

Langley Procedural Requirements LPR 7123.1 C Effective Date: June 21, 2021 Expiration Date: June 30, 2026

Subject: Langley Research Center

Responsible Office: Office of Director

LaRC Systems Engineering Processes and Requirements

National Aeronautics and Space Administration

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Verify the correct revision before use by checking the LMS Web Site.

Document Revision	Effective Date	Description		
А	July 20, 2010	Baseline		
A-2	June 12, 2012	Adds Appendix G		
A-3	April 25, 2014	Revises Appendix G		
В	May 28, 2015	 Updates to be compliant with NPR 7123.1B Revises Section 2.3 to address NPR 7123.1B Compliance Matrix H.1 and H.2 Replaces Appendix E with completed NPR 7123.1BH.1 Compliance Matrix Changes Project "Class" to Project "Type" to be consistent with LPR 7120.5. Updates Table 1-1 Revises Appendix G 		
B-1	December 14, 2016	Updates reference from LPR 1440.7 to LAPD 1440.7		
С	June 03, 2021	Updates to be compliant with NPR 7123.1C Changes Designated Governing Authority terminology to SE Approval Authority Updates Table 1-1 Updates reference to the NPR tailoring tool Fixes definitions of LCC for SEMP approval designation Removes LPR 7510.1 as an Applicable Document Addresses others pre-LMS review comments		

DOCUMENT HISTORY LOG

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PREFACE

P.1 PURPOSE

P.1.1 This Langley Procedural Requirements (LPR) documents LaRC's implementation of the Agency Systems Engineering Management requirements documented in NASA Procedural Requirements (NPR) 7123.1C. Where appropriate, specific tailoring of NPR 7123.1C requirements for LaRC's implementation has been included in this document.

P.2 APPLICABILITY

P.2.1 This LPR applies to the personnel, programs, and projects at LaRC, including contractors 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.)

P.2.2 This LPR applies to all Programs and Projects conducted by LaRC that are governed by NPR 7120.5, *NASA Spaceflight Program and Project Management Requirements*. This LPR also applies to all Institutional Infrastructure Programs and Projects conducted by LaRC (except for environmental compliance and restoration activities), that are governed by NPR 7120.7, *NASA Information Technology Program and Project Management Requirements*. In addition, this LPR applies to Technology Development Programs and Projects conducted by LaRC that are governed by NPR 7120.8, *NASA Research and Technology Program and Project Management Requirements*.

P.3 AUTHORITY

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

P.4 APPLICABLE DOCUMENTS AND FORMS

- a. NPR 7120.5, NASA Space Flight Program and Project Management Requirements
- b. NPR 7120.7, NASA Information Technology Program and Project Management Requirements
- c. NPR 7120.8, NASA Research and Technology Program and Project Management Requirements
- d. NPR 7123.1, NASA Systems Engineering Processes and Requirements
- e. NPR 7150.2, NASA Software Engineering Requirements
- f. NPR 8705.4, Risk Classification for NASA Payloads
- g. NPR 8820.2G, Facility Project Requirements (FPR)
- h. LAPD 7000.2, Review Program for Langley Research Center (LaRC) Facility

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Projects

- i. LAPD 1440.7, Langley Research Center (LaRC) Records Management
- j. LPR 5300.1, Product Assurance Plan
- k. LF-209, Langley Engineering Best Practices
- I. LPR 7120.5, Space Flight Project Practices Handbook
- m. LPR 7130, Project and Task Review Procedural Requirements
- n. LPR 7120.4, LaRC Technical Authority Implementation Plan
- o. LPR 7120.7, Space Flight Independent Life Cycle Review Procedural Requirements
- p. LPR 7150.2 LaRC Software Engineering Requirements
- q. LMS-CP-1725, Export Control
- r. LMS-CP-2310, Electronic Storage and Archival System (Document and Data Management)
- s. LMS-CP-4756, Handling, Preservation, Storage, and Shipping of Flight Hardware and Ground Support Equipment
- t. LMS-CP-5526, Product Requirements Development and Management Procedure
- u. LMS-CP-8041, Master Configuration and Data Management Plan for Flight Projects

P.5 MEASUREMENT/VERIFICATION

Verification will be accomplished by inspection as part of the LaRC Internal Audit process.

P.6 CANCELLATION

LPR 7123.1, dated December 14, 2016

Original signed on file

/s/ David YoungJune 21, 2021Center Deputy DirectorDate

Approved for public release via the Langley Management System. Distribution is unlimited.

1. RESPONSIBILITIES

NPR 7123.1C defines the Engineering Technical Authority (ETA) as the approving authority for a project's systems engineering (SE) implementation. The formal flow of ETA for LaRC-managed projects from the LaRC Center Director to the responsible engineering director is described in LPR 7120.4. In its implementation of the requirements of NPR 7123.1C, LaRC has tailored the delegation of the responsibilities of the ETA for approving a project's systems engineering (SE) implementation by defining a tiered approach that defines an SE implementation approval authority that is dependent on the LaRC mission type, as described in LPR 7120.5, that is assigned to the project. This function is termed in this LPR as "SE Approval Authority." Approval authority of a project's SE implementation defined in this document is a delegated function of ETA from the LaRC Center Director to parties that are independent of the programmatic authority chain. The flow of all other ETA at LaRC follows LPR 7120.4. The definition of SE Approval Authority in this LPR also applied to projects for which LaRC holds engineering technical authority but is not directly responsible for project implementation (e.g., PI-led projects that are managed out of a LaRC-hosted program office).

- 1.1 The LaRC Center Director, or designee, is responsible for the implementation of the SE policies, processes, and procedures at LaRC.
- 1.2 The Chair of the LaRC Center Management Council (CMC), or designee, serves as the SE Approval Authority to approve SE implementation for LaRC Type A-D and Type E with Life Cycle Cost (LCC) > \$30M, Programs/Projects. For more information on LaRC Mission types, refer to Appendix D.
- 1.3 The LaRC Chief Engineer, or designee:
- 1.3.1 Defines the appropriate documentation of SE implementation for Type E with $LCC \le \$30M$ or Type F with $\$10M < LCC \le \$30M$ Programs/Projects;
- 1.3.2 Serves as the LaRC SE Approval Authority to approve documentation of SE implementation of LaRC Type E with LCC ≤ \$30M and Type F with \$10M < LCC ≤ \$30M Programs/Projects;
- 1.3.3 Reviews and concurs on Type A-D and Type E with LCC > \$30M Programs/Projects SE implementation prior to SE Approval Authority review/approval; and
- 1.3.4 Ensures all directorates involved in the engineering work review the SE Management Plan (SEMP) for Type A-D or Type E with LCC > \$30M Programs/Projects or other appropriate documentation of SE implementation for Type E with LCC ≤ \$30M and Type F Programs/Projects.
- 1.4 The Director of the responsible engineering directorate (Engineering Directorates at Langley are specified in LPR 7120.4) providing the Program/Project Chief Engineer (or Lead Systems Engineer if no Chief Engineer), or designee:

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- 1.4.1 Defines the appropriate documentation of SE implementation for Type F with LCC ≤ \$10M Programs/Projects;
- 1.4.2 Ensures a SEMP for Type A-D or Type E with LCC > \$30M Programs/Projects or other appropriate documentation of SE implementation for Type E with LCC ≤ \$30M and Type F Programs/Projects is prepared in accordance with this LPR.
- 1.4.3 Reviews and concurs on Type A-D and Type E with LCC > \$30M Programs/Projects SE implementation prior to SE Approval Authority review/approval
- 1.4.4 Ensures all directorates involved in the engineering work of the Program/Project concur on the SEMP or other appropriate SE implementation documentation.
- 1.4.5 Ensures compliance with the approved SEMP or other appropriate SE implementation documentation.
- 1.4.6 Serves as the LaRC SE Approval Authority to approve SE implementation for Type F and LCC \leq \$10M Programs/Projects.
- 1.5 The Program/Project Manager (PM), or designee:
- 1.5.1 Ensures a SEMP (for a Type A-D or Type E with LCC > \$30M Program/Project) or other appropriate documentation (for a Type E with LCC ≤ \$30M or Type F Program/Project) is written to define Program/Project implementation of SE requirements and processes;
- 1.5.2 Ensures review and approval of the SEMP or other appropriate documentation by the appropriate LaRC SE Approval Authority as defined in Table 1-1;
- 1.5.3 Controls the SEMP or other appropriate documentation under Program/Project control processes;
- 1.5.4 Ensures that software developed within NASA or acquired complies with NPR 7150.2, for systems that contain software (see NPR 7123.1, Section 2.1.5.3) and with LPR 7150.2.
- 1.6 The Program/Project SE Team (SET):
- 1.6.1 Prepares the SEMP or other appropriate documentation as required by the LaRC SE Approval Authority as defined in Table 1-1.
- 1.6.2 Executes or oversees the execution of the Program/Project SE processes.
- 1.6.3 Through the project CE, provides the design team with statutory, regulatory, and Agency mandatory requirements, relevant information from previous similar designs, and any other requirements for product design and development.
- 1.7 For Programs/Projects involving more than one Center, the lead organization Page 7 of 39

develops documentation to describe the hierarchy and reconciliation of plans for implementing SE processes and requirements that are applicable to all Centers involved. However, the LaRC Center Director, Engineering Director and Chief Engineer are responsible to ensure all LaRC work in support of these efforts complies with this LPR and NPR 7123.1.

1.8 Responsibilities for various activities associated with the SEMP or other appropriate documentation of the SE implementation plans are summarized in Table 1-1. In each case the LaRC SE Approval Authority has final approval authority.

LaRC Mission Type ¹ and	All A-D	E: LCC ≤ \$30M	F: LCC
Life-Cycle Cost Criteria	E: LCC > \$30M	F: \$10M < LCC ≤ \$30M	≤ \$10M
CMC Chair	LaRC ETA		
LaRC Chief Engineer	Concurs	LaRC ETA	
Responsible Engineering Director ²	Concurs	Concurs	LaRC ETA
Program/Project Manager	Concurs	Concurs	Concurs
SE Team (SET)	Prepares	Prepares	Prepares
Notes:			

1) LaRC Mission Type defined in the NPR Tailoring Application (NTA)

(https://oneplace.larc.nasa.gov/nta). Mission Type should be documented and approved in the Project Initiation Memorandum as defined in LPR 7120.5. If mission type is not specified, the LaRC SE Approval Authority as determined by project LCC should resolve any ambiguity about type classification. 2) Engineering Directorates at Langley are specified in LPR 7120.4.

Table 1-1 Approval and Review Responsibilities for the SEMP or alternative documentation of SE implementation

2. PROCEDURE

2.1 Program/Project SE

2.1.1 The Program/Project SE Life Cycle is defined as a set of activities, processes and reviews that enables the smooth, incremental development of products essential to successfully achieving the Program/Project goals.

2.2 The Systems Engineering Management Plan (SEMP)

2.2.1 The purpose of a SEMP is to provide a single, integrated technical planning document that addresses the SE management and implementation for systems and subsystems for in-house and contracted Programs/Projects.

Req. 001: Each Type A-D Program/Project regardless of LCC and each Type E Program/Project with LCC > \$30M (refer to Appendix D) SET shall provide to the LaRC SE Approval Authority a SEMP as described in Appendix J of NASA/SP-2016-6105, Rev 2 "NASA Systems Engineering Handbook".

Rationale: [The SEMP is required by NPR 7123.1. The SEMP provides the specifics of the technical effort and describes what technical processes will be used, how the processes will be applied, how the project will be organized to accomplish its activities, and the cost and schedule associated with accomplishing the activities. At LaRC, a stand-alone SEMP is required for any Type A-D Program/Project regardless of LCC and any Type E Program/Project with LCC > \$30M because of their size and/or visibility. For more information on LaRC mission types, refer to Appendix D.]

Trace: [NPR 7123.1C Sections, 6.2.1, 6.2.2, 6.2.3] Allocation: [LPR 7120.5, LPR 7120.7]

Verification Method: [Inspection]

Req. 002: Each Type E with LCC \leq \$30M and Type F Program/Project SET shall provide to the LaRC SE Approval Authority the documentation of the material typically found in a SEMP (see Appendix J of NASA/SP-2016-6105, Rev 2, NASA Systems Engineering Handbook) in the manner and form agreed to with the ETA.

Rationale: [Smaller projects do not have the resources to develop a full SEMP, so the LaRC SE Approval Authority decides what needs to be documented and the form that documentation will take. The SET proposes for approval tailored content of Appendix J of NASA/SP-2016-6105, Rev 2, NASA Systems Engineering Handbook as appropriate for the program or project. For example, the material may be documented in the project plan, as an appendix to the project plan, or in some other appropriate form as determined by the LaRC SE Approval Authority.]

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Trace: [NPR 7123.1C Sections 6.2.1, 6.2.2, 6.2.3]

Allocation: [LPR 7120.5, LPR 7120.7]

Verification Method: [Inspection]

- 2.2.2 The SEMP and the project plan are coordinated to ensure compatibility with the allocated resources/enabling products (cost, schedule, personnel, and facilities), milestones and deliverables. The SEMP is used to identify and evaluate the required technical teams' performances. The SEMP is also used in the technical risk assessment and deriving the progress measurement criteria.
- 2.2.3 For projects with significant portions of the engineering work contracted out, the LaRC SEMP scopes and plans the NASA portion of the project implementation of the SE common technical processes before, during, and at the completion of the contracted effort. This includes planning the technical team's involvement in solicitation (such as a Request for Proposal) preparation, in source selection activities, acceptance of deliverables, and storage and disposal of residual hardware.

Depending upon the scope and content of the contracted effort, a contractor may be required to develop and maintain a SEMP or other appropriate documentation for their contracted effort.

2.2.4 SEMP Maintenance

Req. 003: Each Program/Project SET shall update the SEMP or alternate documentation as changes to the SE implementation evolve throughout the project life cycle (e.g., at major life cycle reviews).

Rationale: [The SEMP (or alternate documentation) is not as useful if it is outdated. As changes to the SEMP occur, they are typically updated and approved as part of the project review processes.]

Trace: [NPR 7123.1 section 6.2.2]

Allocation: []

Verification Method: [Inspection]

Req. 004: The SE Approval Authority shall review and approve or disapprove the SEMP alternate documentation when updated as part of the project review processes.

Rationale: [The SEMP (or alternate documentation) is not as useful if it is outdated. Approval at this frequency is required by NPR 7123.1.]

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Trace: [NPR 7123.1 section 6.2.2]

Allocation: []

Verification Method: [Inspection]

2.3 SE Common Technical Processes

2.3.1 The Center Director is responsible for developing the Center's ETA policies and practices consistent with Agency policies and standards. The Center Director is the ETA responsible for Center engineering design processes, specifications, rules, best practices, and other activities necessary to fulfill mission performance requirements for programs, projects, and/or major systems implemented by the Center. The Center Director delegated the ETA implementation responsibilities to the Center Chief Engineer. Therefore, the Center Chief Engineer supports processing changes to, and waivers or deviations from, requirements that are the responsibility of the Center Director. This includes all applicable Agency and Center engineering directives, requirements, procedures, and standards. This responsibility also includes ensuring the approval of the implementation of the 17 common technical processes by any projects led by LaRC, or for which LaRC holds ETA.

It is the responsibility of the Project Manager to define and implement an instantiation, approved by the LaRC SE Approval Authority, of each of the 17 Common Technical Processes and describe each one in the project SEMP (or alternate project documentation). An outline of a typical SEMP can be found in Appendix J of NASA/SP-2016-6105, Rev 2, NASA Systems Engineering Handbook.

Trace: [NPR 7123.1C Sections 6.2.3, 3.2.2.1, 3.2.3.1, 3.2.4.1, 3.2.5.1, 3.2.6.1, 3.2.7.1, 3.2.8.1, 3.2.9.1, 3.2.10.1, 3.2.11.1, 3.2.12.1, 3.2.13.1, 3.2.14.1, 3.2.15.1, 3.2.16.1, 3.2.17.1, 3.2.18.1]

Allocation: [LPR 7120.5, CP-5526, LPR 5000.2, LPR 5300.1, CP-4756, LAPD 1440.7, LPR 8040.1, CP-1725, CP-2310, LPR 7120.7, LPR 7130, LAPD 7000.2, CP-5621]

Verification Method: [Inspection]

2.4 **Programs/Projects SE Requirements**

2.4.1 SE requirements compliance for programs and projects is documented by appending a tailored Compliance Matrix NPR 7123.1C (see Appendix H) to the Systems Engineering Management Plan (SEMP). LaRC Program/Projects should use the LaRC NPR Tailoring Application (NTA) to tailor and complete the compliance matrix. The tailoring application can be found through visiting

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Langley's OnePlace Portal or at: <u>https://oneplace.larc.nasa.gov/nta</u>

Req. 005: Each Type A-D and Type E with LCC > \$30M Program/Project SET shall complete the NPR Compliance Matrix (NPR 7123.1C Appendix H). It is recommended to use the LaRC NPR Tailoring Application.

Rationale: [The individuality of each Program/Project is appreciated and some practices that work for some Programs/Projects do not work well for others, hence the intent of this requirement is to provide the Program/Project sufficient flexibility. For instance, the SET may conclude that the overhead associated with particular practices, or perhaps even entire processes exceed the benefit derived from particular practices, or they may conclude that alternative practices are better suited to the Program/Project. The LaRC SE Approval Authority will determine if a compliance matrix is required as part of the SE documentation for LaRC Mission Type E Programs/Projects with LCC \leq \$30M and Type F Program/Projects.]

Trace: [NPR 7123.1 Section 2.1.5.2.] Allocation: [LPR 7120.5, CP-5526, LPR 5000.2, LPR 5300.1, CP-4756, LAPD 1440.7, LPR 8040.1, CP-1725, CP-2310, LPR 7120.7, LPR 7130, LAPD 7000.2, CP-5621]

Verification Method: [Inspection]

2.4.2 Approval of the SEMP or equivalent documentation as appropriate by the LaRC ETA constitutes approval of the SE requirements tailoring.

3. RECORDS

The following records are required by this LPR:

Record	Custodian
Approved SEMP or other equivalent documentation	PM or designee
Approved waiver requests	PM or designee

Additional records may be required, depending upon the detailed contents of the SEMP (or equivalent documentation).

4. TAILORING AND WAIVERS

4.1 Waivers to requirements specific to this LPR can be granted by the LaRC Center Director or his/her designee.

In cases where the identity of the Project Chief Engineer or Project Lead Systems Engineer and/or the Project sponsor are unclear, the LaRC Chief Engineer or his/her designee may assign individuals to act in those roles or

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may waive the requirement for concurrence noted in Req. 006 below.

Req. 006: The PM of the Program/Project shall seek approval for waiver requests (with concurrence by the relevant Project Chief Engineer or the Project Lead Systems Engineer and the Program/Project sponsor (the Principal Investigator or other appropriate person)) to Langley Management System (LMS) requirements in accordance with LMS-CP-7151, "Obtaining Waivers for Langley Management System (LMS) Requirements".

Rationale: [The request is in writing to ensure a document trail. The signature of the PM ensures his/her awareness and support of the waiver request. The concurrence of the Project Chief Engineer or the Project Lead Systems Engineer ensures that the engineering aspects have been reviewed. The concurrence of the sponsor ensures that the sponsor is aware of the request – i.e., there is an informed customer. The requirement to follow LMS-CP-7151 is specified in Section 9.3 of LPR 7120.4]

Trace: []

Allocation: []

Verification Method: [Inspection]

Req. 007: The PM of the Program/Project shall maintain all waiver documentation.

Rationale: [The Program/Project is the responsible party for maintaining project documentation.]

Trace: []

Allocation: []

Verification Method: [Inspection]

4.2 Any tailoring or waivers to requirements of this LPR involving other LMS documents will be approved in accordance with the tailoring or waiver processes applicable to those LMS documents.

APPENDIX A. DEFINITIONS

A.1 Customer – The organization or individual that has requested a product and will receive the product to be delivered. The customer may be an end user of the product, the acquiring agent for the end user, or the requestor of the work products from a technical effort. Each product within the system hierarchy has a customer.

A.2 Engineering Technical Authority (ETA) – The ETA establishes and is responsible for the engineering design processes, specifications, rules, best practices, and other activities necessary to fulfill programmatic mission performance requirements. Centers delegate ETA to the level appropriate for the scope and size of the program/project, which may be Center engineering leadership or individuals. When LaRC ETA is used in this document in reference to approval of SE documentation, it is a specific delegation of authority and is not intended to supersede other formal ETA roles described in LPR 7120.4.

A.3 SE Approval Authority - LaRC has tailored the delegation of the responsibilities of the ETA for approving a project's systems engineering (SE) implementation by defining a tiered approach that defines an SE implementation approval authority that is dependent on the LaRC mission type, as described in LPR 7120.5, that is assigned to the project. This function is termed in this LPR as "SE Approval Authority." Approval authority of a project's SE implementation defined in this document is a delegated function of ETA from the LaRC Center Director to parties that are independent of the programmatic authority chain.

A.4 SE Team (SET) – The SET is comprised of the individuals that prepare the SE implementation plan and execute the approved plan throughout the project's life cycle. For small projects with highly tailored SE requirements, the SET may be a SE cognizant engineer or researcher with SE responsibilities as well as other project responsibilities.

A.5 Stakeholder – A group or individual who is affected by or in some way accountable for the outcome of an undertaking. Stakeholders include all who are involved in the Program/Project – end-users, designers, manufacturing, test, and quality personnel, including those who may not be directly involved with doing the processing work.

A.6 Technical Requirements – Statements defining necessary performance characteristics of a product. Technical requirements are stated in a verifiable manner such that pass/fail or quantitative assessment criteria are specified.

A.7 Validation (of a product): The process of showing proof that the product accomplishes the intended purpose based on stakeholder expectations and the Concept of Operations. May be determined by a combination of test, analysis, demonstration, and inspection. (Answers the question, "Am I building the right product?")

A.8 Validation (of requirements): The continuous process of ensuring that requirements are well-formed (clear and unambiguous), complete (agrees with customer and stakeholder needs and expectations), consistent (conflict free), and individually verifiable and traceable to a higher-level requirement or goal. (Answers

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the question, "Will I build the right product?")

A.9 Verification (of a product): Proof of compliance with requirements/specifications. Verification may be determined by test, analysis, demonstration, inspection, or a combination thereof. (Answers the question, "Did I build the product right?")

APPENDIX B. ACRONYMS

CMC	Center Management Council
СР	Center Procedure
ETA	Engineering Technical Authority
LAPD	Langley Policy Directive
LaRC	Langley Research Center
LCC	Life-Cycle Cost
LMS	Langley Management System
LPR	Langley Procedural Requirements
NASA	National Aeronautics and Space Administration
NPR	NASA Procedural Requirements
PM	Program, Project Manager
SE	Systems Engineering
SEMP	Systems Engineering Management Plan
SET	Systems Engineering Team

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APPENDIX C. REQUIREMENTS LIST FOR THIS LPR

Requirement Number	Prior Paragraph Number	Description (these are abbreviated; the full text of the LPR paragraph applies)			
001	2.2.1	Each Type A-D Program/Project regardless of LCC and each Type E Program/Project with LCC > \$30M (refer to Appendix D) SET shall provide to the LaRC SE Approval Authority a SEMP as described in Appendix J of NASA/SP-2016-6105, Rev 2 "NASA Systems Engineering Handbook".			
002	2.2.1	Each Type E with LCC ≤ \$30M and Type F Program/Project SET shall provide to the LaRC SE Approval Authority the documentation of the material typically found in a SEMP (see Appendix J of NASA/SP-2016-6105, Rev 2, NASA Systems Engineering Handbook) in the manner and form agreed to with the ETA.			
003	2.2.4	Each Program/Project SET shall update the SEMP or alternate documentation as changes to the SE implementation plan evolve throughout the project life cycle (e.g., at major life cycle reviews).			
004	2.2.4	The LaRC SE Approval Authority shall review and approve or disapprove the SEMP alternate documentation when updated as part of the project review processes.			
005	2.4.1	Each Type A-D and Type E with LCC > \$30M Program/Project SET shall complete the NPR Compliance Matrix (NPR 7123.1C Appendix H). It is recommended to use the LaRC NPR Tailoring Application.			
006	4.1	The PM of the Program/Project shall seek approval for waiver requests (with concurrence by the relevant Project Chief Engineer or the Project Lead Systems Engineer and the Program/Project sponsor (the Principal Investigator or other appropriate person)) to Langley Management System (LMS) requirements in accordance with LMS-CP-7151, "Obtaining Waivers for Langley Management System (LMS) Requirements".			
007	4.2	The PM of the Program/Project shall maintain all waiver documentation.			

APPENDIX D. LANGLEY MISSION TYPE

D.1 A Langley Mission Type is a center-defined project designator applied to each project. This designation provides direction for projects on the appropriate application and tailoring of the requirements contained within this document. Langley Mission Type designations include A-F. The Langley Mission Type is based on the individual project's characteristics such as priority, acceptable risk, national significance, complexity, mission lifetime, cost guidance, launch constraints, and alternate opportunities.

The requirements within this document are applicable to projects assigned a Langley Mission Type A-F designation. Except where required by the SE Approval Authority or Sponsoring Organization Official, the requirements in this document may inform, but do not apply to projects that are not assigned a Langley Mission Type A-F. These projects would be assigned a Type O per LPR 7120.5. The requirements for Type O projects are defined in LPR 7120.5.

The Langley Mission Type is proposed and agreed to during project initiation and is formally approved in the project's Project Initiation Memorandum as described in LPR 7120.5. The Langley Mission Type may change if there are significant changes in any of its original key characteristics during its life cycle.

The project's Langley Mission Type is a distinct designation that is independent of a project's Risk Classification, as defined in NPR 8705.4, Risk Classification for NASA Payloads, and a project's Category, as defined in NPR 7120.5. The Langley Mission Type and Risk Classification are based on similar criteria (factors), however they are not intended to be confused with each other. Risk classifications are assigned to projects by their HQ stakeholders, although the Langley Mission Type may provide some insight into what that classification might be. Langley Mission Types were developed so that projects could go through the process of self-assessment and decide which Type they align to, and use the guidelines associated with that Type as a starting point for their individual tailoring and governance.

For additional clarification, the table below outlines the key differences between the Langley Mission Type, Risk Classification, and Category to differentiate the Langley Mission Types from other classifications and categorizations defined in agency policy documents.

	Langley Mission Type	Risk Classification	Category
Prescribing document and governance	Prescribed by this document; required for all projects governed by this document.	Prescribed by NPR 8705.4; required for projects governed by NPR 7120.5.	Prescribed by NPR 7120.5; required for projects governed by NPR 7120.5.
Ratings	Types A-F	Classifications A-D	Categories 1-3
Authority	Established by Langley Sponsoring Organization with input from internal Center stakeholders; approved in the Project Initiation Memorandum.	Established by the Mission Directorate with input from the Project, Governing Program Management Council and other customers.	Approved by the NASA Associate Administrator with recommendation from the Mission Directorate Associate Administrator.
Designation level	Project level	Payload or sub payload level	Project level
Purpose	Used to apply the appropriate level of management rigor and control, as well as Center management oversight and organizational insight.	Used to apply the appropriate design and management controls, SE processes, mission assurance requirements, and risk management processes.	Used to apply management requirements and Agency attention and oversight, as well as establishing the oversight council and approval requirements.

Table . Comparison between Langley Mission Type, Risk Classification, and Category

Langley utilizes the Classifier Tool, which is available in the online NPR Tailoring Application (NTA) (<u>https://oneplace.larc.nasa.gov/nta</u>), to assist projects and project stakeholders in classifying the project's Langley Mission Type. Projects not assigned a Langley Mission Type A-F may be assigned a mission Type O per LPR 7120.5. The requirements for Type O projects are defined in LPR 7120.5.

APPENDIX E. NPR 7123.1C TABLE H COMPLIANCE MATRIX FOR LARC

The following matrix provides ETA-approved tailoring and Compliance Rationale for requirements SE-06 through SE-23 of NPR 7123.1. It is intended that Project teams use the verbiage provided or propose new tailoring to be approved as appropriate. Project teams can complete the NPR 7123.1 Compliance Matrix, (SE-01 – SE-64) through the NPR Tailoring Application (NTA), which can be found through visiting Langley's OnePlace Portal or at: https://oneplace.larc.nasa.gov/nta. Project tailoring of the NPR 7123.1 requirements must be approved by the LaRC SE Approval Authority as defined in Table 1-1 of this document.

Req ID	SE NPR Paragraph	Requirement Statement	Rationale	Comply?	Justification
SE-01 to 05		Deleted	See rationale in the Deleted Requirements NPR 7123.1 Table J-1.	Fully Comply (FC)	Deleted
SE-06	6.1.8	The ETA shall approve the SEMP, waiver or deviation authorizations, and other key technical documents to ensure independent assessment of technical content.	This requirement ensures that the ETA has reviewed and approved of key SE documents.	FC	Approval authority is the LaRC SE Approval Authority. LaRC SE Approval Authority is defined in LPR 7123.1C, Table 1-1, which defines SEMP and other SE documentation approval.

Req ID	SE NPR Paragraph	Requirement Statement	Rationale	Comply?	Justification
SE- 07	3.2.2.1	Program/Project Managers shall identify and implement an ETA-approved Stakeholder Expectations Definition process to include activities, requirements, guidelines, and documentation, as tailored and customized for the definition of stakeholder expectations for the applicable product layer.	This requirement ensures that the program/project and the ETA identifies how they will gather and address stakeholder expectations. This ensures that the program/project will gain a thorough understanding of what the customer and other stakeholders expect.	FC	 Projects document SE plans in the SEMP or comparable documentation. Approval authority is the LaRC SE Approval Authority. LaRC SE Approval Authority is defined in LPR 7123.1C, Table 1-1, which defines SEMP and other SE documentation approval. Oversight is through pre-CMCs and EPTR as defined in LPR 7130, Engineering Project and Task Review Procedural Requirements. Additional Center processes supporting this requirement include LPR 7120.5.
SE- 08	3.2.3.1	Program/Project Managers shall identify and implement an ETA-approved Technical Requirements Definition process to include activities, requirements, guidelines, and documentation, as tailored and customized for the definition of technical requirements from the set of agreed upon stakeholder expectations for the applicable product layer.	This requirement ensures that the program/project and the ETA identifies how they will select and gain agreement on the technical requirements.	FC	 Projects document SE plans in the SEMP or comparable documentation. Approval authority is the LaRC SE Approval Authority. LaRC SE Approval Authority is defined in LPR 7123.1C, Table 1-1, which defines SEMP and other SE documentation approval. Oversight is through pre-CMCs and EPTR as defined in LPR 7130, Engineering Project and Task Review Procedural Requirements. Additional Center processes supporting this requirement

Req ID	SE NPR Paragraph	Requirement Statement	Rationale	Comply?	Justification
					include LPR 7120.5 and LPR 7150.2.
SE- 09	3.2.4.1	Program/Project Managers shall identify and implement an ETA-approved Logical Decomposition process to include activities, requirements, guidelines, and documentation, as tailored and customized for logical decomposition of the validated technical requirements of the applicable product layer.	This requirement ensures that the program/project and the ETA identifies how they will take the technical requirements for the program/project and glean from them what is needed to accomplish them (e.g., functional block diagrams, timing, architectures). This places the requirements into context and ensures they are understood well enough to begin the design process.	FC	 Projects document SE plans in the SEMP or comparable documentation. Approval authority is the LaRC SE Approval Authority. LaRC SE Approval Authority is defined in LPR 7123.1C, Table 1-1, which defines SEMP and other SE documentation approval. Oversight is through pre-CMCs and EPTR as defined in LPR 7130, Engineering Project and Task Review Procedural Requirements. Additional Center processes supporting this requirement include LPR 7120.5.

Req ID	SE NPR Paragraph	Requirement Statement	Rationale	Comply?	Justification
SE- 10	3.2.5.1	Program/Project Managers shall identify and implement an ETA-approved Design Solution Definition process to include activities, requirements, guidelines, and documentation, as tailored and customized for designing product solution definitions within the applicable product layer that satisfy the derived technical requirements.	This requirement ensures that the program/project and the ETA identifies how they will take the information from the stakeholder expectations, requirements, and logical decomposition and perform the design function. Since all designs are unique, this will describe the general steps that are taken. The specifics for each of the program/projects will be documented in the SEMP or other equivalent program/project documentation.	FC	 Projects document SE plans in the SEMP or comparable documentation. Approval authority is the LaRC SE Approval Authority. LaRC SE Approval Authority is defined in LPR 7123.1C, Table 1-1, which defines SEMP and other SE documentation approval. Oversight is through pre-CMCs and EPTR as defined in LPR 7130, Engineering Project and Task Review Procedural Requirements. Additional Center processes supporting this requirement include LPR 7120.5.
SE- 11	3.2.6.1	Program/Project Managers shall identify and implement an ETA-approved Product Implementation process to include activities, requirements, guidelines, and documentation, as tailored and customized for implementation of a design solution definition by making, buying, or reusing an end product of the applicable product layer.	This requirement ensures that the program/project and the ETA identifies how they will execute the designs, whether through buying items off the shelf or contracting to have them built, building/coding them within the Center, or reusing products already developed by another program/project. The specifics for how each program/project will make this determination for the various components/assemblies	FC	 Projects document SE plans in the SEMP or comparable documentation. Approval authority is the LaRC SE Approval Authority. LaRC SE Approval Authority is defined in LPR 7123.1C, Table 1-1, which defines SEMP and other SE documentation approval. Oversight is through pre-CMCs and EPTR as defined in LPR 7130, Engineering Project and Task Review Procedural Requirements.

Req ID	SE NPR Paragraph	Requirement Statement	Rationale	Comply?	Justification
			within the product hierarchy are documented in the SEMP or other equivalent program/project documentation.		Additional Center processes supporting this requirement include LPR 7120.5.
SE- 12	3.2.7.1	Program/Project Managers shall identify and implement an ETA-approved Product Integration process to include activities, requirements, guidelines, and documentation, as tailored and customized for the integration of lower level products into an end product of the applicable product layer in accordance with its design solution definition.	This requirement ensures that the program/project and the ETA identifies how they will approach the integration of products within successive levels of the product hierarchy. This ensures that planning is performed that will enable a smooth integration of products into higher level assemblies.	FC	 Projects document SE plans in the SEMP or comparable documentation. Approval authority is the LaRC SE Approval Authority. LaRC SE Approval Authority is defined in LPR 7123.1C, Table 1-1, which defines SEMP and other SE documentation approval. Oversight is through pre-CMCs and EPTR as defined in LPR 7130, Engineering Project and Task Review Procedural Requirements. Additional Center processes supporting this requirement include LPR 7120.5.

Req ID	SE NPR Paragraph	Requirement Statement	Rationale	Comply?	Justification
SE- 13	3.2.8.1	Program/Project Managers shall identify and implement an ETA-approved Product Verification process to include activities, requirements/specifications, guidelines, and documentation, as tailored and customized for verification of end products generated by the product implementation process or product integration process against their design solution definitions.	This requirement ensures that the program/project and the ETA identifies how they will verify that the end products will comply with each of the technical requirements.	FC	 Projects document SE plans in the SEMP or comparable documentation. Approval authority is the LaRC SE Approval Authority. LaRC SE Approval Authority is defined in LPR 7123.1C, Table 1-1, which defines SEMP and other SE documentation approval. Oversight is through pre-CMCs and EPTR as defined in LPR 7130, Engineering Project and Task Review Procedural Requirements. Additional Center processes supporting this requirement include LPR 7120.5.
SE- 14	3.2.9.1	Program/Project Managers shall identify and implement an ETA-approved Product Validation process to include activities, requirements, guidelines, and documentation, as tailored and customized for validation of end products generated by the product implementation process or product integration process against their stakeholder expectations.	This requirement ensures that the program/project and the ETA identifies how they will show that the end products will meet the stakeholder expectations in the intended environment. This is in addition to verifying they meet the stated requirements and ensures the stakeholder is getting what was expected.	FC	 Projects document SE plans in the SEMP or comparable documentation. Approval authority is the LaRC SE Approval Authority. LaRC SE Approval Authority is defined in LPR 7123.1C, Table 1-1, which defines SEMP and other SE documentation approval. Oversight is through pre-CMCs and EPTR as defined in LPR 7130, Engineering Project and Task Review Procedural Requirements.

Req ID	SE NPR Paragraph	Requirement Statement	Rationale	Comply?	Justification
					Additional Center processes supporting this requirement include LPR 7120.5.
SE- 15	3.2.10.1	Program/Project Managers shall identify and implement an ETA-approved Product Transition process to include activities, requirements, guidelines, and documentation, as tailored and customized for transitioning end products to the next higher level product layer customer or user.	This requirement ensures that the program/project and the ETA identifies how they will handle the end products as they move from one location to another. This includes shipping, handling, transportation criteria, physical security, cybersecurity, and receiving facility storage needs. It ensures that receiving facilities are ready to accept the product and that no damage occurs to the product during handling and transportation.	FC	 Projects document SE plans in the SEMP or comparable documentation. Approval authority is the LaRC SE Approval Authority. LaRC SE Approval Authority is defined in LPR 7123.1C, Table 1-1, which defines SEMP and other SE documentation approval. Oversight is through pre-CMCs and EPTR as defined in LPR 7130, Engineering Project and Task Review Procedural Requirements. Additional Center processes supporting this requirement include LPR 7120.5.

Req ID	SE NPR Paragraph	Requirement Statement	Rationale	Comply?	Justification
SE- 16	3.2.11.1	Program/Project Managers shall identify and implement an ETA-approved Technical Planning process to include activities, requirements, guidelines, and documentation, as tailored and customized for planning the technical effort.	This requirement ensures that the program/project and the ETA identifies how they will perform and document all the technical planning for the program/project. This includes all plans developed for the technical effort —Systems Engineering Management Plans, risk plans, integration plans, and V&V plans. This ensures that the program/project teams are thinking ahead for the work to be performed and capturing that information so it can be communicated to the rest of the team, customers, and other stakeholders.	FC	 Projects document SE plans in the SEMP or comparable documentation. Approval authority is the LaRC SE Approval Authority. LaRC SE Approval Authority is defined in LPR 7123.1C, Table 1-1, which defines SEMP and other SE documentation approval. Oversight is through pre-CMCs and EPTR as defined in LPR 7130, Engineering Project and Task Review Procedural Requirements. Additional Center processes supporting this requirement include LPR 7120.5.
SE- 17	3.2.12.1	Program/Project Managers shall identify and implement an ETA-approved Requirements Management process to include activities, requirements, guidelines, and documentation, as tailored and customized for management of requirements throughout the system life- cycle.	This requirement ensures that the program/project and the ETA identifies how they will handle tracking and changes to the baselined set of requirements. It defines who has authority to submit and approve changes and how requirements are tracked as they flow down to other elements in the product breakdown structure. This ensures that changes to	FC	Projects document SE plans in the SEMP or comparable documentation. Approval authority is the LaRC SE Approval Authority. LaRC SE Approval Authority is defined in LPR 7123.1C, Table 1-1, which defines SEMP and other SE documentation approval. Oversight is through pre- CMCs and EPTR as defined in LPR 7130, Engineering

Req ID	SE NPR Paragraph	Requirement Statement	Rationale	Comply?	Justification
			requirements are evaluated and that their impacts are understood and communicated to the rest of the team.		Project and Task Review Procedural Requirements. Additional Center processes supporting this requirement include LPR 7120.5.
SE- 18	3.2.13.1	Program/Project Managers shall identify and implement an ETA-approved Interface Management process to include activities, requirements, guidelines, and documentation, as tailored and customized for management of the interfaces defined and generated during the application of the system design processes.	This requirement ensures that the program/project and the ETA identifies how they will manage the internal and external interfaces of their end product. This will ensure compatibility when the various parts of the system are brought together for assembly/integration.	FC	 Projects document SE plans in the SEMP or comparable documentation. Approval authority is the LaRC SE Approval Authority. LaRC SE Approval Authority is defined in LPR 7123.1C, Table 1-1, which defines SEMP and other SE documentation approval. Oversight is through pre-CMCs and EPTR as defined in LPR 7130, Engineering Project and Task Review Procedural Requirements. Additional Center processes supporting this requirement include LPR 7120.5.

Req ID	SE NPR Paragraph	Requirement Statement	Rationale	Comply?	Justification
SE- 19	3.2.14.1	Program/Project Managers shall identify and implement a Technical Risk Management process to include activities, requirements, guidelines, and documentation, as tailored and customized for management of the risk identified during the technical effort.	This requirement ensures that the program/project and the ETA identifies how they will handle the technical portions of the program/project risks and report them for inclusion with the cost and schedule risk portions. It ensures that the technical aspects of risks to the program/projects successful execution are captured and reported to program/project management who will be developing the overall risk posture.	FC	 Projects document SE plans in the SEMP or comparable documentation. Approval authority is the LaRC SE Approval Authority. LaRC SE Approval Authority is defined in LPR 7123.1C, Table 1-1, which defines SEMP and other SE documentation approval. Oversight is through pre-CMCs and EPTR as defined in LPR 7130, Engineering Project and Task Review Procedural Requirements. Additional Center processes supporting this requirement include LPR 7120.5.

SE- 20	3.2.15.1	Program/Project Managers shall identify and implement an ETA- approved Configuration Management process to include activities, requirements, guidelines, and documentation, as tailored and customized for configuration management.	This requirement ensures that the program/project and the ETA identifies how they will perform configuration management of the end products, enabling products and other work products key to the program/project. The technical products to be controlled are identified and tracked to ensure that the team knows what the configuration of their system is at all phases of the life-cycle.	FC	Projects document SE plans in the SEMP or comparable documentation. Approval authority is the LaRC SE Approval Authority. LaRC SE Approval Authority is defined in LPR 7123.1C, Table 1-1, which defines SEMP and other SE documentation approval. Oversight is through pre-CMCs and EPTR as defined in LPR 7130, Engineering Project and Task Review Procedural Requirements. Additional Center processes supporting this requirement include LPR 7120.5.
SE- 21	3.2.16.1	Program/Project Managers shall identify and implement an ETA- approved Technical Data Management process to include activities, requirements, guidelines, and documentation, as tailored and customized for management of the technical data generated and used in the technical effort.	This requirement ensures that the program/project and the ETA identifies how they will handle all the technical data that is generated by the program/project. This will include all data needed to manage, operate, and support the system products over the life- cycle. It ensures that the data is available and secure when needed.	FC	Projects document SE plans in the SEMP or comparable documentation. Approval authority is the LaRC SE Approval Authority. LaRC SE Approval Authority is defined in LPR 7123.1C, Table 1-1, which defines SEMP and other SE

					documentation approval. Oversight is through pre-CMCs and EPTR as defined in LPR 7130, Engineering Project and Task Review Procedural Requirements. Additional Center processes supporting this requirement include LPR 7120.5.
SE- 22	3.2.17.1	Program/Project Managers shall identify and implement an ETA- approved Technical Assessment process to include activities, requirements, guidelines, and documentation, as tailored and customized for making assessments of the progress of planned technical effort and progress toward requirements satisfaction.	This requirement ensures that the program/project and the ETA identifies how they will assess the progress of the program/project's technical efforts, including life- cycle reviews. It ensures that the program/project team, customers, and other key stakeholders know how the effort is progressing and if additional actions are needed to resolve issues prior to becoming too costly.	FC	Projects document SE plans in the SEMP or comparable documentation. Approval authority is the LaRC SE Approval Authority. LaRC SE Approval Authority is defined in LPR 7123.1C, Table 1-1, which defines SEMP and other SE documentation approval. Oversight is through pre-CMCs and EPTR as defined in LPR 7130, Engineering Project and Task Review Procedural Requirements. Additional Center processes supporting this requirement include LPR 7120.5.

SE- 23	3.2.18.1	Program/Project Managers shall identify and implement an ETA- approved Decision Analysis process to include activities, requirements, guidelines, and documentation, as tailored and customized for making technical decisions.	This requirement ensures that the program/project and the ETA identify how they will make and document key technical decisions. It helps to ensure that all team members know who can make decisions, what their authority levels are, and where to go to gain an understanding of what key decisions have been made.	FC	Projects document SE plans in the SEMP or comparable documentation. Approval authority is the LaRC SE Approval Authority. LaRC SE Approval Authority is defined in LPR 7123.1C, Table 1-1, which defines SEMP and other SE documentation approval.
					Oversight is through pre-CMCs and EPTR as defined in LPR 7130, Engineering Project and Task Review Procedural Requirements. Additional Center processes supporting this requirement include LPR 7120.5.

APPENDIX F. REFERENCES

The following documents may be useful to individuals in addressing the requirements of this LPR.

- a. NRRS 1441.1, NASA Record Retention Schedules
- b. NASA/SP-2016-6105, NASA Systems Engineering Handbook
- c. NPR 8000.4A, Agency Risk Management Procedural Requirements
- d. CMMI[®] Guidelines for Process Integration and Product Improvement Addison- Wesley

APPENDIX G. LARC-SPECIFIC ENGINEERING BEST PRACTICES

LaRC Chief Engineer Board approved 9-12-2013

Preface to Appendix G

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G.1. Introduction

The LaRC-Specific Engineering Best Practices contained in this appendix are those considered by the LaRC Chief Engineer and the members of the Chief Engineers Board to be most appropriate and useful to the development of space and ground support systems. However, these Best Practices should also be considered, where applicable, for aircraft-borne systems and their associated ground support systems.

G.2. Applicability

Although these Engineering Best Practices are not requirements, they are to be considered in the development of space systems, including instruments, research instrumentation flown on aircraft and balloons, and the associated ground support equipment, inasmuch as the individual practices are applicable to the situation at hand. Further, it is the intent that these practices become engrained in the practitioners such that they will automatically refer to and use them, and in the reviewers such that they will ask questions about them at life-cycle reviews.

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It is also noted that in case of a disagreement between any of the best practices shown in this appendix and any NPR or LPR, the NPR or LPR governs.

G.3. Authority and Maintenance

The LaRC Chief Engineer (LaRC CE) has the responsibility and authority for developing and maintaining this Appendix (G) containing LaRC-Specific Engineering Best Practices. This responsibility and authority is carried out with the advice of the LaRC Chief Engineer's Board (CEB) and with the support of the LaRC Appendix G Section Owners in the following manner:

The basic tenets of maintaining the LaRC-Specific Engineering Best Practices Appendix are shown below.

- Owners are responsible for their section of the Best Practices Appendix. The ownership of each section is assigned to an entity within LaRC. The organizational ownership of each section is shown in Table G1.
- Owners are ultimately responsible for proposing any changes to their section of the Appendix in the form of change requests.
- Recommendations for changes to Best Practices can come from different sources:
 - Individuals.
 - NASA-Wide Lessons Learned.
 - LaRC Lessons Learned Committee When the committee deems a lesson is appropriate for inclusion in the LaRC Lessons Learned Repository.
- All recommendations for changes are routed through the LaRC Chief Engineer.
- The Chief Engineer, with input from Chief Engineers Board, is responsible for governing the change request process and for ultimately dispensing with the change requests.

The process for maintaining the Appendix and the associated practices is shown in Figure G-1. Discussion of the process follows:

• Recommendations for a best practice can come from different sources. These include individuals, NASA-wide Lessons Learned that are transmitted to the LaRC CE, or LaRC Lessons Learned that are judged by the LaRC Lessons

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Learned Committee to be appropriate for consideration in the LaRC Best Practices.

- The LaRC CE will distribute any of these recommendations considered appropriate to the CEB for review.
- The board will consider the recommendations and the CE will decide, with CEB input, if LaRC should develop a new practice, modify or delete an existing practice, or do nothing.
- If a change is required, the CE will assign the appropriate section owner the task of developing the change request to include the new or modified practice.
- The section owner will develop the change request for the new or modified practice and present it to the board for approval. This change request will provide a practice with the standard information of Practice, Rationale, and Implementation and a proposed paragraph number indicating the location of the proposed practice in the Appendix.
- The board will review the change request and the CE will decide if the request is ready for inclusion in the Appendix, if it needs more work by the section owner, or if it should be deleted. If the change goes into the Appendix, the Appendix manager will be notified to implement the change and inform the LaRC Lessons Learned Committee.



Figure G-1 - Best Practice Change Request Process

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Sections	Responsible Organizational Owner
1.0 – Assembly Integration and Test	D210 Systems Integration and Test Branch Branch Head
2.0 – Command and data Handling	D203 Electronic Systems Branch Branch Head
3.0 – Contamination Control	D210 Systems Integration and Test Branch Branch Head
4.0 – Electronic Systems	D203 Electronic Systems Branch Branch Head
5.0 – Fluids	Standard Practice Engineer for Flight Systems - Pressure Systems Committee (Established by LaPD 1150.2)
6.0 – Guidance navigation and Control	D316 Dynamic Systems and Control Branch Branch Head
7.0 – Mechanical Systems	D202 Mechanical Systems Branch Branch Head
8.0 – Operations and Ground Systems	D209 - Systems Engineering and Engineering Methods Branch (SEEMB) Branch Head
9.0 – Reliability	C202 Mission Assurance Branch Branch Head
10.0 – Software	D207 Flight Software Systems Branch Branch Head
11.0 – Systems	D209 - Systems Engineering and Engineering Methods Branch (SEEMB) Branch Head
12.0 – Project Cybersecurity	B507 – Cybersecurity and Privacy Branch Deputy Chief Information Security Officer

Table G-1 - Appendix G Section Owners

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G.4. Change Management for Best Practices

The following change management process will be used to maintain currency in the Best Practices and maintain traceability from the previous baselines to the present baseline.

- Baselines will be dated and maintained. Previous baselines will be archived.
- Best Practices will be periodically updated. When this occurs, a redline version of the Best Practices will be generated showing the from-to and the reason for the change.
- Upon approval by the LaRC CE of the redline version of the Best Practices, a new, dated, baseline will be generated showing the current Best Practices.
- The resulting detailed Best Practices will be maintained in the Excel Spreadsheet (<u>Langley Form 209</u>). The red-lined version of the Best Practices will be archived in order to maintain a traceable path to the previous baseline.

G.5. Change Management Rules Regarding the Best Practices Database

- A change column will be maintained in the searchable data base showing the date of the change and describing the nature of the change.
- If a practice is deleted, the title of the practice and the practice number will remain to maintain the proper cross-references from previous baselines and within the current practices themselves.
- Once a practice is in the document it will remain in place for the above reasons.
- New practices will be added at the end of the proper section.

G.6. Best Practice Structure

The Best Practices as shown in this appendix are grouped in different technical areas to assist the user in quickly finding those practices of greatest interest. Each practice contains a *Title* and three pieces of additional information. The three pieces of information are the *Best Practice* itself, the *Rationale* or the reason for that practice to exist, and the *Implementation* that describes how the practice can be carried out and what product or action should be completed by the reviews in the project life cycle.

The implementation sections of the Best Practices state that certain products should be available by various reviews, such as PDR or CDR. It is intended that these reviews refer to the subsystem PDR or CDR, or the system level reviews if the subsystem level reviews are not held.

Section 0 contains an abbreviated listing of the Best Practices (Headings and Titles) for quick reference and location. To obtain the full context of the Best Practices and related additional information, see <u>LF 209</u> per Section 0.

G.7. Use of Acronyms and the Project Life Cycle

In many cases acronyms have been used in the discussion of individual best practices. In those cases, an attempt has been made to define the acronyms within the individual best practice discussion. However, the acronyms for the standard project reviews used in NPR 7120.5 are not defined in the individual best practices discussions, as they are used multiple times. The acronyms for those reviews that have been cited in this Appendix are defined below.

- MCR Mission Concept Review
- SRR System Requirements Review
- MDR Mission Definition Review
- PDR Preliminary Design Review
- CDR Critical Design Review
- IRR Integration Readiness Review
- SIR System Integration Review
- ORR Operational Readiness Review
- FRR Flight Readiness Review

G.8. LaRC-Specific Engineering Best Practices Database

The details of the Best Practices identified in this Appendix are contained in an Excel Spreadsheet that is captured as Langley Form 209 (LF209) that can be found on the Langley Management System (<u>https://lms.larc.nasa.gov/index.cfm</u>).

The details of the Best Practices identified in this Appendix are also being included into an online, searchable database through Langley's Institutional Knowledge Management (IKM) Best Practices application. The user can search on the technical areas of interest and pull out the applicable practices that have been included to date. Access the IKM Best Practices application at the following hyperlink: https://oneplace.larc.nasa.gov/ikmbp. Once the move to the IKM application is completed and all Best Practices are available, that database will be the authoritative source and this document will be updated to reflect this change.