special Independent Assessments.	Full		
			26.7.5	26.7.5 The TD Project Lead shall periodically report the status of project performance to the CMC in accordance with MPR 7120.4.	Full		
NPR 7120.8	4.1.1.5	4.1.1.5 For TD Projects, the governing PMC and the DA for each KDP shall be defined in Table 2.3.2.	26.3	26.3 For TD Projects, the governing PMC and the DA for each KDP shall be as defined in Table 26-1. *Note: The content of Table 26-1 is based on content taken from NPR 7120.8 adapted here for specific applicability to MSFC.*	Full		
NPR 7120.8	4.1.2.1	4.1.2.1 NASA's four-part process for managing programs and projects described in section 1.2.1 consists of: Formulation, Approval, Implementation, and Evaluation. The TD Project shall follow the life cycle in Figure 2.2.1, including the minimum set of reviews and gate products specified in this NPR.	26.1	26.1 TD projects for which MSFC has management responsibility shall follow the TD Project life cycle as shown in Figure 26-1. *Note: The content of Figure 26-1 is based on content taken from NPR 7120.8 adapted here for specific applicability to MSFC.*	Full		
			26.1.1	26.1.1 TD Project Lead shall formulate and implement the TD Project, including the minimum set of reviews, technical data and planning specified in this chapter.	Full		

NPR	Section	Requirement Statement	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	MSFC Compliance: Comply? (Full, Tailored, or NA)	MSFC Compliance: Rationale for Decisions, Comments, Waiver/Deviations	Other Associated Documents
NPR 7120.8	4.2.2	4.2.2 The Program Lead, in coordination with the MDAA or MSOD, shall assign a TD Project Lead to manage the effort.	25.1.1	25.1.1 The R&T Program Lead shall formulate and implement the R&T Program, including the minimum set of reviews, technical data, and planning specified in this chapter, assign TD Project Leads and R&T Portfolio Project Leads to manage their respective projects (in coordination with the applicable Center Directors), and manage any project formulation activities that are required while in the Program's Formulation Phase.	Full		
NPR 7120.8	4.2.2.1	4.2.2.1 If a TD Project Lead resides at a Center, the Program Lead shall coordinate the assignment of the TD Project Lead with the Center Director.	25.1.1	25.1.1 The R&T Program Lead shall formulate and implement the R&T Program, including the minimum set of reviews, technical data, and planning specified in this chapter, assign TD Project Leads and R&T Portfolio Project Leads to manage their respective projects (in coordination with the applicable Center Directors), and manage any project formulation activities that are required while in the Program's Formulation Phase.	Full		
NPR 7120.8	4.2.3	4.2.3 The Program Lead shall manage any project formulation activities required while in the Program's Formulation Phase. The Program Lead, in coordination with the MDAA or MSOD, may allocate program funds to perform pre-formulation tasks associated with a potential project. These funds may be allocated by the Program Lead to specific Centers, managed internally, or may be used to fund external studies associated with a	25.1.1	25.1.1 The R&T Program Lead shall formulate and implement the R&T Program, including the minimum set of reviews, technical data, and planning specified in this chapter, assign TD Project Leads and R&T Portfolio Project Leads to manage their respective projects (in coordination with the applicable Center Directors), and manage any project formulation activities that are required while in the Program's Formulation Phase.	Full		
NPR 7120.8	4.2.4	4.2.4 The TD Project Lead shall create an R&T Project FAD, using the template provided in Appendix G. The R&T Project FAD is approved by the Project DA with concurrence by the Program Lead.	26.4.1	26.4.1 The TD Project Lead shall create an R&T Project FAD, using the template provided in Appendix G of NPR 7120.8 as guidance. *Note: The R&T Project FAD is approved by the Project DA with concurrence by the Program Lead. The FAD may be implemented as an early version of the project plan, provided it contains all the specified information. For projects established through the Announcement of Opportunity (AO) process, the MDAA letter selecting a specific AO proposal serves as the FAD.*	Full		
NPR 7120.8	4.2.5	4.2.5 As a minimum, an R&T Project FAD shall: a. Contain a statement of purpose for the proposed project and define its relationship to the ProgramÕs strategic goals and objectives. b. Establish the scope of work to be accomplished. c. Identify the TD Project Lead. d. Identify the management process for the project. e. Provide initial constraints, including resources, schedule and project participants within and external to NASA, including international partnerships. f. Define the approach, resources, and reviews required to conduct project formulation. g. Identify optional KDP B if required by the DA during Formulation or identify optional KDP B is not needed.	26.4.1.1	26.4.1.1 As a minimum, an R&T Project FAD shall: a. Contain a statement of purpose for the proposed project and define its relationship to the Program's strategic goals and objectives, and its alignment with NASA and/or MSFC technology roadmaps. b. Establish the scope of work to be accomplished. c. Identify the TD Project Lead. d. Identify the management process for the project. e. Provide initial constraints, including resources, schedule and project participants within and external to NASA, including international partnerships. f. Define the approach, resources, and reviews required to conduct project formulation and implementation. g. Identify optional KDP B if required by the DA during Formulation or identify optional KDP B is not needed. *Note: Approval of the R&T Project FAD by the Project DA is KDP A, which initiates the Project's movement from Pre-Formulation into the Formulation phase of the life cycle.*	Full		
NPR 7120.8	4.3.1.2	4.3.1.2 During Formulation, the TD Project Lead should develop a preliminary WBS, project schedule, and the allocation of resources to perform the project (see section 4.5.1.1 for later lifecycle requirements). The projectÕs preliminary WBS and associated WBS should be consistent with Appendix K. In coordination with OCFO, the TD Project Lead should identify and establish a WBS Element (level 3 or lower) specifically for capital assets, when purchase of capital assets is required. In coordination with the OCFO, the TD Project Lead shall complete the Alternative Future Use (AFU) Questionnaire (Form NF 1739) if any NASA-owned equipment purchased on the project has an acquisition value of $100,000 or greater per item, has an estimated useful life of two years or more, and has a planned use on another project.	26.5.1	26.5.1 During Formulation, the TD Project Lead should develop a preliminary WBS, project schedule, and the allocation of resources to perform the project. The preliminary WBS should include an element (level 3 or lower) specifically for capital assets, when purchase of capital assets is required. The project's preliminary WBS and associated final WBS should be consistent with Appendix K of NPR 7120.8. The NASA Work Breakdown Structure Handbook and NASA Schedule Management Handbook contain additional guidance which programs/projects may use to establish the WBS, accompanying dictionary, and schedule. *Note: The NASA Work Breakdown Structure Handbook (NASA/SP-2010-3404) and NASA Schedule Management Handbook (NASA/SP-2010-3403) are available at https://nen.nasa.gov/web/pm/evm, under the Document Repository folder, in the EVM Reference Guides sub-folder.*	Full		
			26.5.2	26.5.2 The TD Project Lead shall complete the Capitalization Determination Form (NF 1739) if any NASA-owned equipment purchased on the project has an acquisition value of $500,000 or greater per item, has an estimated useful life of two years or more, and has a planned use on another project.	Full		
NPR 7120.8	4.3.2.1	4.3.2.1 The Project Lead shall identify the customers/beneficiaries who will benefit from the TD Project. The customers/beneficiaries may include space flight projects, another R&T Program, another Government agency, the aeronautics community, or the U.S. aerospace industry.	26.5.3	26.5.3 The Project Lead shall identify the customers/beneficiaries who will benefit from the TD Project. The customers/beneficiaries may include space flight projects, another R&T Program, another Government agency, the aeronautics community, or the U.S. aerospace industry.	Full		
NPR 7120.8	4.3.2.2	4.3.2.2 The TD Project Lead shall define specific points of contacts (e.g., working groups, advisory committees, integrated product teams, technology infusion liaisons) that are capable of representing the customer/beneficiary's requirements (e.g., technology needs, technology prioritization, key performance parameters, and technology maturity) for technology development.	26.5.4	26.5.4 The TD Project Lead shall define specific points of contacts (e.g., working groups, advisory committees, integrated product teams, technology infusion liaisons) that are capable of representing the customer/beneficiary's requirements (e.g., technology needs, technology prioritization, key performance parameters, and technology maturity) for TD.	Full		
NPR 7120.8	4.3.3.1	4.3.3.1 The TD Project Lead shall ensure that credible technology needs are derived from sources such as the customer/beneficiary's mission concept studies or design reference missions (DRMs), technology roadmaps and associated system analysis, or technology gap analysis.	26.5.5	26.5.5 The TD Project Lead shall define customer/beneficiary requirements, objectives, credible technology needs, and key performance parameters. Credible technology needs are derived from sources such as the customer/beneficiary's mission concept studies or DRMs, technology roadmaps and associated system analysis, or technology gap analysis. This derivation should be consistent with the overall R&T program goals and objects, not duplicative of existing TD efforts, and include an assessment of the maturity level of each needed technology that identifies both the current TRL and a desired, target TRL goal that is acceptable to the customer/beneficiary. The derivation should also include assessment of KPPs that identify the minimum threshold performance levels necessary to meet the customer/beneficiary's mission requirements, and an assessment of any heritage elements. The initial derivation of technology needs is done at the system concept level (during formulation) and is later, iteratively refined (during implementation) down through the WBS (in conjunction with overall architectural studies and end-item system design) to provide greater granularity to the definition of needed technologies and associated technical performance requirements for key parameters. Refer to MSFC-HDBK-3173 for additional, detailed guidance and best practices, relative to TD project formulation, implementation, and evaluation. Refer to Appendix L for the system characteristics and criteria that define the standard TRL levels.	Full		
NPR 7120.8	4.3.3.2	4.3.3.2 The TD Project Lead shall ensure the customer/beneficiary is involved in these assessments and the results should be consistent with the customer/beneficiary's technology infusion plan.	26.5.6	26.5.6 The TD Project Lead shall ensure the customer/beneficiary is involved in these assessments and the results should be consistent with the customer/beneficiary's technology infusion plan. Examples of customer/beneficiary involvement include working with product integration teams and technical points of contact/liaisons from NASA space flight programs/projects, the aeronautics community, other NASA-focused technology projects, and other commercial partners, to identify gaps/shortfalls in existing technologies, and to review and assess the TD project's overall TD plans and technical success criteria for compatibility with the customer/beneficiary's technology infusion plans.	Full		
NPR 7120.8	4.3.4.1	4.3.4.1 The TD Project Lead shall ensure that appropriate analyses and studies are conducted to justify technology selections. Techniques such as Alignment Matrices, Return on Investment vs. Risk Matrices, or Technology S-curve Maps can be used to determine the best mix of technologies that will balance the project's risk posture. Formal systems analysis should be performed, when practical, to support the results. These analyses should include investment priorities for developing alternative technologies to maximize the probability of success and to enable rational allocation of resources in the event of budget fluctuation.	26.5.7	26.5.7 The TD Project Lead shall ensure that appropriate analyses and studies are conducted to justify technology selections. *Note: Techniques such as Alignment Matrices, Return on Investment vs. Risk Matrices, or Technology S-curve Maps can be used to determine the best mix of technologies that will balance the project's risk posture. Formal systems analysis should be performed, when practical, to support the results. These analyses should include investment priorities for developing alternative technologies to maximize the probability of success and to enable rational allocation of resources in the event of budget fluctuation.*	Full		

NPR	Section	Requirement Statement	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	MSFC Compliance: Comply? (Full, Tailored, or NA)	MSFC Compliance: Rationale for Decisions, Comments, Waiver/Deviations	Other Associated Documents
NPR 7120.8	4.3.4.2	4.3.4.2 The TD Project Lead shall perform an assessment of related technology development activities (e.g., Gap Analysis, section 4.7.2.1b) in other NASA programs, other Government agencies, and the commercial sector to eliminate unnecessary duplication of effort.	26.5.8	26.5.8 The TD Project Lead shall perform an assessment (gap analysis) of related TD activities in other NASA programs, other Government agencies, and the commercial sector to eliminate unnecessary duplication of effort. This assessment is typically based on a literature search and technical coordination/communication with points of contact in other NASA programs, other Government agencies, and the commercial sector. This assessment should include (as a minimum) a listing of identified technology needs with rationale for each, confirming that duplicative TD efforts are not currently existing in these other areas, and include consideration of any related TD efforts that were tried but failed.	Full		
NPR 7120.8	4.3.4.3.1	4.3.4.3.1 Prior to KDP C, a Formulation Review shall be conducted. The Formulation Review has both an internal and external component. The internal component is a project review to ensure the project is ready to proceed to KDP C. The external component is an independent assessment that includes the customer/beneficiary and may involve external advisory groups such as the National Research Council (NRC). The Formulation Review will assess the projectÕs alignment with the customer/beneficiary's needs and the adequacy of the TD Project Plan to meet the specified objectives. The selecting official identified in Table 2.3.2 assigns the IA to be performed by one or more organizations. The selecting official for the Formulation Review team (see Table 2.3.2) is responsible for the development and approval of the Terms of Reference (ToR) for the Formulation Review. Conflicts during ToR development should be resolved in accordance with section 3.6. The TD Project Lead will revise the TD Project Plan to properly disposition any recommendations resulting from the Formulation Review.	26.6.2	26.6.2 Prior to KDP C, a FR shall be conducted per the milestone technical data and planning maturity matrix requirements provided in Table 26-2 and minimum review content in 26.6.2.2 below. FR may be conducted as a part of Preliminary Design Review. 26.6.2.1 The Independent Assessment should be conducted together with the internal component as a single, integrated Formulation Review. *Note: The Formulation Review has both an internal and external component. The internal component is a project review to ensure the project is ready to proceed to KDP C. The external component is an independent assessment that includes the customer/beneficiary and may involve external advisory groups such as the National Research Council (NRC). The Formulation Review will assess the project's alignment with the customer/beneficiary's needs and the adequacy of the TD Project Plan to meet the specified objectives. The selecting official identified in Table 26-1 assigns the IA to be performed by one or more organizations. The external component is accomplished concurrently with the internal component by adding independent assessors to the internal project review team. The selecting official for the Formulation Review team (see Table 26-1) is responsible for the development and approval of the Terms of Reference (ToR).*	Full		
NPR 7120.8	4.3.5.1	4.3.5.1 To increase the likelihood of successful technology infusion, the TD Project Lead shall define and document KPPs that are important to the customers/beneficiaries. KPPs consist of measurable engineering parameters that would be readily understood and used by engineers concerned with the ultimate application of the technology. For each KPP, both a goal and a threshold will be specified. The goal is a performance level that the project team is striving for, and the threshold is the minimum performance level that users agree is acceptable for the end item deliverable. Typically, the threshold KPP values are set beyond the current state-of-the art to warrant investment in the project. KPPs include information that enables an assessment of the advancement of the maturity of the technology throughout the development process. The definition of a KPP includes defining the appropriate environment and the component, subsystem, or system within which the KPP measurements are to be made.	26.5.9	26.5.9 TD Project Lead shall establish and document Key Performance Parameters (KPPs) for each task or deliverable, and ensure that they are reviewed annually by the customer/beneficiary to verify that they are still aligned with mission requirements.	Full		
NPR 7120.8	4.3.5.2	4.3.5.2 When the TD Project contains multiple tasks and deliverables, the TD Project Lead shall identify KPPs for each task or deliverable.			Full		
NPR 7120.8	4.3.5.3	4.3.5.3 The TD Project Lead shall ensure KPPs are reviewed annually by the customer/beneficiary to verify that they are still aligned with mission requirements.			Full		
NPR 7120.8	4.3.6.2	4.3.6.2 The TD Project Plan is an agreement between the Project DA, the Program Lead, and the TD Project Lead that details how the project will be managed. The TD Project Lead shall create a TD Project Plan, using the template provided in Appendix H. The TD Project Plan is signed by the TD Project Lead and approved by the Project DA with concurrence by the Program Lead. The TD Project Plan is used by the governing PMC in the review process to determine if the project is fulfilling its agreement.	26.5.10	26.5.10 The TD Project Lead shall create a TD Project Plan, using the template provided in Appendix H of NPR 7120.8 as guidance, and ensure it is updated (as required) and maintained consistent with the R&T Program Plan. *Note: Approval of this project from the formulation phase to implementation (KDP C) is granted by the DA's approval of the TD Project Plan.*	Full		
NPR 7120.8	4.3.6.3	4.3.6.3 As a minimum, a TD Project Plan shall: a. State the specific project objectives, performance goals, and their relationship to the program objectives and goals. b. Present a technical description of the project. c. Document the project requirements/objectives, including Key Performance Parameters (KPPs). d. Document an assessment (Gap Analysis) of related technology development activities in other NASA programs, other Government agencies, and the commercial sector to eliminate unnecessary duplication of effort. e. Identify the TD Project Lead. f. Define the projectÕs management approach, resource requirements (including NASA personnel, facilities, and aircraft uses), schedule and work breakdown structure. g. Describe the projectÕs strategy for technology transition. h. Summarize the risk management approach to be used for the project. i. Define the specific reviews that will be conducted during the performance of the project. j. Document the project's approach to implementing IT security requirements in accordance with NPR 2810.1, Security of Information Technology. k. Identify any optional KDPs (KDP B, D, and E) required by the DA.	26.5.10.1	26.5.10.1 As a minimum, a TD Project Plan shall: a. State the specific project objectives, performance goals, and their relationship to the program objectives and goals, and their alignment with NASA and/or MSFC technology roadmaps. b. Present a technical description of the project. Identify customer/beneficiary requirements/objectives, credible technology needs, key performance parameters necessary to meet the customer/beneficiary's mission requirements, and results of analyses/studies conducted to justify technology selections. Also include an assessment of the maturity level of each needed technology that identifies both the current TRL and a desired, target TRL goal that is acceptable to the customer/beneficiary. c. Document the project requirements/objectives and how they will flow down from the program to the projects, including Key Performance Parameters (KPPs) and Independent Assessments. Describe the technical performance requirements, technical success criteria, and technical performance measures (i.e. KPPs) including the specific goals/minimum threshold values needed to achieve the program/project objectives/goals and meet the customer/beneficiary needs. d. Document an assessment (Gap Analysis) of related TD activities, including failures experienced in the same or similar development efforts, in other NASA programs, other Government agencies, and the commercial sector to eliminate unnecessary duplication of effort. Include in the assessment (gap analysis), how the proposed approach will address the failures/LL from any related past TD efforts, and how it will reduce the risk of a repeated failure e. Identify the TD Project Lead. f. Define the project's management approach, resource requirements (including NASA personnel, facilities, and aircraft uses), schedule and WBS. g. Describe the project's strategy for technology transition. h. Summarize the project's approach for implementing safety, mission assurance and risk management requirements and whether separate SMA and Risk Management Plans will be developed (see 26.5.13). i. Define the specific reviews that will be conducted during the performance of the project, including independent assessments. j. Document the project's approach to implementing IT security requirements. *Note: Refer to NPR 2810.1, Security of Information Technology for additional detailed requirements.* k. Identify any optional KDPs (KDP B, D, and E) required by the DA as well as optional IAs and determine the technical data and planning required for each. l. Summarize the systems engineering processes the project will utilize to produce the deliverable technology products (hardware and software), including (as a minimum) requirements definition, CM/control, verification/validation, and system acceptance for the deliverable technology end item. Reference separate SEMP, if applicable. m. Describe how the project will develop the payload safety process deliverables in accordance with NPR 8715.7, for Expendable Launch Vehicle payloads. n. Describe how the project will implement the orbital debris/EOMP requirements specified in NPR 8715.6, if applicable. o. Describe how the project will implement the export control requirements specified in MPR 2190.1 and NPR 2190.1. p. Describe how the project will develop a Human Rating Certification Package (or equivalent for ISS payloads) specified in NPR 8705.2, if applicable. q. Describe how the project will implement the nuclear safety launch approval requirements specified in NPR 8715.3, if applicable. *Note: This minimum content may be addressed within the project plan, or in a separate document, at the project's discretion.*	Full		

NPR	Section	Requirement Statement	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	MSFC Compliance: Comply? (Full, Tailored, or NA)	MSFC Compliance: Rationale for Decisions, Comments, Waiver/Deviations	Other Associated Documents
NPR 7120.8	4.3.6.4	4.3.6.4 If warranted by changes in the stated commitments or requirements, the TD Project Lead shall update the TD Project Plan. Each revised TD Project Plan is reviewed and approved using the same process as the original.	26.5.10	26.5.10 The TD Project Lead shall create a TD Project Plan, using the template provided in Appendix H of NPR 7120.8 as guidance, and ensure it is updated (as required) and maintained consistent with the R&T Program Plan. *Note: Approval of this project from the formulation phase to implementation (KDP C) is granted by the DA's approval of the TD Project Plan.*	Full		
NPR 7120.8	4.3.6.5	4.3.6.5 The TD Project Lead shall ensure the TD Project Plan and R&T Program Plan are consistent. If changes are required, the approval process for the applicable document(s) will be followed.			Full		
NPR 7120.8	4.3.6.6	4.3.6.6 If the TD Project resides at a Center, the TD Project Lead shall add the Center Director (or designee) responsible for committing workforce and facilities as a concurrence signature to the TD Project Plan. Other concurrence signatures such as the customer(s)/beneficiary(ies) may be added, if applicable.	26.5.10.2	26.5.10.2 The TD Project Lead shall ensure the applicable Center Director (or designee responsible for committing workforce and facilities) is added as a concurrence signature, to the TD Project Plan, for each Center at which the project resides.	Full		
NPR 7120.8	4.3.6.7	4.3.6.7 For TD Projects proposing the construction of new or modification to existing NASA owned facilities within normal Construction of Facilities (CoF) funding limits (see NPD 7330.1, Approval Authorities for Facility Projects (Revalidated 10/19/04)), the TD Project Lead shall complete a preliminary business case analysis in accordance with NPD 8820.2, Design and Construction of Facilities and NPR 8820.2, Facility Project Implementation Guide. A business case guide can be located at http://www.hq.nasa.gov/office/codej/codejx/codejx.html.	26.5.11	26.5.11 For TD Projects proposing the construction of new or modification to existing NASA owned facilities using Construction of Facilities (CoF) funding, the TD Project Lead shall complete a preliminary business case analysis. *Note: A business case guide can be located at http://www.hq.nasa.gov/office/codej/codejx/codejx.html.* *Refer to NPD 8820.2, Design and Construction of Facilities, and NPR 8820.2, Facility Project Requirements, for additional details. The "business case analysis" is referred to as a "Life-Cycle Cost Analysis" in NPR 8820.2.*	Full		
NPR 7120.8	4.3.6.8	4.3.6.8 For TD Projects proposing the acquisition of new aircraft, the TD Project Lead shall plan and perform these acquisitions in accordance with NPR 7900.3, NASA Aircraft Operations Management. The term "aircraft" includes both piloted and unmanned aerial vehicles.	26.5.12	26.5.12 For TD Projects proposing the acquisition of new aircraft, the TD Project Lead shall coordinate with the Office of Strategic Infrastructure and prepare a business case analysis which will be approved by the MDAA and the AA for the Office of Strategic Infrastructure. *Note: Refer to NPR 7900.3, NASA Aircraft Operations Management Manual, for additional details. The term "aircraft" includes both piloted and unmanned aerial vehicles.*	Full		
NPR 7120.8	4.3.6.9	4.3.6.9 The TD Project Lead shall ensure that proposals and plans for subordinate activities/tasks include documentation of (a) environmental compliance and permit considerations and (b) NEPA evaluation.	26.5.14	26.5.14 The TD Project Lead shall ensure that proposals and plans for subordinate activities/tasks include documentation of environmental compliance, environmental permit considerations, and NEPA evaluation.	Full		
NPR 7120.8	4.3.6.10	4.3.6.10 If a TD Project contains elements that include hardware used for flight (piloted or unpiloted), flight control software, wind tunnel testing, or systems that could result in potential harm to personnel or property, the TD Project Lead shall ensure a Safety and Mission Assurance (SMA) plan is developed. The plan identifies and documents project element-specific SMA roles, responsibilities, and relationships with appropriate Headquarters and/or Center- SMA organizations. The plan should reflect the SMA role in areas such as: 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. In many cases, these plans are already established by Center and/or facility procedures for operations such as wind tunnel tests and flight testing and do not need to be developed by the project. The TD Project Plan should be used to document when project elements or other entities will need to develop unique SMA plans. However, this plan should still be a stand-alone document.	26.5.13	26.5.13 If a TD Project contains elements that include hardware used for flight (piloted or unpiloted), flight control software, wind tunnel testing, or systems that could result in potential harm to personnel or property, the Project Lead shall ensure that a SMA Plan and a Risk Management Plan exist that address the applicable hazards. *Note: In many cases, these plans are already established by Center and/or facility procedures for operations such as wind tunnel tests and flight testing and do not need to be developed by the TD Project. These plans may be included as part of the TD Project Plan, provided they contain the necessary information.*	Full		
NPR 7120.8			26.5.13.1	26.5.13.1 The S&MA Plan shall identify and document project specific SMA roles, responsibilities, and relationships with appropriate HQ and/or Center-level SMA organizations. The SMA Plan also addresses specific critical SMA disciplines, including system safety/hazard analysis per NPR 8715.3 and NPR 8705.2; quality assurance per NPD 8730.5; SMA compliance verification, audit, and reviews per NPR 8705.6; reliability and maintainability per NPD 8720.1; software safety and assurance per NASA-STD-8719.13 and NASA-STD-8739.8; parts and material quality assurance per NPR 8735.1; contract quality assurance functions per NPR 8735.2; and other applicable NASA safety and mission success requirements. *Note: The plan should reflect the SMA role in areas such as: 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.*	Full		
NPR 7120.8	4.3.6.11	4.3.6.11 If a TD Project contains elements that include hardware used for flight (piloted or unpiloted), flight control software, wind tunnel testing, or systems that could result in potential harm to personnel or property, the TD Project Lead shall ensure a risk management plan is developed. In many cases, these plans are already established by Center and/or facility procedures for operations such as wind tunnel tests and flight testing and do not need to be developed by the project.	26.5.13 26.5.13.2	26.5.13 If a TD Project contains elements that include hardware used for flight (piloted or unpiloted), flight control software, wind tunnel testing, or systems that could result in potential harm to personnel or property, the Project Lead shall ensure that a SMA Plan and a Risk Management Plan exist that address the applicable hazards. *Note: In many cases, these plans are already established by Center and/or facility procedures for operations such as wind tunnel tests and flight testing and do not need to be developed by the TD Project. These plans may be included as part of the TD Project Plan, provided they contain the necessary information.* 26.5.13.2 MWI 7120.6 contains the Center specific requirements for developing the Risk Management Plan.	Full		
NPR 7120.8	4.3.6.12	4.3.6.12 If a risk management plan does not already exist for a project element containing hardware used for flight (piloted or unpiloted), flight control software, wind tunnel testing, or systems that could result in potential harm to personnel or property, the TD Project Lead shall ensure a stand-alone risk management plan is developed that includes the content shown in NPR 8000.4, Risk Management Procedural Requirements. The TD Project Plan should be used to document when unique risk plans need to be developed for project elements because existing plans are not sufficient or when no plan exists. However, these plans should still be stand-alone documents.			Full		MWI 7120.6
NPR 7120.8	4.5.1.1	4.5.1.1 Use of accepted project management principles will increase the likelihood that the TD Project will be successful in achieving its technical objectives within cost and schedule constraints. At a minimum, the TD Project Lead shall establish a WBS, in accordance with Appendix K, a project schedule with milestones for each element in the WBS, and an allocation of the project's available resources necessary to achieve each milestone (see section 4.3.1.2 for preliminary requirements). The milestones should be chosen at intervals sufficient to demonstrate steady progress towards achieving the overall KPPs for the project.	26.7.1	26.7.1 The TD Project Lead shall establish a WBS, in accordance with Appendix K of NPR 7120.8, a project schedule with milestones for each element in the WBS, and an allocation of the project's available resources necessary to achieve each milestone. The milestones should be chosen at intervals sufficient to demonstrate steady progress towards achieving the overall KPPs for the project.	Full		
NPR 7120.8	4.5.1.3	4.5.1.3 A TD Project Lead shall track progress against a baseline plan. The WBS, the project schedule, and the allocation of resources to milestones constitute the baseline plan for assessing technical, schedule, and cost performance.	26.7.2	26.7.2 The TD Project Lead shall track progress against a baseline plan. The WBS, the project schedule, and the allocation of resources to milestones constitute the baseline plan for assessing technical, schedule, and cost performance.	Full		
NPR 7120.8	4.5.1.4	4.5.1.4 For all development projects or single contracts exceeding $250M life-cycle cost, the TD Project Lead shall provide immediate written notice and a recovery plan to the Program Lead and MDAA or MSOD, if the implementation costs of the project are estimated to exceed the baseline cost by 15 percent or more or if a schedule milestone is estimated to be delayed six months or more.	26.7.3	26.7.3 The TD Project Lead shall provide immediate written notice and a recovery plan to the Program Lead and MDAA or MSOD, if the implementation costs of the project are estimated to exceed the baseline cost by 15 percent or more, or if a schedule milestone is estimated to be delayed six months or more, for development project (or single contracts) exceeding $250M LLC.	Full		
NPR 7120.8	4.5.3.1	4.5.3.1 The TD Project Lead shall conduct TD Project status reviews annually to assess both progress towards the KPPs and the maturity of the technology. In addition, status reviews may be called by the MDAA, MSOD, or Program Lead at any time to determine the need to modify or end the project. The status reviews are utilized by the Program Lead to recommend whether the TD Project should be continued for another year, re-directed, modified, or discontinued. Status reviews require customer/beneficiary involvement (e.g. status review's external component) and can help ensure mature technologies are utilized when available. IA per section 4.5.2.4 may also be conducted in parallel to status reviews and act as the status review's external component. Status reviews may also include members from the Formulation Review panel. The Program Lead, in consultation with the customer/beneficiary or his/her representative(s), makes a recommendation on TD Project continuation to the MDAA or MSOD. KDP F occurs when the Project DA decides to close a TD Project or transition the technology to a different project.	26.7.4	26.7.4 The TD Project Lead shall conduct TD Project status reviews annually to assess both progress towards the KPPs and the maturity of the technology. In addition, status reviews may be called by the MDAA, MSOD, or Program Lead at any time to determine the need to modify or end the project. *Note: TD Project status reviews may be conducted as part of the MPR 7123.1 defined technical reviews (see 26.7.6) provided that they occur at least annually.*	Full		
			26.7.4.1	26.7.4.1 The TD Project Lead shall provide (to the R&T Program), documentation summarizing performance against baseline plan (for technical, schedule, and cost performance), including status/closure of formal actions from previous KDP, and plans for work to be accomplished during next life cycle phase. This includes documentation of progress towards achieving the overall KPPs (goals and minimum thresholds) for the project.	Full		
			26.7.5	26.7.5 The TD Project Lead shall periodically report the status of project performance to the CMC in accordance with MPR 7120.4.	Full		

NPR	Section	Requirement Statement	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	MSFC Compliance: Comply? (Full, Tailored, or NA)	MSFC Compliance: Rationale for Decisions, Comments, Waiver/Deviations	Other Associated Documents
NPR 7120.8	4.6.2.1	4.6.2.1 At the conclusion of each TD Project, a closeout review of the project's accomplishments, including an independent assessment of the final TRL and other maturity measures is performed. A final report is required for the Closeout Review. The TD Project Lead shall document lessons learned, in accordance with NPR 7120.6, Lessons Learned Process.	26.8.1	26.8.1 The TD Project Lead shall conduct a closeout review of the project's accomplishments and/or failures, including an independent assessment of the final TRL and other maturity measures, and/or remaining issues. A final report is required for the Closeout Review.	Full		
			26.8.2	26.8.2 The TD Project Lead shall document LL, in accordance with this MPR.	Full		
NPR 7120.8	4.6.3.1	4.6.3.1 At the conclusion of the TD Project, the TD Project Lead shall ensure that sufficient data is archived so that future users can assess the technology maturity (e.g., TRL) and incorporate the technology into system designs. These data include the final report from the Closeout Review, engineering drawings, specifications, test reports, and any other documentation of project activities and results necessary for future researchers to understand the work performed and the results that were achieved.	26.8.3	26.8.3 The TD Project Lead shall ensure that sufficient data is archived, in accordance with NPR 1441.1, so that future users can assess the technology maturity (e.g., TRL) and incorporate the technology into system designs. Note: These data include the final report from the Closeout Review, engineering drawings, specifications, test reports, and any other documentation of project activities and results necessary for future researchers to understand the work performed and the results that were achieved, to include both successes and failures.	Full		
NPR 7120.8	4.6.3.2	4.6.3.2 All documentary information, regardless of format, made or received in the course of conducting NASA R&T Projects are Federal records and shall be maintained, safeguarded, and dispositioned, in accordance with the guidelines of NPR 1441.1, NASA Records Retention Schedules.	App. D	D.1 Program/project/activity records are maintained by the responsible manager or their designee in accordance with MPR 1440.2 and NRRS 1441.1, Schedule 8, items 101-110. The exact retention used depends on the type of program/project/activity that generates the records. MPR 7123.1 requires a list of program/project/activity records, retention schedules, custodians, locations, and any other program/project/activity-unique records management requirements, to be established and maintained by the program/project/activity. Note: These records include, but are not limited to, documentation concerning program/project/activity planning, formulation, and implementation.	Full		MPR 1440.2 NRRS 1441.1
NPR 7120.8	4.7.1.2	4.7.1.2 The TD Project Lead shall ensure Technology Readiness Levels (TRLs) and/or other measures of technology maturity that are important to the customer/beneficiary are used in conjunction with KPPs to assess maturity throughout the project life cycle. When a TD Project uses a measure of maturity other than TRLs, the measurement system should map back to TRLs. TRLs are defined in Appendix J.	26.9.1	26.9.1 The TD Project Lead shall ensure TRLs and/or other measures of technology maturity that are important to the customer/beneficiary are used in conjunction with KPPs to assess maturity throughout the project life cycle. When a TD Project uses a measure of maturity other than TRLs, the measurement system should map back to TRLs. See the table in Appendix F for a description of each TRL level.	Full		
NPR 7120.8	4.7.1.3	4.7.1.3 An independent group should validate the current state of maturity. The maturity assessment should involve or be reviewed by the customer(s)/beneficiary(ies) or his/her representatives. The initial maturity assessment is done in the Formulation phase and updated at the project status reviews. At the conclusion of the TD Project, an independent assessment of the final TRL is performed. The Program Lead shall assign the independent group responsible for the Technology Maturity Assessment.	26.9.2	26.9.2 The TD Project Lead shall provide data, thru the Program Lead, to an independent group for their assessment of the project's maturity assessment.	Full		
NPR 7120.8	4.8.1	4.8.1 Portions or elements of TD Projects may be accomplished at different Centers. The TD Project Lead shall flow down requirements for this work sufficiently to ensure requirements are met at the TD Project level.	26.10.1	26.10.1 Portions or elements of TD Projects may be accomplished at different Centers. The TD Project Lead shall flow down requirements for this work sufficiently to ensure requirements are met at the TD Project level.	Full		
NPR 7120.8	5.1.1.3	5.1.1.3 The R&T Portfolio Project Lead shall support reviews required by the governing PMC (section 2.3.2), CMC (section 2.3.3), Strategic Acquisition Planning (section 2.2.3), and Special Independent Assessments (sections 3.4.3 and 5.2.5.6.2).	27.2	27.2 The R&T Portfolio Project Lead shall support reviews required by the governing PMC, the CMC, the ASP meeting, the ASM, the PSM, and Special Independent Assessments.	Full		
NPR 7120.8	5.1.1.5	5.1.1.5 For R&T Portfolio Projects, the governing PMC and the DA for each KDP shall be as defined in Table 2.3.2 and Table 5.1.1.	27.3	27.3 For R&T Portfolio Projects, the governing PMC and the DA for each KDP shall be as defined in Table 27-1 and Table 27-2. *Note: The content of Table 27-1 and 27-2 is based on content taken from NPR 7120.8 adapted here for specific applicability to MSFC.*	Full		
NPR 7120.8	5.2.1.1	5.2.1.1 The life cycle of an R&T Portfolio Project follows a structured process that involves KDPs for assessing progress. An R&T Portfolio Project shall follow the life cycle in Figure 2.2.2, including the minimum set of reviews and gate products specified in this NPR.	27.1	27.1 R&T Portfolio projects for which MSFC has management responsibility shall follow the NASA R&T Portfolio Project life cycles as shown in Figure 27-1 and Figure 27-2. *Note: The content of Figure 27-1and 27-2 is taken from NPR 7120.8 and included here for clarity/readability.*	Full		
NPR 7120.8			27.1.1	27.1.1 R&T Portfolio Project Lead shall formulate and implement the R&T Portfolio Project, including the minimum set of reviews, technical data, and planning specified in this chapter.	Full		
NPR 7120.8	5.2.2.2	5.2.2.2 The Program Lead, in coordination with the MDAA or MSOD, shall assign an R&T Portfolio Project Lead, who is responsible for managing the R&T Portfolio Project.	25.1.1	25.1.1 The R&T Program Lead shall formulate and implement the R&T Program, including the minimum set of reviews, technical data, and planning specified in this chapter, assign TD Project Leads and R&T Portfolio Project Leads to manage their respective projects (in coordination with the applicable Center Directors), and manage any project formulation activities that are required while in the Program's Formulation Phase.	Full		
NPR 7120.8	5.2.2.2.1	5.2.2.2.1 If an R&T Portfolio Project Lead resides at a Center, the Program Lead shall coordinate the assignment of the R&T Portfolio Project Lead with the Center Director.	25.1.1	25.1.1 The R&T Program Lead shall formulate and implement the R&T Program, including the minimum set of reviews, technical data, and planning specified in this chapter, assign TD Project Leads and R&T Portfolio Project Leads to manage their respective projects (in coordination with the applicable Center Directors), and manage any project formulation activities that are required while in the Program's Formulation Phase.	Full		
NPR 7120.8	5.2.2.3	5.2.2.3 The R&T Portfolio Project Lead shall create an R&T Project FAD or an appendix to the Cross-Program Research Plan (see Appendix F), using the template in Appendix G. The R&T Project FAD is approved by the Project DA with concurrence by the Program Lead.	27.4.1	27.4.1 The R&T Portfolio Project Lead shall create an R&T Project FAD, using the template in Appendix G of NPR 7120.8 as guidance, or create an appendix to the Cross-Program Research Plan (using Appendix F of NPR 7120.8 as guidance). The R&T Project FAD is approved by the Project DA with concurrence by the Program Lead. *Note: The Program Lead, in coordination with the MDAA or MSOD, should provide, in writing, a scope of the project to the R&T Portfolio Project Lead. The FAD may be implemented as an early version of the project plan, provided it contains all the specified information. For projects established through the Announcement of Opportunity (AO) process, the MDAA letter selecting a specific AO proposal serves as the FAD.*	Full		
NPR 7120.8	5.2.2.4	5.2.2.4 As a minimum, an R&T Project FAD shall: a. Contain a statement of purpose for the proposed project and define its relationship to the Program's strategic goals and objectives. b. Establish the scope of work to be accomplished. c. Identify the R&T Portfolio Project Lead. d. Identify the management process for the project. e. Provide initial constraints, including resources, schedule and project participants within and external to NASA, including international partnerships. f. Define the approach, resources, and reviews required to conduct project formulation. g. Identify optional KDP B, if required by the DA, during Formulation or identify if optional KDP B is not needed.	27.4.2	27.4.2 As a minimum, an R&T Portfolio Project FAD shall: a. Contain a statement of purpose for the proposed project and define its relationship to the Program's strategic goals and objectives, and its alignment with NASA and/or MSFC technology roadmaps. b. Establish the scope of work to be accomplished. c. Identify the R&T Portfolio Project Lead. d. Identify the management process for the project. e. Provide initial constraints, including resources, schedule and project participants within and external to NASA, including international partnerships. f. Define the approach, resources, and reviews required to conduct project formulation and implementation. g. Identify optional KDP B, if required by the DA, during Formulation or identify if optional KDP B is not needed. *Note: KDP A (Figure 27-1) occurs when the Project DA approves the Project FAD, which initiates the R&T Portfolio Project's movement from Pre-Formulation into the Formulation phase of the life cycle.*	Full		

NPR	Section	Requirement Statement	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	MSFC Compliance: Comply? (Full, Tailored, or NA)	MSFC Compliance: Rationale for Decisions, Comments, Waiver/Deviations	Other Associated Documents
NPR 7120.8	5.2.3.2	5.2.3.2 During Formulation, the R&T Portfolio Project Lead should develop a preliminary WBS, project schedule, and the allocation of resources to perform the project (see section 5.2.5.2 for later life cycle requirements). The project's preliminary WBS and associated WBS should be consistent with Appendix K. In coordination with the OCFO, the R&T Portfolio Project Lead should identify and establish a WBS Element (level 3 or lower) specifically for capital assets, when purchase of capital assets is required. In coordination with the OCFO, the R&T Portfolio Project Lead shall complete the Alternative Future Use (AFU) Questionnaire (Form NF 1739) if any NASA owned equipment purchased on the project has an acquisition value of $100,000 or greater per item, has an estimated useful life of two years or more, and has a planned use on another project.	27.5.1	27.5.1 The R&T Portfolio Project Lead should develop a preliminary WBS, project schedule, and the allocation of resources to perform the project. The project's preliminary WBS and associated WBS should be consistent with Appendix K of NPR 7120.8. In coordination with the OCFO, the R&T Portfolio Project Lead should identify and establish a WBS Element (level 3 or lower) specifically for capital assets, when purchase of capital assets is required. The NASA Work Breakdown Structure Handbook and NASA Schedule Management Handbook contain additional guidance which programs/projects may use to establish the WBS, accompanying dictionary, and schedule. *Note: The NASA Work Breakdown Structure Handbook (NASA/SP-2010-3404) and NASA Schedule Management Handbook (NASA/SP-2010-3403) are available at https://nen.nasa.gov/web/pm/evm, under the Document Repository folder, in the EVM Reference Guides sub-folder.*	Full		
NPR 7120.8			27.5.2	27.5.2 In coordination with the OCFO, the R&T Portfolio Project Lead shall complete the Capitalization Determination Form (NF 1739) if any NASA owned equipment purchased on the project has an acquisition value of $500,000 or greater per item, has an estimated useful life of two years or more, and has a planned use on another project.	Full		
NPR 7120.8	5.2.3.3.1	5.2.3.3.1 The R&T Portfolio Project Lead shall create the R&T Portfolio Project Plan or an appendix to the Cross-Program Research Plan (see Appendix F), using the template provided in Appendix I. The R&T Portfolio Project Plan is signed by the R&T Portfolio Project Lead and approved by the Project DA, with concurrence by the Program Lead. The R&T Portfolio Project Plan is used by the governing PMC in the review process to determine if the project is fulfilling its agreement.	27.5.6	27.5.6 The R&T Portfolio Project Lead shall create the R&T Portfolio Project Plan, using the template provided in Appendix I of NPR 7120.8 as guidance, or create an appendix to the Cross-Program Research Plan (using Appendix F of NPR 7120.8 as guidance), update it as required and ensure it is maintained consistent with the R&T Program Plan.	Full		
NPR 7120.8	5.2.3.3.2	5.2.3.3.2 As a minimum, an R&T Portfolio Project Plan shall: a. State the area of specialty of the R&T Portfolio Project, the R&T Portfolio Project's objectives, and the relationship to the program objectives and goals. b. Define a process for the solicitation, evaluation, and selection of proposals (including identifying Selection Official(s)) for competed portions of the R&T Portfolio Project. Note that this may be accomplished by referencing appropriate sections of standard R&T process documents, including the Guidebook for Proposers to NASA Research Announcements (http://www.hq.nasa.gov/office/procurement/nraguidebook) and any MD or MSO omnibus NASA Research Announcements (NRA) (e.g., Research Opportunities in Space and Earth Sciences (ROSES) or Research Opportunities in Aeronautics (ROA)). c. Establish evaluation criteria, including considerations of technical merit, relevance to the Agency's vision and mission, as defined by NPD 1001.0, NASA Strategic Plan, and cost realism or reference existing documentation that defines this process. Describe how often reviews will be conducted and how the evaluation team will be formed. d. Identify an integrated budget typically for three or five years, including appropriate WBS elements (see Appendix K) consistent with available R&T program resources. e. Include a multi-year schedule for the R&T Portfolio Project. f. Identify the R&T Portfolio Project Lead. g. Identify a management and control structure to implement the R&T Portfolio Project. h. Summarize the risk management approach to be used for the R&T Portfolio Project. i. Define the project's resource requirements, including NASA personnel, facilities, and aircraft uses. j. Define the specific reviews that will be conducted during the performance of the R&T Portfolio Project. k. Document the project's approach to implementing IT security requirements in accordance with NPR 2810.1, Security of Information Technology. l. Identify any optional KDPs (KDP B, D, and E) required by the DA.	27.5.6.1	27.5.6.1 As a minimum, an R&T Portfolio Project Plan shall: a. State the area of specialty of the R&T Portfolio Project, the R&T Portfolio Project's objectives, and the relationship to the program objectives and goals, and alignment with NASA and/or MSFC technology roadmaps. Describe the specific research investigation areas needed to satisfy the goals and objective, along with the technical requirements and technology maturity assessment results for each area. b. Define a process for the solicitation, evaluation, and selection of proposals (including identifying Selection Official(s)) for competed portions of the R&T Portfolio Project. (See NPR 1080.1, MWI 5000.1, and MWI 5115.1.) *Note: This may be accomplished by referencing appropriate sections of standard R&T process documents, including the Guidebook for Proposers to NASA Research Announcements (http://www.hq.nasa.gov/office/procurement/nraguidebook) and any MD or MSO omnibus NASA Research Announcements (NRA) (e.g., Research Opportunities in Space and Earth Sciences (ROSES) or Research Opportunities in Aeronautics (ROA)).* c. Establish evaluation criteria, including considerations of technical merit, relevance to the Agency's vision and mission, as defined by NPD 1001.0, NASA Strategic Plan, and cost realism or reference existing documentation that defines this process. Describe how often reviews will be conducted and how the evaluation team will be formed. d. Identify an integrated budget typically for three or five years, including appropriate WBS elements (see Appendix K of NPR 7120.8) consistent with available R&T program resources. e. Include a multi-year schedule for the R&T Portfolio Project. f. Identify the R&T Portfolio Project Lead. g. Identify a management and control structure to implement the R&T Portfolio Project. h. Summarize the project's approach for implementing safety, mission assurance and risk management requirements and whether separate SMA and Risk Management Plans will be developed (see 27.5.11). i. Define the project's resource requirements, including NASA personnel, facilities, and aircraft uses. j. Define the specific reviews that will be conducted during the performance of the R&T Portfolio Project, including independent assessments. k. Document the project's approach to implementing IT security requirements. *Note: Refer to NPR 2810.1, Security of Information Technology, for additional detailed requirements.* l. Identify any optional KDPs (KDP B, D, and E) required by the DA. m. Summarize the systems engineering processes the project will utilize to carry out the research investigations and produce the deliverable results (i.e. basic knowledge, applied technologies), including (as a minimum) requirements definition, CM/control of research facilities/test equipment, verification/validation, and review/acceptance of research data for compliance with the project level requirements/goals/objectives. Reference separate SEMP, if applicable.	Full		
NPR 7120.8	5.2.3.3.3	5.2.3.3.3 If warranted by changes in the stated commitments or requirements, the R&T Portfolio Project Lead shall update the R&T Portfolio Project Plan. Each revised R&T Portfolio Project Plan is reviewed and approved using the same process as the original.	27.5.6	27.5.6 The R&T Portfolio Project Lead shall create the R&T Portfolio Project Plan, using the template provided in Appendix I of NPR 7120.8 as guidance, or create an appendix to the Cross-Program Research Plan (using Appendix F of NPR 7120.8 as guidance), update it as required and ensure it is maintained consistent with the R&T Program Plan.	Full		
NPR 7120.8	5.2.3.3.4	5.2.3.3.4 The R&T Portfolio Project Lead shall ensure the R&T Portfolio Project Plan and R&T Program Plan are consistent. If changes are required, the approval process for the applicable document(s) will be followed.			Full		
NPR 7120.8	5.2.3.3.5	5.2.3.3.5 If the R&T Portfolio Project resides at one or more Centers, the R&T Portfolio Project Lead shall add the Center Director(s) or his/her designee(s) responsible for committing workforce and facilities as concurrence signature(s) to the R&T Portfolio Project Plan.	27.5.7	27.5.7 The R&T Portfolio Project Lead shall ensure the applicable Center Director (or designee responsible for committing workforce and facilities) is added as a concurrence signature, to the R&T Portfolio Project Plan, for each Center at which the project resides.	Full		
NPR 7120.8	5.2.3.5	5.2.3.5 Prior to KDP C, a Formulation Review shall be conducted. The Formulation Review has both an internal and external component. The internal component is a project review to ensure the project is ready to proceed to KDP C. The external component is an independent assessment and is optional per DA discretion. The selecting official identified in Table 2.3.2 assigns the IA to be performed by one or more organizations. The selecting official for the Formulation Review team (see Table 2.3.2) is responsible for the development and approval of the ToR for the Formulation Review. Conflicts during ToR development should be resolved in accordance with section 3.6.	27.6.1, 27.6.1.1	27.6.1 Prior to KDP C, a FR shall be conducted to include the milestone technical data and planning maturity matrix requirements provided in Table 27-3. 27.6.1.1 The Independent Assessment should be conducted together with the internal component as a single, integrated FR. *Note: The FRhas both an internal and external component. The internal component is a project review to ensure the project is ready to proceed to KDP C. The external component is an independent assessment and is optional per DA discretion. The selecting official identified in Table 27-1 assigns the IA to be performed by one or more organizations. The external component is accomplished concurrently with the internal component by adding independent assessors to the internal project review team. The selecting official for the Formulation Review team (see Table 27-1) is responsible for the development and approval of the ToR for the FR. Conflicts during ToR development should be resolved in accordance with the dissenting opinion process in MCP 8070.2, (MSFC) Technical Authority Implementation Plan.*	Full		
NPR 7120.8	5.2.3.6	5.2.3.6 For R&T Portfolio Projects proposing the construction of new or modification to existing NASA owned facilities using CoF funding, the R&T Portfolio Project Lead shall complete a preliminary business case analysis, in accordance with NPD 8820.2, Design and Construction of Facilities and NPR 8820.2, Facility Project Implementation Guide. A business case guide can be located at http://www.hq.nasa.gov/office/codej/codejx/codejx.html.	27.5.8	27.5.8 For R&T Portfolio Projects proposing the construction of new or modification to existing NASA owned facilities using Construction of Facilities (CoF) funding, the R&T Portfolio Project Lead shall complete a preliminary business case analysis. *Note: A business case guide can be located at http://www.hq.nasa.gov/office/codej/codejx/codejx.html.* *Refer to NPD 8820.2, Design and Construction of Facilities, and NPR 8820.2, Facility Project Requirements, for additional details. The "business case analysis" is referred to as a "Life-Cycle Cost Analysis" in NPR 8820.2.*	Full		
NPR 7120.8	5.2.3.7	5.2.3.7 For R&T Portfolio Projects proposing the acquisition of new aircraft, the R&T Portfolio Project Lead shall plan and perform these acquisitions, in accordance with NPR 7900.3, NASA Aircraft Operations Management. The term aircraft includes both piloted and unmanned aerial vehicles.	27.5.9	27.5.9 For R&T Portfolio Projects proposing the acquisition of new aircraft, the R&T Portfolio Project Lead shall coordinate with the Office of Strategic Infrastructure and prepare a business case analysis which will be approved by the MDAA and the AA for the Office of Strategic Infrastructure. *Note: Refer to NPR 7900.3, NASA Aircraft Operations Management Manual, for additional details. The term aircraft includes both piloted and unmanned aerial vehicles.*	Full		

NPR	Section	Requirement Statement	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	MSFC Compliance: Comply? (Full, Tailored, or NA)	MSFC Compliance: Rationale for Decisions, Comments, Waiver/Deviations	Other Associated Documents
NPR 7120.8	5.2.3.8	5.2.3.8 The R&T Portfolio Project Lead shall ensure that proposals and plans for subordinate activities/tasks include documentation of (a) environmental compliance and permit considerations and (b) NEPA evaluation.	27.5.10	27.5.10 The R&T Portfolio Project Lead shall ensure that proposals and plans for subordinate activities/tasks include documentation of environmental compliance, environmental permit considerations, and NEPA evaluation.	Full		
NPR 7120.8	5.2.3.9	5.2.3.9 If an R&T Portfolio Project contains elements that include hardware used for flight (piloted or unpiloted), flight control software, wind tunnel testing, or systems that could result in potential harm to personnel or property, the R&T Portfolio Project Lead shall ensure a Safety and Mission Assurance (SMA) plan is developed. The plan identifies and documents project element-specific SMA roles, responsibilities, and relationships, with appropriate Headquarters and/or Center- SMA organizations. The plan should reflect the SMA role in areas such as: 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. In many cases, these plans are already established by Center and/or facility procedures for operations such as wind tunnel tests and flight testing and do not need to be developed by the project. The R&T Portfolio Project Plan should be used to document when project elements or other entities will need to develop unique SMA plans. However, these plans should still be stand-alone documents.	27.5.11	27.5.11 If an R&T Portfolio Project contains elements that include hardware used for flight (piloted or unpiloted), flight control software, wind tunnel testing, or systems that could result in potential harm to personnel or property, the Project Lead shall ensure that a SMA Plan and a Risk Management Plan exist that address the applicable hazards. *Note: In many cases, these plans are already established by Center and/or facility procedures for operations such as wind tunnel tests and flight testing and do not need to be developed by the Portfolio Project. These plans may be included as part of the R&T Portfolio Project Plan, provided they contain the necessary information.*	Full		
NPR 7120.8			27.5.11.1	27.5.11.1 The SMA Plan shall identify and document project specific SMA roles, responsibilities, and relationships with appropriate HQ and/or Center- SMA organizations. The SMA Plan also addresses specific critical SMA disciplines, including system safety/hazard analysis per NPR 8715.3 and NPR 8705.2; quality assurance per NPD 8730.5; SMA compliance verification, audit, and reviews per NPR 8705.6; reliability and maintainability per NPD 8720.1; software safety and assurance per NASA-STD-8719.13 and NASA-STD-8739.8; parts and material quality assurance per NPR 8735.1; contract quality assurance functions per NPR 8735.2; and other applicable NASA safety and mission success requirements. *Note: The plan should reflect the SMA role in areas such as: 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.*			
NPR 7120.8	5.2.3.10	5.2.3.10 If an R&T Portfolio Project contains elements that include hardware used for flight (piloted or unpiloted), flight control software, wind tunnel testing, or systems that could result in potential harm to personnel or property, the R&T Portfolio Project Lead shall ensure a risk management plan is developed. In many cases, these plans are already established by Center and/or facility procedures for operations such as wind tunnel tests and flight testing and do not need to be developed by the project.	27.5.11, 27.5.11.2	27.5.11 If an R&T Portfolio Project contains elements that include hardware used for flight (piloted or unpiloted), flight control software, wind tunnel testing, or systems that could result in potential harm to personnel or property, the Project Lead shall ensure that a SMA Plan and a Risk Management Plan exist that address the applicable hazards. *Note: In many cases, these plans are already established by Center and/or facility procedures for operations such as wind tunnel tests and flight testing and do not need to be developed by the Portfolio Project. These plans may be included as part of the R&T Portfolio Project Plan, provided they contain the necessary information.* 27.5.11.2 MWI 7120.6 contains the Center specific requirements for developing the Risk Management Plan.	Full		
NPR 7120.8	5.2.3.11	5.2.3.11 If a risk management plan does not already exist for a project element containing hardware used for flight (piloted or unpiloted), flight control software, wind tunnel testing, or systems that could result in potential harm to personnel or property, the R&T Portfolio Project Lead shall ensure a stand-alone risk management plan is developed that includes the content shown in NPR 8000.4, Risk Management Procedural Requirements. The R&T Portfolio Project Plan should be used to document when unique risk plans need to be developed for project elements because existing plans are not sufficient or when no plan exists. However, these plans should still be stand-alone documents.			Full		
NPR 7120.8	5.2.5.2	5.2.5.2 Use of accepted project management principles will increase the likelihood that the R&T Portfolio Project will be successful in achieving its technical objectives within cost and schedule constraints. At a minimum, the R&T Portfolio Project Lead shall establish a WBS, in accordance with Appendix K, a project schedule with milestones for each element in the WBS, and an allocation of the project's available resources necessary to achieve each milestone (see section 5.2.3.2 for preliminary requirements). The milestones should be chosen at intervals sufficient to demonstrate steady progress.	27.7.1	27.7.1 At a minimum, the R&T Portfolio Project Lead shall establish a WBS, in accordance with Appendix K of NPR 7120.8, a project schedule with milestones for each element in the WBS, and an allocation of the project's available resources necessary to achieve each milestone The milestones should be chosen at intervals sufficient to demonstrate steady progress.	Full		
NPR 7120.8	5.2.5.3	5.2.5.3 An R&T Portfolio Project Lead shall track progress against a baseline plan. The WBS, the project schedule, and the allocation of resources to milestones constitute the baseline plan for assessing technical, schedule, and cost performance. Note that it is not uncommon to re-baseline R&T Portfolio Projects due to the uncertain nature of research. It is possible that this may occur as a result of periodic assessments.	27.7.2	27.7.2 The R&T Portfolio Project Lead shall track progress against a baseline plan. The WBS, the project schedule, and the allocation of resources to milestones constitute the baseline plan for assessing technical, schedule, and cost performance. Note that it is not uncommon to re-baseline R&T Portfolio Projects due to the uncertain nature of research. It is possible that this may occur as a result of periodic assessments. *Note: The Project DA will determine if optional KDPs (KDP D and E) are required during Implementation or if the optional KDPs (KDP D and E) are not needed. These optional KDPs are added at the Project DA's discretion and identified in the Project FAD. If these optional KDPs are required, the Project DA should determine the gate products required prior to these optional KDPs.*	Full		
NPR 7120.8	5.2.5.5.1	5.2.5.5.1 The R&T Portfolio Project Lead shall conduct R&T Portfolio Project status reviews annually to assess progress towards the R&T Portfolio Projects goals and for NASA officials to gain better insight into the R&T work being performed. The R&T Portfolio Project status reviews are also utilized by the Program Lead and R&T Portfolio Project Lead to decide whether the R&T Portfolio Project should be continued for another year or transferred/closed for lack of sufficient progress (see section 5.2.6.1). These reviews can also be called by the MDAA, MSOD, or Program Lead at any time to determine the need to modify or end the project. The R&T Portfolio Project status reviews and the R&T Portfolio Cycle status reviews (see section 5.2.5.7.4) may be combined per R&T Portfolio Project Lead direction.	27.7.3.1	27.7.3.1 The R&T Portfolio Project Lead shall conduct R&T Portfolio Project status reviews annually to assess progress towards the R&T Portfolio Projects goals and for NASA officials to gain better insight into the R&T work being performed. The R&T Portfolio Project status reviews are also utilized by the Program Lead and R&T Portfolio Project Lead to decide whether the R&T Portfolio Project should be continued for another year or transferred/closed for lack of sufficient progress These reviews can also be called by the MDAA, MSOD, or Program Lead at any time to determine the need to modify or end the project. The R&T Portfolio Project status reviews and the R&T Portfolio Cycle status reviews may be combined per R&T Portfolio Project Lead direction.	Full		
			27.7.3.2	27.7.3.2 The R&T Portfolio Project Lead shall provide (to the R&T Program), documentation summarizing performance against baseline plan (for technical, schedule, and cost performance), including status/closure of formal actions from previous KDP, and plans for work to be accomplished during next life cycle phase. This includes documentation of progress towards achieving the overall technology maturity goals, technical performance measures, and technical success criteria for the project and research investigation areas.			
			27.7.5	27.7.5 The R&T Portfolio Project Lead shall periodically report the status of project performance to the CMC in accordance with MPR 7120.4.			
NPR 7120.8	5.2.5.7.4	5.2.5.7.4 Status reviews (see Figure 2.2.3) typically occur annually during Portfolio Cycle implementation through the review of each group of R&T investigations and the progress reports submitted by the selected investigators. The status reviews are utilized by the Program Lead and R&T Portfolio Project Lead to decide whether each R&T investigation should be continued for another year or transferred/closed for lack of sufficient progress. The status reviews are used to: a. Determine changes in scope that effect subsequent solicitations. b. Provide information to support evaluation of performance, as specified in the R&T Portfolio Project Plan, R&T Program Plan, or Cross-Program Research Plan. c. Determine if the results of any of the R&T investigations are ready to be transitioned to another project or to an organization outside the Agency. d. Determine if any of the R&T investigations should be terminated.	27.7.4.3	27.7.4.3 The Program Lead and R&T Portfolio Project Lead shall use the status reviews to decide whether each R&T investigation should be continued for another year or transferred/closed for lack of sufficient progress. The status reviews are used to: a. Determine changes in scope that effect subsequent solicitations. b. Provide information to support evaluation of performance, as specified in the R&T Portfolio Project Plan, R&T Program Plan, or Cross-Program Research Plan. c. Determine if the results of any of the R&T investigations are ready to be transitioned to another project or to an organization outside the Agency. d. Determine if any of the R&T investigations should be terminated. *Note: Prior to the decision to terminate a contract or multiyear grant prior to completion of the terms of the document, the R&T Portfolio Project Lead should consult with the Contracting/Procurement Officer to understand the full legal and cost ramifications.*	Full		
NPR 7120.8	5.2.5.7.5	5.2.5.7.5 Prior to the decision to terminate a contract or multiyear grant prior to completion of the terms of the document, the R&T Portfolio Project Lead should consult with the Contracting/Procurement Officer to understand the full legal and cost ramifications.					

NPR	Section	Requirement Statement	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	MSFC Compliance: Comply? (Full, Tailored, or NA)	MSFC Compliance: Rationale for Decisions, Comments, Waiver/Deviations	Other Associated Documents
NPR 7120.8	5.2.5.7.6	5.2.5.7.6 The status of publication of R&T investigations should be reported to the Project Lead on an annual basis. The R&T Portfolio Project Lead should ensure investigators are encouraged to publish the results of R&T investigations. The R&T Portfolio Project Lead should ensure that NASA investigators publish or disseminate the results of NASA R&T activities according to the data dissemination plans documented in the Program and Project Plans.	27.7.4.4	27.7.4.4 Status of publications shall be reported to the Project Lead on an annual basis and final reports are archived in the NASA Scientific and Technical Information System. *Note: Refer to NPR 2200.2, Requirements for Documentation, Approval, and Dissemination of NASA Scientific and Technical Information, for additional details.*	Full		
NPR 7120.8	5.2.5.7.7	5.2.5.7.7 The R&T Portfolio Project Lead should ensure investigators submit final reports for investigations funded through grants and contracts, and ensure that final reports are archived in the NASA Scientific and Technical Information System, as specified in NPR 2200.2, Requirements for Documentation, Approval, and Dissemination of NASA Scientific and Technical Information.			Full		
NPR 7120.8	5.2.6.2	5.2.6.2 In the R&T Portfolio Project Transition/Closure Phase, the results of R&T investigations are published and archived or transitioned to another project, and the investigations are then closed out. The R&T Portfolio Project Lead shall document lessons learned, in accordance with NPR 7120.6, Lessons Learned Process.	27.8.1	27.8.1 In the R&T Portfolio Project Transition/Closure Phase, the results of R&T investigations shall be published and archived or transitioned to another project, and the investigations closed out.	Full		
NPR 7120.8			27.8.2	27.8.2 The R&T Portfolio Project Lead shall document LL, in accordance with this MPR.			
NPR 7120.8	5.3.1	5.3.1 Portions or elements of R&T Portfolio Projects may be accomplished at different Centers. The R&T Portfolio Project Lead shall flow down requirements for this work sufficiently to ensure requirements are met at the R&T Portfolio Project level.	27.9.1	27.9.1 Portions or elements of R&T Portfolio Projects may be accomplished at different Centers. The R&T Portfolio Project Lead shall flow down requirements for this work sufficiently to ensure requirements are met at the R&T Portfolio Project level.	Full		
NPR 7120.10	P.2.b	b. Technical standards products and this NPR are also applicable to programs and projects managed under NPR 7120.5, NASA Space Flight Program and Project Management Requirements; NPR 7120.7, NASA Information Technology and Institutional Infrastructure Program and Project Management Requirements; and NPR 7120.8, NASA Research and Technology Program and Project Management Requirements.	2.2, 1., 2., 4.	2.2 All MSFC programs, projects, and activities shall follow the applicable requirements as described in Table 2-1. Chapters 1-23 are applicable for: 1. All current and future MSFC-managed space flight programs and projects and the MSFC-managed, subordinate activities that fall under them, including: 1a. All MSFC spacecraft, launch vehicles, and instruments developed for space flight programs and projects, 1b. All MSFC research and TDs that are: (1) directly funded by and to be incorporated into a space flight program/project, and (2) the space flight mission's success and schedule are directly tied to the success of the research and TD, or (3) the research and TD is a large scale (i.e. life-cycle cost (LCC) greater than $250 million) development project, 1c. All MSFC critical technical facilities specifically developed, or significantly modified for space flight systems, and ground systems that are in direct support of space flight operations. 2. All MSFC-managed research and technology programs and projects not meeting the criteria in 1. above, and the MSFC-managed , subordinate activities that fall under them. Chapter 1-4 (common requirements) and Chapter 29 (specific requirements 4. All IT and Institutional Infrastructure programs and projects not meeting the criteria in 1. above. Chapter 1-4 (common requirements) and Chapter 29 (specific requirements)	Full	Paragraphs 2.2.1-6 apply the technical standard requirements in MPR 7120.1 (chapter 4.2) to each of the types of programs/projects.	
NPR 7120.10	2.3.1	2.3.1 Mission Directorates and program and project managers support the Agency's established processes for reviewing technical standards products for technical accuracy and adequacy and provide comments when necessary.	4.2.2.2.d, 4.2.2.3.b., 4.2.2.4.b., 1.10, 1.10.3	4.2.2.2.d. During Agency-wide review, MSFC engineering discipline experts shall technically review for adequacy and accuracy and provide concurrence or comments for new, and revisions to, existing NASA Technical Standards (Engineering). 4.2.2.3.b. During Agency-wide review, the Director, MSFC SMA Directorate, or designated personnel, shall ensure that NASA Technical Standards (OSMA) are reviewed by the appropriate MSFC offices and disciplines with comments returned to the NASA OSMA. 4.2.2.4.b. During Agency-wide review, the Director, MSFC OCIO, or designated personnel, shall ensure that NASA Technical Standards (OCIO) are reviewed by the appropriate MSFC offices and disciplines with comments returned to the NASA OCIO. 1.10 MSFC personnel/discipline experts from Engineering Directorate, Safety and Mission Assurance, and MSFC Office of Chief Information Officer (as applicable) 1.10.3 Reviews draft NASA Technical Standards for adequacy and accuracy during Agency-wide reviews (see 4.2).	Full	MSFC's processes places the responsibilitiy on MSFC Engineering, S&MA, and OCIO to ensure the Technical Standards are properly reviewed by appropriate organizations at MSFC (i.e. discipline experts within those organizations, as well as by the appropriate program/project personnel).	
NPR 7120.10	2.3.2	2.3.2 Mission Directorates and program and project managers evaluate, select, tailor, when necessary, and use technical standards and specifications as program and project requirements in accordance with NPR 7120.5, NPR 7120.7, NPR 7120.8, or NASA-STD-8709.20, Management of Safety and Mission Assurance Technical Authority (SMA TA) Requirements, observing and protecting copyrights and managing classified national security and sensitive but unclassified information.	4.2.1.1	4.2.1.1 Programs/projects/activities, in conjunction with the appropriate Technical Authority, shall select technical standards for use as program/project and contract requirements, giving preference to outcome-based, performance standards (as opposed to prescriptive, process-based design standards), according to the following order of priority: (a.) Standards imposed by legal requirements (e.g., regulations). (b.) Mandatory NASA Technical Standards (i.e., those imposed by NASA directives). (c.) VCS, domestic and international. (d.) Other Government (Non-NASA) Standards. (e.) Other NASA Technical Standards (i.e., those not imposed by NASA directives). (f.) MSFC Technical Standards. *Note: Technical standard selection is based on currency and applicability to the particular program/project requirements and should include selection of those standards considered necessary to promote mission success and engineering excellence. Current versions should be selected, except when justified as impractical or incompatible with program/project requirements. Where previous/obsolete versions or multiple versions have applicability, clearly identify the intended use of each version (e.g., on a Master List, or in a project plan, memorandum, task agreement, or contract).*	Full		
			4.2.1.2	4.2.1.2 Programs/projects/activities, in conjunction with the appropriate Technical Authority, shall evaluate those standards listed as "NASA-endorsed technical standards" for use as program/project and contract requirements. *Note: "NASA-endorsed technical standards" is a "pick list" intended to promote commonality in use across NASA and includes VCS, and other Government standards, as well as NASA Technical Standards. This list is accessible at https://standards.nasa.gov.*			
			4.2.1.4	4.2.1.4 When tailoring requirements in technical standards, programs/projects/activities shall document the changes with traceability to the original requirements, and obtain approval from the appropriate Technical Authority. *Note: The NASA OCE has delegated the authority to approve waivers/deviation to requirements in engineering technical standards to the Center Director. MCP 8070.2 further delegates this authority to the implementing chief engineer for the program/project.*			

NPR	Section	Requirement Statement	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	MSFC Compliance: Comply? (Full, Tailored, or NA)	MSFC Compliance: Rationale for Decisions, Comments, Waiver/Deviations	Other Associated Documents
NPR 7120.10	2.4.1	2.4.1 Center Directors, or designees, support established processes for (1) development and maintenance of voluntary consensus standards and other Government technical standards products, (2) NASA technical standards products, including but not limited to, maintenance and improvement of NASA technical standards products for which they have assigned responsibility, and (3) designation and use of NASA-endorsed technical standards products.	1.2, 1.2.4, 1.3, 1.3.2, 1.4, 1.4.3, 4.2.2.1.a, 4.2.2.1.b	1.2 Director, MSFC Engineering Directorate, (or designee) 1.2.4 Provides concurrence with NASA Technical Standards (Engineering) (see Chapter 4.2). 1.3 Director, MSFC SMA Office 1.3.2 Ensures review of NASA Technical Standards (OSMA) (see Chapter 4.2). 1.4 Center MSFC Chief Information Officer (CIO) 1.4.3 Ensures review of NASA Technical Standards (OCIO) (see Chapter 4.2). 4.2.2.1.a When the need is identified by NASA to participate in development/revision of a VCS or other VCS bodies' activities, MSFC personnel/discipline experts may propose participation through their organizational management to the Directorate/Office level, with notification to the MSFC representative to the NESP. 4.2.2.1.b The applicable Director (or designee) for Engineering, SMA, or OCIO shall authrize, by memorandum, MSFC personnel/discipline experts to participate in developing VCS or other VCS bodies' activities, where appropriate and compatible with NASA's mission, authorities, and budget resources.	Full		
			4.2.1.2	4.2.1.2 Programs/projects/activities, in conjunction with the appropriate Technical Authority, shall evaluate those standards listed as "NASA-endorsed technical standards" for use as program/project and contract requirements. *Note: "NASA-endorsed technical standards" is a "pick list" intended to promote commonality in use across NASA and includes VCS, and other Government standards, as well as NASA Technical Standards. This list is accessible at https://standards.nasa.gov.*			
			4.2.2.2.b.	4.2.2.2.b. The Director, MSFC Engineering Directorate (or designee) shall assign by memorandum MSFC's representative to the NESP to perform functions related to development of NASA Technical Standards (Engineering) as described in NASA-NTSP-1, Appendix A, Charter, NESP.			
NPR 7120.10	2.4.2	2.4.2 Center Directors, or designees, promote and authorize participation of their employees in voluntary consensus standards bodies and report annually on these activities to the NASA Chief Engineer to support NASA's annual report to NIST.	4.2.2.1.b	4.2.2.1.b The applicable Director (or designee) for Engineering, SMA, or OCIO shall authrize, by memorandum, MSFC personnel/discipline experts to participate in developing VCS or other VCS bodies' activities, where appropriate and compatible with NASA's mission, authorities, and budget resources.	Full		
			4.2.2.1.d	4.2.2.1..d. The MSFC Director, Engineering Directorate, (or designated personnel) shall respond to the call for information (from NASA OCE) for NASA's annual report on the use of VCS and Center participation in VCS bodies' activities.			
NPR 7120.10	3.1.1	Program and project managers, in conjunction with the appropriate Technical Authority, shall select technical standards products based on currency and applicability for use as program/project requirements according to the following order of priority: a. Technical standards required by legal requirements. b. Technical standards products designated as mandatory by NPDs and NPRs. c. Technical standards products necessary to promote mission success and engineering excellence. When all other factors are the same, select in the following order of precedence: (1) Voluntary consensus standards, domestic and international. (2) NASA technical standardss or other Government agency technical standards.1 1 Consider NASA-endorsed technical standards products, accessible at https://standards.nasa.gov, first.	4.2.1.1	4.2.1.1 Programs/projects/activities, in conjunction with the appropriate Technical Authority, shall select technical standards for use as program/project and contract requirements, giving preference to outcome-based, performance standards (as opposed to prescriptive, process-based design standards), according to the following order of priority: a. Standards imposed by legal requirements (e.g., regulations). b. Mandatory NASA Technical Standards (i.e., those imposed by NASA directives). c. VCS, domestic and international. d. Other Government (Non-NASA) Standards. e. Other NASA Technical Standards (i.e., those not imposed by NASA directives). f. MSFC Technical Standards. *Note: Technical standard selection is based on currency and applicability to the particular program/project requirements and should include selection of those standards considered necessary to promote mission success and engineering excellence. Current versions should be selected, except when justified as impractical or incompatible with program/project requirements. Where previous/obsolete versions or multiple versions have applicability, clearly identify the intended use of each version (e.g., on a Master List, or in a project plan, memorandum, task agreement, or contract).*	Full		
NPR 7120.10	3.1.2	Program and project managers, in conjunction with the appropriate Technical Authority, shall select current versions of technical standards products except when justified as impractical or incompatible with requirements. *Note: Promote commonality in the use of technical standards across NASA.1* 1 Consider NASA-endorsed technical standards products, accessible at https://standards.nasa.gov, first.	4.2.1.1	4.2.1.1 Programs/projects/activities, in conjunction with the appropriate Technical Authority, shall select technical standards for use as program/project and contract requirements, ... *Note: Technical standard selection is based on currency and applicability to the particular program/project requirements and should include selection of those standards considered necessary to promote mission success and engineering excellence. Current versions should be selected, except when justified as impractical or incompatible with program/project requirements. Where previous/obsolete versions or multiple versions have applicability, clearly identify the intended use of each version (e.g., on a Master List, or in a project plan, memorandum, task agreement, or contract).*	Full		
			4.2.1.3	4.2.1.3 Use of alternate standards shall be invoked through the program/project/activity technical requirements documents at the discretion of the implementing chief engineer and/or CSO. *Note: The NASA OCE flows down authority to approve substitution of industry, contractor, etc., design and construction standards in place of NASA standards to the implementing chief engineer responsible for the end item in question.*			
NPR 7120.10	3.1.3	Program and project managers shall review lessons learned, including but not limited to, those in the NASA Lessons Learned Information System, for applicability to current technical standards applications.	4.1.3.2, 4.1.5, Figure 4-1	4.1.3.2 The LLC shall review the MSFC LL recommendations from the MSFC Distilling Team to determine which items warrant changes to existing Center policies, practices, or programs or input into existing Center corrective action processes. 4.1.5 The Office of Primary Responsibility (OPR) shall incorporate directed actions into MSFC policy and procedural documentation, best practices, or through existing corrective action and training systems. Figure 4-1. MSFC Lessons Learned Process • When applicable, LLC refers LL to appropriate Program Managers or project leads for knowledge infusion and as recommendations for actionable process improvement.	Full		
			4.1.7	4.1.7 Program/project/activity managers shall ensure review of LL (referred by LLC) for knowledge infusion throughout the program/project life cycle.			
NPR 7120.10	3.1.4	3.1.4 Program and project managers, NASA Headquarters offices, and Center Directors shall give preference to performance standards over prescriptive standards.	4.2.1.1	4.2.1.1 Programs/projects/activities, in conjunction with the appropriate Technical Authority, shall select technical standards for use as program/project and contract requirements, giving preference to outcome-based, performance standards (as opposed to prescriptive, process-based design standards), according to the following order of priority: a. Standards imposed by legal requirements (e.g., regulations). b. Mandatory NASA Technical Standards (i.e., those imposed by NASA directives). c. VCS, domestic and international. d. Other Government (Non-NASA) Standards. e. Other NASA Technical Standards (i.e., those not imposed by NASA directives). f. MSFC Technical Standards. *Note: Technical standard selection is based on currency and applicability to the particular program/project requirements and should include selection of those standards considered necessary to promote mission success and engineering excellence. Current versions should be selected, except when justified as impractical or incompatible with program/project requirements. Where previous/obsolete versions or multiple versions have applicability, clearly identify the intended use of each version (e.g., on a Master List, or in a project plan, memorandum, task agreement, or contract).*	Full		

NPR	Section	Requirement Statement	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	MSFC Compliance: Comply? (Full, Tailored, or NA)	MSFC Compliance: Rationale for Decisions, Comments, Waiver/Deviations	Other Associated Documents
NPR 7120.10	3.2.1	NASA Headquarters offices and program and project managers shall: a. Tailor, when necessary, technical standardsy and document necessary changes to meet specific application needs and to avoid over- or under-specification of requirements. b. In the case when the technical standard is invoked by a NASA directive or other NASA requirements document (e.g., a contract), document the traceability of the tailored requirements to the original standard and obtain approval from the appropriate Technical Authority as required by NPR 7120.5, NPR 7120.7, NPR 7120.8, NPR 8900.1, Health and Medical Requirements for Human Space Exploration, and for Safety and Mission Assurance, by NPR 8715.3, NASA General Safety Program Requirements, and NASA-STD-8709.20. *Note: Tailoring of technical standards required by law or Federal regulation requires General Counsel and Technical Authority involvement.* c. Ensure that requirements from voluntary consensus standards, other Government agencies, and NASA technical standards used as requirements in program and documentation are traceable to the original standards product and track changes for review and potential revision to program/project requirements.	4.2.1.2	4.2.1.2 Programs/projects/activities, in conjunction with the appropriate Technical Authority, shall evaluate those standards listed as "NASA-endorsed technical standards" for use as program/project and contract requirements. *Note: "NASA-endorsed technical standards" is a "pick list" intended to promote commonality in use across NASA and includes VCS, and other Government standards, as well as NASA Technical Standards. This list is accessible at https://standards.nasa.gov.*	Full		
			4.2.1.4	4.2.1.4 When tailoring requirements in technical standards, programs/projects/activities shall document the changes with traceability to the original requirements, and obtain approval from the appropriate Technical Authority. *Note: The NASA OCE has delegated the authority to approve waivers/deviation to requirements in engineering technical standards to the Center Director. MCP 8070.2 further delegates this authority to the implementing chief engineer for the program/project.*			
			4.2.1.5	4.2.1.5 Programs/projects/activities shall identify, assess, and document the impact of changes to technical standards being used as program/project and contract requirements. *Note: The notification system at https://standards.nasa.gov may be utilized.*			
NPR 7120.10	3.3.1	Program and project managers shall: a. Use established voluntary consensus standards, both domestic and international, in lieu of other Government agenices and NASA technical standards as program/project requirements unless use of such standards would be inconsistent with applicable laws or NASA NPDs/NPRs, technically inadequate, or otherwise impractical. b. Evaluate NASA-endorsed technical standards products for use when selecting program and project requirements. c. Register to receive notification of changes to technical standards products imposed as requirements at https://standards.nasa.gov. d. Review changes to imposed standards products to determine the need for revision of program/project requirements.	4.2.1.1	4.2.1.1 Programs/projects/activities, in conjunction with the appropriate Technical Authority, shall select technical standards for use as program/project and contract requirements, giving preference to outcome-based, performance standards (as opposed to prescriptive, process-based design standards), according to the following order of priority: a. Standards imposed by legal requirements (e.g., regulations). b. Mandatory NASA Technical Standards (i.e., those imposed by NASA directives). c. VCS, domestic and international. d. Other Government (Non-NASA) Standards. e. Other NASA Technical Standards (i.e., those not imposed by NASA directives). f. MSFC Technical Standards. *Note: Technical standard selection is based on currency and applicability to the particular program/project requirements and should include selection of those standards considered necessary to promote mission success and engineering excellence. Current versions should be selected, except when justified as impractical or incompatible with program/project requirements. Where previous/obsolete versions or multiple versions have applicability, clearly identify the intended use of each version (e.g., on a Master List, or in a project plan, memorandum, task agreement, or contract).*	Full		
			4.2.1.2	4.2.1.2 Programs/projects/activities, in conjunction with the appropriate Technical Authority, shall evaluate those standards listed as "NASA-endorsed technical standards" for use as program/project and contract requirements. *Note: "NASA-endorsed technical standards" is a "pick list" intended to promote commonality in use across NASA and includes VCS, and other Government standards, as well as NASA Technical Standards. This list is accessible at https://standards.nasa.gov.*			
			4.2.1.5	4.2.1.5 Programs/projects/activities shall identify, assess, and document the impact of changes to technical standards being used as program/project and contract requirements. *Note: The notification system at https://standards.nasa.gov may be utilized.*			
NPR 7120.10	3.4.1	NASA Headquarters offices and Center Directors, or their designees, shall submit to the NASA Chief Engineer input for NASA's annual report to NIST as required by OMB Circular No. A-119 describing NASA's use of voluntary consensus standards, participation in the development of voluntary consensus standards and voluntary consensus standards bodies, and conformity assessment based on guidance issued by the Secretary of Commerce.	1.2, 1.2.1	1.2 Director, MSFC Engineering Directorate, (or designee) 1.2.1 Reports on the use of VCS to NASA OCE (see Chapter 4.2).	Full		
			4.2.2.1.d	4.2.2.1..d. The MSFC Director, Engineering Directorate, (or designated personnel) shall respond to the call for information (from NASA OCE) for NASA's annual report on the use of VCS and Center participation in VCS bodies' activities.			
NPR 7120.10	4.1.2	NASA Headquarters offices, Center Directors, or designees shall endorse participation of their employees in the development of voluntary consensus standards and other Government agency standards in areas where participation is in the public interest and is compatible with NASA's mission, authorities, and budget resources.	1.2, 1.2.2, 1.3, 1.3.1, 1.4, 1.4.2	1.2 Director, MSFC Engineering Directorate, (or designee) 1.2.2 Authorizes Engineering Directorate employees to develop VCS and other VCS bodies' activities (see Chapter 4.2). 1.3 Director, MSFC SMA Office 1.3.1 Authorizes SMA employees to develop VCS and other VCS bodies' activities (see Chapter 4.2). 1.4 Center MSFC Chief Information Officer (CIO) 1.4.2 Authorizes Office of Chief Information Officer (OCIO) employees to develop VCS and other VCS bodies' activities (see Chapter 4.2).	Full		
			4.2.2.1.b.	4.2.2.1.b The applicable Director (or designee) for Engineering, SMA, or OCIO shall authrize, by memorandum, MSFC personnel/discipline experts to participate in developing VCS or other VCS bodies' activities, where appropriate and compatible with NASA's mission, authorities, and budget resources.			
NPR 7120.10	4.2.4.2	NASA technical standards development for engineering shall follow the direction provided by the NASA Chief Engineer. *Note: The current directions for engineering standards are provided at https://standards.nasa.gov/documents/ProcessforNASA-DevelopedStandards.pdf. Note: Other NASA Headquarters offices, with the exception of the Office of Safety and Mission Assurance Officer, and the Health and Medical Officer, may utilize the process specified in paragraph 4.2.4.2.*	4.2.2.2.a	4.2.2.2.a. NPR 7120.10 requires NASA Technical Standards (Engineering) to be developed and maintained in accordance with the direction provided by the NASA Chief Engineer. This direction is provided in the document NASA-NTSP-1, which is available on the NASA Technical Standards System (NTSS) at https://standards.nasa.gov.	Full		
NPR 7120.10	4.2.4.3	NASA technical standards development for safety and mission assurance shall follow the direction provided by the NASA Chief, Safety and Mission Assurance. *Note: The current directions for safety and mission assurance standards are provided at http://nodis3.gsfc.http://nodis3.gsfc.nasa.gov/hq_isodetail.cfm?id=H_OWI_1410_GA000_002_E_.*	4.2.2.3.a.	4.2.2.3.a. NPR 7120.10 requires NASA Technical Standards (OSMA) to be developed in accordance with the direction provided by the NASA Chief, SMA. This direction is provided in the document HQOWI 1410-GA002, which is available at http://nodis3.gsfc.nasa.gov/hq_Lib/hq_Doclist.cfm	Full		
NPR 7120.10	4.2.4.4	NASA technical standards development for health and medical shall follow the direction provided by the NASA Chief Health and Medical Officer. *Note: The current directions for health and medical standards are provided at http://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPR&c=8900s=1.*	1.1, 1.1.13	1.1 Center Director (or designee) 1.1.14 Is the overall Engineering and SMA Technical Authority for programs/projects. *Note: This responsibility is delegated from the OCE, and OSMA. Reference MCP 8070.2, (MSFC) Technical Authority Implementation Plan MSFC recognizes the HMTA function managed through the Office of the Chief Health and Medical Officer OCHMO at NASA HQ. Responsibility for HMTA for Human Spaceflight programs has been delegated by the NASA CHMO to the JSC Chief Medical Officer who appoints an HMTA Delegate. Therefore, for issues related to HMTA requirements, MSFC will work either through the HMTA office at JSC, or directly with OCHMO at HQ, as appropriate. 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 MCP 8070.2.*	NA	MSFC does not have responsibility for development of Health and Medical Standards.	

NPR	Section	Requirement Statement	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	MSFC Compliance: Comply? (Full, Tailored, or NA)	MSFC Compliance: Rationale for Decisions, Comments, Waiver/Deviations	Other Associated Documents
NPR 7120.10	4.2.4.5	NASA technical standards product development for information technology shall follow the direction provided by the NASA Chief Information Officer. *Note: The current directions for information technology standards products are provided at http://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPD&c=2800&s=1.*	4.2.2.4.a.	4.2.2.4.a. NPR 7120.10 requires NASA Technical Standards OCIO to be developed in accordance with the direction provided by the NASA CIO at http://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPD&c=2800&s=1.	Full		
NPR 7150.2B	P.2.b & c	b. This directive applies to software development, maintenance, retirement, operations, management, acquisition, and assurance activities. The requirements of this directive cover all software created, acquired, or maintained by or for NASA and apply to all of the Agency's investment areas containing software systems and subsystems. ... c. This directive is not retroactively applicable to software development, maintenance, operations, management, acquisition, and assurance activities started before September 27, 2004 (i.e., existing systems and subsystems containing software for the International Space Station, Hubble, Chandra, etc.).	4.3.1	4.3.1 All MSFC software development, maintenance, retirement, operations, management, acquisition, and assurance activities shall comply with requirements in NPR 7150.2. *Note: The software engineering requirements in NPR 7150.2, and this MPR, section 4.3, are not applicable to software development, maintenance, operations, management, acquisition, and assurance activities started before September 27, 2004 (i.e., existing systems and subsystems. including any maintenance to products whose initial development started before September 27, 2004. The NASA Engineering Network, Software Engineering Community has the following references and aids: NASA Software Engineering Handbook, Software Classification Tool, Safety Critical Assessment Tool, and Compliance Matrices by Class. Compliance Matrices are located in software document repository at: https://nen.nasa.gov/web/software/documents.*	Full		
NPR 7150.2B	2.1.3.2 (SWE-003)	2.1.3.2 Center Directors, or designees, shall maintain, staff, and implement a plan to continually advance the Center's in-house software engineering capability and monitor the software engineering capability of NASA's contractors. [SWE-003] *Note: The recommended practices and guidelines for the content of a Center Software Engineering Improvement Plan are defined in NASA-HDBK-2203, NASA Software Engineering Handbook. Each Center has a current Center Software Engineering Improvement Plan on file in the NASA Chief Engineer's office.*	4.3.2	4.3.2 The MSFC representative to the Agency Software Working Group shall develop, and maintain, the MSFC-PLAN-3204. The individual appointed as MSFC's representative to the Software Working Group may be found at the following webpage: https://nen.nasa.gov/web/software/contacts. *Note: The recommended practices and guidelines for the content of a Center Software Engineering Improvement Plan are defined in NASA-HDBK-2203, NASA Software Engineering Handbook.*	Full		
NPR 7150.2B	2.1.3.3 (SWE-005)	2.1.3.3 Center Directors, or designees, shall establish, document, execute, and maintain software processes. [SWE-005]	4.3.3	4.3.3 MSFC organizations responsible for software development, maintenance, retirement, operations, management, acquisition, or assurance activities shall establish, document, execute, and maintain their software processes.	Full		
NPR 7150.2B	2.1.3.4 (SWE-140)	2.1.3.4 Center Directors, or designees, shall comply with the requirements in this directive that are marked with an "X" in Appendix C. [SWE-140] *Note: Project relief from an applicable "X" requirement can be granted only by the designated Technical Authority called out in the column titled "Technical Authority" in Appendix C. The projects also document their related mitigations and risk acceptance in the approved compliance matrix. When the requirement and software class are marked with an "X," the projects record the risk and rationale for any requirements that are completely relieved in the compliance matrix.*	4.3.1	4.3.1 All MSFC software development, maintenance, retirement, operations, management, acquisition, and assurance activities shall comply with requirements in NPR 7150.2. *Note: The software engineering requirements in NPR 7150.2, and this MPR, section 4.3, are not applicable to software development, maintenance, operations, management, acquisition, and assurance activities started before September 27, 2004 (i.e., existing systems and subsystems. including any maintenance to products whose initial development started before September 27, 2004. The NASA Engineering Network, Software Engineering Community has the following references and aids: NASA Software Engineering Handbook, Software Classification Tool, Safety Critical Assessment Tool, and Compliance Matrices by Class. Compliance Matrices are located in software document repository at: https://nen.nasa.gov/web/software/documents.*	Full		
NPR 7150.2B	2.1.3.5 (SWE-122)	2.1.3.5 The designated Center Engineering Technical Authority(s) for requirements in this NPR that can be waived or deviated at the Center level shall be NASA civil servants (or JPL/CalTech employees) approved by the Center Director. [SWE-122] Note: Center Directors designate an Engineering Technical Authority for software from their engineering organization for software Classes A through E and from their Center CIO organization for Classes G and H. The designation of an Engineering Technical Authority(ies) is documented in the Technical Authority Implementation Plan. The NASA CIO designates the Engineering Technical Authority for Class F software. Refer to Appendix C (column titled "Technical Authority") for requirements and their associated Technical Authority.	4.3.6, 4.3.6.1, 4.3.6.2, 4.3.6.3	4.3.6 The Center Director has designated Software Technical Authorities (SwTA). The SwTA(s) for Class A through E are identified in the MSFC Technical Authority Implementation Plan, MCP 8070.2. The SwTA(s) for Class G and H are designated by memorandum. The designation information may be found at https://explornet.msfc.nasa.gov/docs/DOC-19449. 4.3.6.1 The designated SwTA(s) for Classes A through E (non-business and non-IT infrastructure systems) shall have approval authority for waivers, deviations, and exceptions for requirements in NPR 7150.2 that can be waived at the Center level, and for requirements in this MPR, section 4.3. 4.3.6.2 The designated SwTA(s) for Classes G and H (business and IT-infrastructure systems) shall have approval authority for waivers, deviations, and exceptions for requirements in NPR 7150.2 that can be waived at the Center level, and for requirements in this MPR, section 4.3. 4.3.6.3 The SwTA(s) should be a software engineering expert and shall comply with the Technical Authority roles and responsibilities as documented in the MSFC Technical Authority Implementation Plan, MCP 8070.2. *Note: The SwTA for technical software (Class A-E) that is a program/project deliverable item, is the applicable Chief Engineer for that program/project, and tailoring of requirements in this MPR, section 4.3, is typically approved and documented through the normal program/project/activity established configuration control board process. The SwTA for technical software that is not a program/project deliverable item (e.g. basic engineering design, development, and analysis tools, and engineering/research facility operations), is the Lead Discipline Engineer (LDE) for that organization, and tailoring for requirements in this MPR, section 4.3, is typically approved and documented through the organization's internal processes such as a memorandum of record, or an organizational issuance.*	Full		
NPR 7150.2B	2.1.3.6 (SWE-126)	2.1.3.6 Serving as Technical Authorities for requirements in this directive, Center Directors, or designees shall: a. Assess projects' compliance matrices, tailoring, waivers, and deviations from requirements in this directive by: [SWE-126] (1) Checking the accuracy of the project's classification of software components against the definitions in Appendix D. (2) Evaluating the project's compliance matrix for commitments to meet applicable requirements in this directive, consistent with software classification. (3) Confirming that requirements marked "Not-Applicable" in the project's compliance matrix are not relevant or not capable of being applied. (4) Determining whether the project's risks, mitigations, and related requests for relief from requirements designated with "X" in Appendix C are reasonable and acceptable. (5) Coordinate with the Center S&MA organization that the compliance matrix implementation approach does not impact safety and mission assurance on the project. (6) Approving/disapproving requests for relief from requirements designated with "X" in Appendix C, which fall under this Technical Authority's scope of responsibility. (7) Facilitating the processing of projects' tailoring/compliance matrices, tailoring, waivers, or deviations from requirements in this directive, which fall under the responsibilities of a different Technical Authority (see column titled "Technical Authority" in Appendix C). (8) Ensuring that approved compliance matrices, including any waivers and deviations against this directive, are archived as part of retrievable project records. Note: To effectively assess projects' compliance matrices, the designated Center Engineering Technical Authorities for this NPR are recognized NASA software engineering experts or utilize recognized NASA software engineering experts in their decision processes. Additionally, it is a best practice to obtain a risk assessment from the Center's Safety and Mission Assurance organization for any software waivers/deviations prior to Technical Authority approval. NASA-HDBK-2203 contains valuable information on each requirement, links to relevant NASA Lessons Learned, and guidance on tailoring. Center organizations or branches may also share frequently used tailoring and related common processes. b. Indicate their approval by signature(s) in the compliance matrix itself, when the compliance matrix is used to waive/deviate from applicable "X" requirement(s). [SWE-145] *Note: The compliance matrix documents the requirements that the project plans to meet, "not applicable" requirements, and any tailoring approved by designated Technical Authorities with associated justification. If a project wants to waive or deviate from a requirement marked as Headquarters Technical Authority, then the project is required to get NASA Headquarters approval (e.g., NASA Chief Engineer (CE), NASA Chief Safety and Mission Assurance (CSMA), and/or NASA Chief Information Officer (CIO)) on a formal waiver/deviation request or on a software compliance matrix.*			Full		

DIRECTIVE IS UNCONTROLLED WHEN PRINTED
Verify current version before use at https://dml.msfc.nasa.gov/directi

NPR	Section	Requirement Statement	MPR 7120.1 Rev. H Section	MPR 7120.1 Rev. H Requirement Statement	MSFC Compliance: Comply? (Full, Tailored, or NA)	MSFC Compliance: Rationale for Decisions, Comments, Waiver/Deviations	Other Associated Documents
NPR 7150.2B	2.1.3.7 (SWE-095)	2.1.3.7 The Center Director or designee shall periodically report on the status of the Center's software engineering discipline, as applied to its projects, to the NASA Office of Chief Engineer and relevant Technical Authorities as requested. [SWE-095]	4.3.11 4.3.11.1	4.3.11 MSFC organizations that have software development activities with NPR 7150.2 software classifications of A, B, or C, shall periodically report on the status of their software engineering discipline, as applied to their projects, to the MSFC representative to the Agency Software Working Group, as requested by the Agency OCE. *Note: The MSFC representative to the Agency Software Working Group may also request status information for software with classification of D, as needed, to support requests by the Agency OCE.* 4.3.11.1 The MSFC representative to the Agency Software Working Group will integrate these responses and provide to the OCE and other required Technical Authorities, as requested.	Full		
NPR 7150.2B	2.1.3.8 (SWE-006)	2.1.3.8 Center Directors, or designees, shall maintain a reliable list of their Center's programs and projects containing Class A, B, C, and D software. [SWE-006] The list should include: a. Project/program name and Work Breakdown Structure (WBS) number. b. Software name(s) and WBS number(s). c. Software size estimate (report in Kilo/Thousand Source Lines of Code (KSLOCs)). d. Phase of development or operations. e. Safety Critical Software (Yes or No). f. Software Class or list of the software classes being development on the project. g. For each Computer Software Configuration Item (CSCI)/Major System containing Class A, B, or C software, provide: (1) The name of the software development organization. (2) Title or brief description of the CSCI/Major System. (3) The estimated total KSLOC the CSCI/Major System represents. (4) The primary programing languages used. (5) Primary life-cycle methodology being used on the software project. (6) Name of responsible software assurance organization(s).	4.3.12 4.3.12.1 4.3.12.2	4.3.12 MSFC organizations that have software development activities with NPR 7150.2 software classifications of A, B, C or D, shall develop and maintain a list of all such program/project software development activities that contains, at a minimum: a. Project/program name (or "multiprogram") b. Software CSCI name(s) c. Safety Critical Software (Yes or No) d. NPR 7150.2 Software Classification e. For software classifications of A, B, and C, total software lines of code (SLOC) projected and/or actual, as appropriate. 4.3.12.1 Each organization will provide this list to MSFC representative to the Agency Software Working Group on an annual basis. 4.3.12.2 When multiple MSFC organizations contribute to the development of a software product, the responsibility for reporting of data related to a particular Computer Software Configuration Item (CSCI) will belong to the organization that is responsible for producing the corresponding Software Development Plan for that particular CSCI.	Full		
NPR 7150.2B	2.1.3.9 (SWE-091)	2.1.3.9 For Class A, B, C, and safety critical software projects, the Center Director shall establish and maintain a software measurement repository for software project measurements containing at a minimum: [SWE-091] a. Software development tracking data. b. Software functionality achieved data. c. Software quality data. d. Software development effort and cost data.	4.3.13	4.3.13 MSFC organizations that have software development activities with NPR 7150.2 software classifications of A, B, or C, regardless of "safety criticality", and those with classification of D that are designated as "safety critical," shall develop and maintain a software measurement repository that includes the following data, at a minimum: a. Software development tracking data (e.g., Schedule Status, plan vs. actual) b. Software functionality achieved data (e.g. Software Release Implementation Status, plan vs. actual) c. Software quality data (e.g. Post Release Defects) d. Software development effort and cost data (e.g. Staffing work year equivalent/full-time equivalent, plan vs. actual).	Full		
NPR 7150.2B	2.1.3.10 (SWE-092)	2.1.3.10 For Class A, B, C, and safety critical software projects, the Center Director shall utilize software measurement data for monitoring software engineering capability, improving software quality, and tracking the status of software engineering improvement activities. [SWE-092]	4.3.13.1	4.3.13.1 Each organization shall utilize measurement data from this repository to monitor software engineering capability, to improve software quality, and to track the status of software engineering improvement activities.	Full		
NPR 7150.2B	2.1.3.11 (SWE-101)	2.1.3.11 Each Center Director shall maintain and implement software training plan(s) to advance its in-house software engineering capability and as a reference for its contractors. [SWE-101]	4.3.5	4.3.5 MSFC organizations that have software development activities with NPR 7150.2 software classifications of A, B, or C, shall maintain and implement an organization software training plan to advance the organization's in-house software engineering capability and as a reference for its organizational support contractors, as requested. *Note: The recommended practices and guidelines for the content of software training plans are defined in NASA-HDBK-2203. Organizations that develop only class D or E software may utilize the normal employee career development planning process, along with the annual training needs survey, as described in MPR 3410.1, to address software training needs and goals. For all software classes, the MSFC organizational management will have authority to determine the priority and selection of training activities within existing resource limitations.*	Full		
NPR 7150.2B	2.1.3.12 (SWE-142)	2.1.3.12 For Class A, B, and C software projects, each Center Director shall establish and maintain a software cost repository(ies) that contains at least one of the following measures: [SWE-142] a. Planned and actual effort and cost. b. Planned and actual schedule dates for major milestones. c. Both planned and actual values for key cost parameters that typically include software size, requirements count, defects counts for maintenance or sustaining engineering projects, and cost model inputs. d. Project descriptors or metadata that typically includes software class, software domain/type, and requirements volatility.	4.3.14 4.3.14.1	4.3.14 MSFC organizations that have software development activities with NPR 7150.2 software classifications of A, B, or C, shall develop and maintain (annually) a software cost repository that contains planned vs. actual major milestones dates for each software development program/project activity. 4.3.14.1 Each organization will provide this data to MSFC representative to the Agency Software Working Group, as requested.	Full		
NPR 7150.2B	2.1.3.13 (SWE-144)	2.1.3.13 Each Center Director shall contribute applicable software engineering process assets in use at his/her Centers to the Agency-wide process asset library. [SWE-144]	4.3.4	4.3.4 MSFC organizations that have software development activities will contribute applicable software engineering process assets to the NASA Process Asset Library (PAL), via the MSFC representative to the Agency Software Working Group. *Note; The NASA PAL is located on the NEN Web site. It contains examples of software best practices, templates, processes, advanced methods, and tools, which are made available to the NASA software community to continuously improve software engineering capabilities across the Agency. Applicability of assets for the PAL will be determined by the software developing organization based on the potential for the asset to be reutilized in other applications.*	Full		
NPR 7150.2B	2.1.3.14 (SWE-153)	2.1.3.14 The designated Engineering Technical Authority(s) shall define the content requirements for software documents or records. [SWE-153]. *Note: The recommended practices and guidelines for the content of different types of software activities (whether stand-alone or condensed into one or more project level or software documents or electronic files) are defined in NASA-HDBK-2203. The Center defined content should address prescribed content, format, maintenance instructions, and submittal requirements for all software related records. The designated Engineering Technical Authority for software approves the required software content for projects within their scope of authority. Electronic submission of data deliverables is preferred.*	4.3.15	4.3.15 At MSFC, the expected content for software documents and records is defined in the standard Data Requirements Descriptions (DRDs), which are available in the MSFC Data Requirements Management System that can be accessed in the MSFC Integrated Document Library.	Full		
NPR 7150.2B	4.5.7 (SWE-070)	4.5.7 The project manager shall use validated and accredited software models, simulations, and analysis tools required to perform qualification of flight software or flight equipment. [SWE-070] *Note: Information regarding specific verification and validation techniques and the analysis of models and simulations can be found in NASA-STD-7009 and NASA-HDBK-7009.*	20.1.2	20.1.2 M&S required to perform qualification of flight software or flight equipment, or used to make a decision (the consequence of which impacts human safety or program/project-defined mission success criteria if the decision proves incorrect, and whose degree of influence in the decision is moderate, significant, or controlling, per NASA-STD-7009 Appendix A.2), shall be classified as Critical M&S.	Full		
			20.3.1	20.3.1 Critical M&S shall comply with NASA-STD-7009.			
			20.6.1	20.6.1 Critical M&S shall be formally accredited for their intended use. *Note: Refer to VI-NASA08-RP005, Modeling & Simulation Verification, Validation, & Accreditation Recommended Practices Guide.*			
NPD 7120.4D	5.h.7)	h. Center Directors shall: 7) Appoint and support an individual as the Center's Software Release Authority (SRA). The Center Director may appoint a group of individuals as the Software Release Group to be chaired by the Center SRA in accordance with NPR 2210.1. The SRA shall be the Center representative on the SRAWG. The Chairperson of the SRAWG shall be a member of the SWG.	4.3.7	4.3.7 The Center Director has appointed and supports the SRA in accordance with NPR 2210.1. The individuals who have been appointed as SRA and alternate SRA for MSFC are listed on the following webpage: https://nen.nasa.gov/web/sra/contacts.	Full		
NPD 7120.4D	5.h.8)	h. Center Directors shall: 8) Provide the Chief Engineer with information to support the creation of the Software Inventory.	4.3.9	4.3.9 The MSFC representative to the Agency Software Working Group has been designated to provide the Agency Chief Engineer with information to support the creation of the software Inventory.	Full		

Appendix I

Activity Agreement Template

Activity Agreement (SPAA)	SPAA Number		Date
Task Information			
Point of Contact (Requesting)	Organization	Mail Code	Phone Number
Point of Contact (Providing)	Organization	Mail Code	Phone Number
Other Organizations: Including International Participants, Internal and External to NASA			
Task Description: (include specification descriptions and cite references where appropriate (Requestor))			
Purpose/objectives			
Scope			
Governance/management process			
Approval Process			
Change Process			
Initial constraints including resources, schedule			
Reporting Requirements: (Give frequency, due dates, and attach sheet(s) with required format (Requestor))			
Project Reviews			
Life Cycle Reviews			
Safety Reviews			
Schedule			
Data Requirements (Requestor): or a generic checklist			**Delivery Date**
Data Requirements (Responder (See attached)): Customized checklist (NA or Applicable)			**Delivery Date**
Deliverable Items (Responder): Items delivered to carrier vehicle or other organization (not deliverables for design reviews -- see above)			**Delivery Date**

Activity Agreement (SPAA) (contd)		SPAA Number			Date	
Impacts by UPN & Center Procurement $	FY1 $K	FY2 $K	FY3 $K	FY4 $K	FY5 $K	Total $K
Impacts by UPN & Center Non-Procurement $	FY1 $K	FY2 $K	FY3 $K	FY4 $K	FY5 $K	Total $K
Total						
CS Salary (Direct)						
CS Travel (Direct)						
Service Pools						
Facility Uilization						
Center G&A						
Workforce by UPN & Center	FY1 FTE	FY2 FTE	FY3 FTE	FY4 FTE	FY5 FTE	Total FTE
Current Year (Activities/Milestones)						
Out Years (Activities/Milestones)						
Approval Signatures						
Requestor	Name & Title		Signature			Date
Manager/Lead						
Business Manager/Lead						
Provider						
Manager/Lead						
Business Manager/Lead						

Appendix J

ACTIVITY PLAN TEMPLATES

A. Objectives
Specific objectives/performance goals related to the requester objective/goals

B. Activity success criteria/requirements
State full mission success criteria clearly and concisely such that the objectives/requirements are defined and can be verified and validated. Derived requirements are defined is this plan, along with methods for verification/validation.

C. Technical Approach
Define (or document in an activity SEMP and reference here) the technical approach of the activity including facilities, flight plans, operations, logistics and planned life-cycle technical reviews. Identify any relationships with outside organizations that have products owed to them, if any. (See MPR 7123.1)
Define any heritage hardware and/or software along with the results of the heritage hardware/software review for use in this application/architecture.
Define any new TD required for this activity, along with its current TRL and the required TRL.
Define and classify any models and simulations per NASA-STD-7009, Appendix A.2

D. Management Approach
Describe the activity management structure including the activity lead with roles and responsibilities. Identify any special boards/committees including control boards for activity products.
Define insight and oversight model and processes, as required.

E. Resource Requirements
a) Funding requirements (see agreement)
b) Institutional requirements

F. Schedule and margins
Document Integrated Master Schedule with all major events, reviews and other activities.
Document any resource and/or technical margins, as required

G. WBS
Define an activity WBS, if required

H. SMA/Risk Management
Define the SMA activities/analyses, as required.
Summarize the activity risk management approach. Describe any risk management requirements from parent program/project and how the MSFC activity plans to meet those requirements.
Using MWI 7120.6 as guidance, assess and describe how the MSFC activity will address risk

management planning and risk informed decision making in context of overall activity management approach, with involvement of applicable technical authorities.

I. Activity evaluation
Details of the life-cycle reviews and other status/assessment reviews

Data Product		Activity Implementation (N/A or Applicable, and Actual Customization)
1	Technical, schedule and cost control plan	
2	Safety and mission assurance	
3	Risk management plan	
4	Acquisition plan	
5	Technology Development Plan	
6	Systems Engineering Management Plan	
7	Information Technology Plan	
8	Software Management Plan	
9	Verification and Validation Plan	
10	Review Plan	
11	Mission Operations Plan	
12	Environmental Management Plan	
13	Integrated Logistics Support Plan	
14	Science Data Management Plan	
15	Integration Plan	
16	Configuration Management	
17	Security Plan	
18	Project Protection Plan	
19	Export Control Plan	
20	Lessons Learned Plan	
21	Human Rating Certification Package	
22	Planetary Protection Plan	
23	Nuclear Safety Launch Approval Plan	
24	Range Safety Risk Management Plan	
25	Expendable Launch Vehicle Payload Safety Process Deliverables	
26	Data Management Plan	
27	Quality Plan	
28	Education Plan	
29	Communications Plan	

Check List for Additional Possible Data Products or Checklist Supplied by the Requester

Technical Review		Activity Implementation (N/A or Applicable, and Actual Customization)
1	System Requirements Review (SRR)	
2	Preliminary Design Review (PDR)	
3	Critical Design Review (CDR)	
4	Design Certification Review (DCR)/ System Acceptance Review (SAR) or Pre-Ship Review	
5	Flight Readiness Review (FRR)	

Check List for Additional Possible Technical Reviews or Checklist Supplied by the Requester

ISS Checklist	
1	Op Nom (Payload Name) approved
2	Display and graphics review process briefing
3	Software Interface Definition (SW Identifiers)
4	Label approval process briefing
5	Export Classification Letter
6	Payload Development Schedule
7	Payload Integration Agreement
8	Major Payload components
9	GFE List
10	Limited Life List
11	Ground Processing Plan
12	Operations Plan
13	Viewing, Pointing, Exposure requirements (Attached Payloads)
14	Operations Procedures
15	EVR Installation Concept (Attached Payloads)
16	EVA Contingency Concept (Attached Payloads)
17	Disposal plan (Attached Payloads)
18	Command and Data Handling Plan.
19	Design Data Package (Drawings & Drawing Tree/Engineering Drawing List)
20	Electrical, Thermal, Command and Data Handling Schematics
21	On-Orbit Configuration Drawings (including definition of unique protrusions)
22	Hardware Interface Control Document
23	Structural Analysis
24	Fracture Control Plan and Fracture Control Summary Report
25	Power Requirements
26	Electromagnetic Interference/Compatibility Plan
27	ISS I/F FMECA
28	Thermal analysis (Attached Payloads)
29	Offgassing/venting Data submitted to the External Contamination Group
30	"ISS Supplied Consumables(Water, Nitrogen, Oxygen, etc)Total Used (Lbm) + Rate of Use (Lbm/day), Frequency of use per Increment"
31	Vacuum System /Consumable Usage plan (This will allow ample time for appropriate accommodations for Consumable strategic planning, as well as venting ops planning/coordination.)
32	Payload Trainer Requirements
33	Readiness for Payload Safety Review Panel
34	Acoustics Control Plan -Acoustic Noise Control Plans, although highly encouraged this is not required

APPENDIX K

Reserved

APPENDIX L

TECHNOLOGY READINESS LEVELS

Note: The content of NPR 7123.1 Appendix E is included here for clarity/readability.

TRL	Definition	Hardware Description	Software Description	Exit Criteria
1	Basic principles observed and reported	Scientific knowledge generated underpinning hardware technology concepts/applications.	Scientific knowledge generated underpinning basic properties of software architecture and mathematical formulation.	Peer reviewed publication of research underlying the proposed concept/application.
2	Technology concept and/or application formulated	Invention begins, practical applications are identified but are speculative, no experimental proof or detailed analysis is available to support the conjecture.	Practical application is identified but is speculative; no experimental proof or detailed analysis is available to support the conjecture. Basic properties of algorithms, representations, and concepts defined. Basic principles coded. Experiments performed with synthetic data.	Documented description of the application/concept that addresses feasibility and benefit.
3	Analytical and experimental critical function and/or characteristic proof-of-concept	Analytical studies place the technology in an appropriate context and laboratory demonstrations, modeling and simulation validate analytical prediction.	Development of limited functionality to validate critical properties and predictions using non-integrated software components.	Documented analytical/experimental results validating predictions of key parameters.
4	Component and/or breadboard validation in laboratory environment.	A low fidelity system/component breadboard is built and operated to demonstrate basic functionality and critical test environments, and associated performance predictions are defined relative to final operating environment.	Key, functionality critical software components are integrated and functionally validated to establish interoperability and begin architecture development. Relevant environments defined and performance in the environment predicted.	Documented test performance demonstrating agreement with analytical predictions. Documented definition of relevant environment.

TRL	Definition	Hardware Description	Software Description	Exit Criteria
5	Component and/or breadboard validation in relevant environment.	A medium fidelity system/component brassboard is built and operated to demonstrate overall performance in a simulated operational environment with realistic support elements that demonstrate overall performance in critical areas. Performance predictions are made for subsequent development phases.	End-to-end software elements implemented and interfaced with existing systems/simulations conforming to target environment. End-to-end software system tested in relevant environment, meeting predicted performance. Operational environment performance predicted. Prototype implementations developed.	Documented test performance demonstrating agreement with analytical predictions. Documented definition of scaling requirements.
6	System/subsystem model or prototype demonstration in a relevant environment.	A high fidelity system/component prototype that adequately addresses all critical scaling issues is built and operated in a relevant environment to demonstrate operations under critical environmental conditions.	Prototype implementations of the software demonstrated on full-scale, realistic problems. Partially integrated with existing hardware/software systems. Limited documentation available. Engineering feasibility fully demonstrated.	Documented test performance demonstrating agreement with analytical predictions.
7	System prototype demonstration in an operational environment.	A high fidelity engineering unit that adequately addresses all critical scaling issues is built and operated in a relevant environment to demonstrate performance in the actual operational environment and platform (ground, airborne, or space).	Prototype software exists having all key functionality available for demonstration and test. Well integrated with operational hardware/software systems demonstrating operational feasibility. Most software bugs removed. Limited documentation available.	Documented test performance demonstrating agreement with analytical predictions.

TRL	Definition	Hardware Description	Software Description	Exit Criteria
8	Actual system completed and "flight qualified" through test and demonstration.	The final product in its final configuration is successfully demonstrated through test and analysis for its intended operational environment and platform (ground, airborne, or space)	All software has been thoroughly debugged and fully integrated with all operational hardware and software systems. All user documentation, training documentation, and maintenance documentation completed. All functionality successfully demonstrated in simulated operational scenarios. Verification and validation (V&V) completed.	Documented test performance verifying analytical predictions.
9	Actual system flight proven through successful mission operations.	The final product is successfully operated in an actual mission.	All software has been thoroughly debugged and fully integrated with all operational hardware and software systems. All documentation has been completed. Sustaining software support is in place. System has been successfully operated in the operational environment.	Documented mission operational results.