



# NASA Procedural Requirements

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Request Notification of Change

(NASA Only)

## Subject: NASA Systems Engineering Processes and Requirements

Responsible Office: Office of the Chief Engineer

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## Appendix G. Life-cycle and Technical Review Entrance and Success Criteria

This appendix describes the recommended best practices for entrance and success criteria for the life-cycle and technical reviews required in Chapter 5 regardless of whether the review is accomplished in a one-step or two-step process. Terms for maturity levels of technical products defined in the tables of this appendix are addressed in detail in Appendix F. The products indicated in the entrance criteria cover the technical products for each review. Additional programmatic products may also be required by the appropriate governing project/program management NPR.

### G.1 System Requirements Review (SRR) for Program

The SRR for a program is used to ensure that the program's functional and performance requirements are properly formulated and correlated with the Agency and Mission Directorate strategic objectives. Uncoupled, loosely coupled, tightly coupled and AO programs should use the entrance and success criteria in Table G-1. For projects and single-project programs, refer to Table G-4.

**Table G-1 - SRR Entrance and Success Criteria for a Program**

<b>System Requirements Review for a Program</b>	
<b>Entrance Criteria</b>	<b>Success Criteria</b>
<ol style="list-style-type: none"> <li>1. The Program has successfully completed the MCR milestone review (if applicable) and responses have been made to all RFAs and RIDs, or a timely closure plan exists for those remaining open.</li> <li>2. A preliminary Program SRR agenda, success criteria, and instructions to the review board have been agreed to by the technical team, the project manager, and the review chair prior to the Program SRR.</li> <li>3. All planned higher level SRRs and peer reviews have been successfully conducted and RID/RFA/Action Items have been addressed with the concurrence of the originators.</li> <li>4. Programmatic products are ready for review at the maturity levels stated in the governing</li> </ol>	<ol style="list-style-type: none"> <li>1. Program requirements have been defined and support Mission Directorate strategic objectives.</li> <li>2. The program requirements are adequately levied on either the single-program project or the multiple projects of the program.</li> <li>3. Traceability of program requirements to individual projects is documented in accordance with Agency needs, goals, and objectives, as described in the NASA Strategic Plan.</li> <li>4. Definition of interfaces with other programs is complete and approved.</li> <li>5. The program cost and schedule estimates are credible to meet program</li> </ol>

<p>program/project management NPR.</p> <ol style="list-style-type: none"> <li>5. Top program risks with significant technical, health and safety, cost, and schedule impacts have been identified along with corresponding mitigation strategies.</li> <li>6. An approach for verifying compliance with program requirements has been defined.</li> <li>7. Procedures for controlling changes to program requirements have been defined and approved.</li> <li>8. The following primary products are ready for review:             <ol style="list-style-type: none"> <li>a. **Program requirements (including performance, health and safety, and defined interfaces to other programs) are ready to be baselined after review comments are incorporated.</li> <li>b. ** For one-step AO programs, SEMP is ready to be baselined after review comments are incorporated.</li> </ol> </li> <li>9. Other Program SRR technical products have been made available to the cognizant participants prior to the review:             <ol style="list-style-type: none"> <li>a. *Preliminary traceability of program-level requirements on projects to the Agency strategic goals and Mission Directorate requirements and constraints.</li> <li>b. *Initial risk mitigation plans and resources for significant technical risks.</li> <li>c. *Preliminary cost and schedule for Uncoupled, Loosely Coupled, and Tightly Coupled Programs.</li> <li>d. *Preliminary documentation of Basis of Estimate (cost and schedule) for Uncoupled, Loosely Coupled, and Tightly Coupled Programs.</li> <li>e. * Review Plan ready to be baselined after review comments are incorporated.</li> <li>f. *Preliminary Configuration Management Plan.</li> <li>g. *Preliminary SEMP for uncoupled, loosely coupled, tightly coupled, and two-step AO programs.</li> </ol> </li> </ol>	<p>estimates are credible to meet program requirements.</p> <ol style="list-style-type: none"> <li>6. Top risk identification is complete and mitigation strategies appear reasonable.</li> <li>7. Evidence is provided that the program is compliant with NASA and implementing Center requirements, standards, processes, and procedures.</li> <li>8. To-be-determined (TBD) and to-be-resolved (TBR) items are clearly identified with acceptable plans and schedules for their disposition.</li> </ol>
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\* Product is required for programs/projects covered by NPR 7120.5. If there is disagreement between this table and NPR 7120.5, NPR 7120.5 takes precedence.

\*\* Product is required per NPR 7123.1.

G.2 System Definition Review for a Program

The SDR for a Program evaluates the credibility and responsiveness of the proposed program requirements/architecture to the Mission Directorate requirements, the allocation of program requirements to the projects, and the maturity of the program's mission/system definition. Uncoupled, loosely coupled, tightly coupled, and AO programs should use the entrance and success criteria in Table G-2. For project and single-project programs, refer to Table G-5.

**Table G-2 - SDR Entrance and Success Criteria for a Program**

<b>System Definition Review for a Program</b>	
<b>Entrance Criteria</b>	<b>Success Criteria</b>
<ol style="list-style-type: none"> <li>1. The Program has successfully completed the previous planned milestone reviews and responses have been made to all RFAs and RIDs, or a timely closure plan exists for those remaining open.</li> <li>2. An agenda for the Program SDR, success criteria, and instructions to the review board have been agreed to by the technical team, the project manager, and the review chair prior to the review.</li> <li>3. All planned higher level SDRs and peer reviews have been successfully conducted and RID/RFA/Action Items have been addressed with the concurrence of the originators.</li> <li>4. Programmatic products are ready for review at the maturity levels stated in the governing program/project management NPR.</li> <li>5. The following primary products are ready for review:               <ol style="list-style-type: none"> <li>a. **Approved definition of program TPMs.</li> <li>b. **Program architecture definition and a list of specific supporting projects that is ready to be baselined after review comments are incorporated.</li> <li>c. **Allocation of program requirements to the supporting projects that is ready to be baselined after review comments are incorporated.</li> <li>d. **Initial trending information on the mass margins (for projects involving hardware), power margins (for projects that are powered), and closure of review actions (RFA, RID, and/or Action Items).</li> <li>e. **SEMP ready to be baselined for uncoupled, tightly coupled, and loosely coupled programs and for two-step AO programs.</li> </ol> </li> <li>6. Other SDR technical products (as applicable) for hardware, software, and human system elements have been made available to the cognizant participants prior to the review:               <ol style="list-style-type: none"> <li>a. *Updated Program requirements and constraints.</li> <li>b. *Traceability of program-level requirements on projects to the Agency strategic goals and Mission Directorate requirements and constraints that is ready to be baselined after review comments are incorporated.</li> <li>c. Preliminary interface definitions.</li> <li>d. Preliminary implementation plans.</li> <li>e. Preliminary integration plans.</li> <li>f. *Preliminary verification and validation plans.</li> <li>g. *Updated cost and schedule.</li> <li>h. *Updated SEMP for one-step AO programs.</li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>1. Evidence is provided that the program formulation activities are complete and implementation plans are credible to meet mission success.</li> <li>2. The program requirements address critical NASA needs as identified in the Mission Directorate strategic objectives.</li> <li>3. The program cost and schedule estimates are credible to meet program requirements within available resources.</li> <li>4. Program implementation plans are credible to achieve mission success.</li> <li>5. The program risks have been identified and mitigation strategies appear reasonable.</li> <li>6. Allocation of program requirements to projects has been completed and proposed projects are feasible within available resources.</li> <li>7. The maturity of the program's definition and associated plans are sufficient to begin preliminary design.</li> <li>8. The program/project has demonstrated compliance with applicable NASA and implementing Center requirements, standards, processes, and procedures.</li> <li>9. TBD and TBR items are clearly identified with acceptable plans and schedules for their disposition.</li> </ol>

<ul style="list-style-type: none"> <li>i. *Updated risk mitigation plans and resources for significant technical risks.</li> <li>j. *Updated cost and schedule.</li> <li>k. *Updated Documentation of Basis of Estimate (cost and schedule).</li> <li>l. *Preliminary plans for technical work to be accomplished during Implementation.</li> <li>m. *Updated Review Plan.</li> <li>n. * Configuration Management Plan that is ready to be baselined after review comments are incorporated.</li> <li>o. *Initial PDLM Plan.</li> </ul>	
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G.3 Mission Concept Review

The MCR affirms the mission/project need and evaluates the proposed mission's objectives and the ability of the concept to fulfill those objectives.

**Table G-3 - MCR Entrance and Success Criteria**

<b>Mission Concept Review</b>	
<b>Entrance Criteria</b>	<b>Success Criteria</b>
<ol style="list-style-type: none"> <li>1. An agenda for the MCR, success criteria, and instructions to the review board have been agreed to by the technical team, the project manager, and the review chair prior to the review.</li> <li>2. All planned higher level MCRs and peer reviews have been successfully conducted and RID/RFA/Action Items have been addressed with the concurrence of the originators.</li> <li>3. The following primary products are ready for review:                             <ul style="list-style-type: none"> <li>a. **Stakeholders have been identified and stakeholder expectations have been defined and are ready to be baselined after review comments are incorporated.</li> <li>b. **The concept has been developed to a sufficient level of detail to demonstrate a technically feasible solution to the mission/project needs and is ready to be baselined after review comments are incorporated.</li> <li>c. **MOEs and any other mission success criteria have been defined and are ready to be approved.</li> </ul> </li> <li>4. Programmatic products are ready for review at the maturity levels stated in the governing program/project management NPR.</li> <li>5. Other technical products (as applicable) for hardware, software, and human system elements have been made available to the cognizant participants prior to the review:</li> </ol>	<ol style="list-style-type: none"> <li>1. Mission objectives are clearly defined and stated and are unambiguous and internally consistent.</li> <li>2. The selected concept(s) satisfactorily meets the stakeholder expectations.</li> <li>3. The mission is feasible. A concept has been identified that is technically feasible. A rough cost estimate is within an acceptable cost range.</li> <li>4. The concept evaluation criteria to be used in candidate systems evaluation have been identified and prioritized.</li> <li>5. The need for the mission has been clearly identified.</li> <li>6. The cost and schedule estimates are credible and sufficient resources are available for project formulation.</li> <li>7. The program/project has demonstrated compliance with applicable NASA and implementing Center requirements, standards, processes, and procedures.</li> <li>8. TBD and TBR items are clearly identified with acceptable plans and schedule for their disposition.</li> <li>9. Alternative concepts have adequately considered the use of existing assets or products that could satisfy the mission or parts of the mission.</li> </ol>

<ul style="list-style-type: none"> <li>a. Mission/project goals and objectives that are ready to be baselined after review comments are incorporated.</li> <li>b. Alternative concepts that have been analyzed and are ready to be reviewed.</li> <li>c. *Initial risk-informed cost and schedule estimates for implementation.</li> <li>d. Preliminary mission descope options.</li> <li>e. *A preliminary assessment performed by the team of top technical, cost, schedule, and safety risks with developed associated risk management and mitigation strategies and options.</li> <li>f. *Preliminary approach to verification and validation for the selected concept(s).</li> <li>g. *A preliminary SEMP, including technical plans.</li> <li>h. * Technology Development Plan that is ready to be baselined after review comments are incorporated.</li> <li>i. *Initial technology readiness that has been assessed and documented with technology assets, heritage products, and gaps identified.</li> <li>j. Preliminary engineering development assessment and technical plans to achieve what needs to be accomplished in the next phase.</li> <li>k. Conceptual life-cycle support strategies (logistics, manufacturing, and operation).</li> <li>l. Software criteria and products, per NASA-HDBK-2203, NASA Software Engineering Handbook.</li> </ul>	<ul style="list-style-type: none"> <li>10. Technical planning is sufficient to proceed to the next phase.</li> <li>11. Risk and mitigation strategies have been identified and are acceptable based on technical risk assessments.</li> <li>12. Software components meet the exit criteria defined in the NASA-HDBK-2203, NASA Software Engineering Handbook.</li> </ul>
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**G.4 System Requirements Review**

The SRR evaluates whether the functional and performance requirements defined for the system are responsive to the program's requirements and ensures the preliminary project plan and requirements will satisfy the mission. This table is used for projects and single-project programs. For uncoupled, loosely coupled, tightly coupled, and AO programs, refer to Table G-1.

**Table G-4 - SRR Entrance and Success Criteria**

<b>System Requirements Review for Projects and Single-project Programs</b>	
<b>Entrance Criteria</b>	<b>Success Criteria</b>
<ul style="list-style-type: none"> <li>1. The project has successfully completed the previously planned milestone reviews and responses have been made to all RFAs and RIDs, or a timely closure plan exists for those items remaining open.</li> <li>2. A preliminary SRR agenda, success criteria, and instructions to the review board have been</li> </ul>	<ul style="list-style-type: none"> <li>1. The functional and performance requirements defined for the system are responsive to the parent requirements and represent achievable capabilities.</li> <li>2. The maturity of the requirements definition and associated plans is sufficient to begin Phase B.</li> </ul>

- agreed to by the technical team, project manager, and review chair prior to the SRR.
3. All planned higher level SRR and peer reviews have been successfully conducted and RID/RFA/Action Items have been addressed with the concurrence of the originators.
  4. Programmatic products are ready for review at the maturity levels stated in the governing program/project management NPR.
  5. The following primary technical products for hardware and software system elements are available to the cognizant participants prior to the review:
    - a. \*\*Requirements for system being reviewed are ready to be baselined after the review and preliminary allocation to the next lower level system has been performed.
    - b. \*\*For projects and single-project programs, the SEMP is ready to be baselined after review comments are incorporated.
  6. Other SRR work products (as applicable) for hardware, software, and human system elements have been made available to the cognizant participants.
    - a. \*Updated concept definition.
    - b. \* Updated concept of operations.
    - c. Updated parent requirements.
    - d. \* Risk management plan ready to be baselined after review comments are incorporated.
    - e. \*Updated risk assessment and mitigations.
    - f. \* Configuration management plan ready to be baselined after review comments are incorporated.
    - g. Initial document tree or model structure.
    - h. Preliminary verification and validation method identified for each requirement.
    - i. Preliminary system safety analysis.
    - j. Preliminary MOPS and TPM and other key driving requirements.
    - k. Other specialty discipline analyses, as required.
    - l. \*Updated cost and schedule estimates for the project implementation.
    - m. \*Updated documentation of Basis of Estimate (cost and schedule).
    - n. \*Updated Technology Development Plan.
    - o. \*Updated technology readiness that has been assessed and documented with
  3. The project utilizes a sound process for the allocation and control of requirements throughout all levels, and a plan has been defined to complete the requirements definition at lower levels within schedule constraints.
  4. Interfaces with external entities and between major internal elements have been identified.
  5. Preliminary approaches have been determined for how requirements will be verified and validated.
  6. Major risks have been identified and technically assessed, and viable mitigation strategies have been defined.
  7. The program/project has demonstrated compliance with applicable NASA and implementing Center requirements, standards, processes, and procedures.
  8. TBD and TBR items are clearly identified with acceptable plans and schedule for their disposition.
  9. Software components meet the exit criteria defined in NASA-HDBK-2203, NASA Software Engineering Handbook.

<p>technology assets, heritage products, and gaps identified.</p> <p>P. Logistics documentation (e.g., preliminary maintenance plan).</p> <p>Q. *Initial Human Rating Certification Package.</p> <p>r. Human Systems Integration Plan (HSIP) ready to be baselined after review comments are incorporated.</p> <p>S. *System safety and mission assurance plan ready to be baselined after review comments are incorporated.</p> <p>t. *Preliminary operations concept.</p> <p>u. Preliminary engineering development assessment and technical plans to achieve what needs to be accomplished in the next phase.</p> <p>V. Software criteria and products, per the NASA-HDBK-2203, NASA Software Engineering Handbook.</p>	
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G.5 Mission Definition Review/System Definition Review

The MDR/SDR evaluates whether the proposed mission/system architecture is responsive to the program mission/system functional and performance requirements and requirements have been allocated to all functional elements of the mission/system. This table is to be used for projects and single-project programs. For uncoupled, loosely coupled, tightly coupled, and AO programs, refer to Table G-2.

**Table G-5 - MDR/SDR Entrance and Success Criteria**

<b>Mission Definition Review/System Definition Review for Projects and Single-project Programs</b>	
<b>Entrance Criteria</b>	<b>Success Criteria</b>
<ol style="list-style-type: none"> <li>1. The project has successfully completed the previously planned milestone reviews and responses have been made to all RFAs and RIDs, or a timely closure plan exists for those items remaining open.</li> <li>2. A preliminary MDR/SDR agenda, success criteria, and instructions to the review board have been agreed to by the technical team, project manager, and review chair prior to the MDR/SDR.</li> <li>3. All planned higher level MDR/SDR and peer reviews have been successfully conducted and RID/RFA/Action Items have been addressed with the concurrence of the originators.</li> <li>4. Programmatic products are ready for review at the maturity levels stated in the governing program/project management NPR.</li> <li>5. The following primary technical products for hardware, software, and human system elements are available to the cognizant participants prior to</li> </ol>	<ol style="list-style-type: none"> <li>1. The proposed mission/system architecture is credible and responsive to program requirements and constraints, including resources.</li> <li>2. The mission can likely be achieved within available resources with acceptable risk.</li> <li>3. The project's mission/system definition and associated plans are sufficiently mature to begin Phase B.</li> <li>4. All technical requirements are allocated to the architectural elements.</li> <li>5. The architecture tradeoffs are completed, and those planned for Phase B adequately address the option space.</li> <li>6. Significant development, mission, and health and safety risks are identified and technically assessed, and a</li> </ol>

the review:

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| <ul style="list-style-type: none"> <li>a. ** Defined architecture, including major tradeoffs and options ready to be baselined after review comments are incorporated.</li> <li>b. ** Allocation of requirements to next lower level ready to be baselined after review comments is incorporated.</li> <li>c. ** MOPs, TPM, and other key driving requirement ready to be approved.</li> <li>d. **Initial trending information on the mass margins (for projects involving hardware), power margins (for projects that are powered) and closure of review actions (RFA, RID, and/or Action Items).</li> </ul> <p>6. Other MDR/SDR technical products listed below for both hardware and software system elements have been made available to the cognizant participants prior to the review:</p> <ul style="list-style-type: none"> <li>a. Supporting analyses, functional/timing descriptions, and allocations of functions to architecture elements.</li> <li>b. *Updated SEMP.</li> <li>c. *Updated risk management plan.</li> <li>d. *Updated risk assessment and mitigations (if required by the governing PM NPR, including PRA).</li> <li>e. *Updated Technology Development Plan.</li> <li>f. *Updated technology readiness that has been assessed and documented with technology assets, heritage products, and gaps identified.</li> <li>g. *Updated cost and schedule data with ranges and a basis of the estimates.</li> <li>h. *Preliminary Integrated Logistics Support Plan (ILSP).</li> <li>i. *Updated Human Rating Certification Package.</li> <li>j. Preliminary interface definitions.</li> <li>k. Initial technical resource utilization estimates and margins.</li> <li>l. *Updated safety and mission assurance (SandMA) plan.</li> <li>m. Updated HSIP.</li> <li>n. *Preliminary operations concept.</li> <li>o. Preliminary system safety analysis.</li> <li>p. Software criteria and products, per NASA-HDBK-2203, NASA Software Engineering Handbook.</li> </ul> | <p>process and resources exist to manage the risks.</p> <ul style="list-style-type: none"> <li>7. Adequate planning exists for the development of any enabling new technology.</li> <li>8. The operations concept is consistent with proposed design concept(s) and is in alignment with the mission requirements.</li> <li>9. The program/project has demonstrated compliance with applicable NASA and implementing Center requirements, standards, processes, and procedures.</li> <li>10. TBD and TBR items are clearly identified with acceptable plans and schedule for their disposition.</li> <li>11. Software components meet the exit criteria defined in NASA-HDBK-2203, NASA Software Engineering Handbook.</li> </ul> |
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G.6 Preliminary Design Review

The PDR demonstrates that the preliminary design meets all system requirements with acceptable risk and within the cost and schedule constraints and establishes the basis for proceeding with detailed design.

**Table G-6 - PDR Entrance and Success Criteria**

<b>Preliminary Design Review</b>	
<b>Entrance Criteria</b>	<b>Success Criteria</b>
<ol style="list-style-type: none"> <li>1. The Project has successfully completed the previous planned milestone reviews, and responses have been made to all RFAs and RIDs, or a timely closure plan exists for those remaining open.</li> <li>2. A preliminary PDR agenda, success criteria, and instructions to the review board have been agreed to by the technical team, project manager, and review chair prior to the PDR.</li> <li>3. All planned lower level PDRs and peer reviews have been successfully conducted and RID/RFA/Action Items have been addressed with the concurrence of the originators.</li> <li>4. Programmatic products are ready for review at the maturity levels stated in the governing program/project management NPR.</li> <li>5. The following primary products are ready for review:                         <ol style="list-style-type: none"> <li>a. **A preliminary design that can be shown to meet requirements and key technical performance measures.</li> <li>b. Updated trending information on the mass margins (for projects involving hardware), power margins (for projects that are powered), and closure of review actions (RFA, RID, and/or Action Items).</li> </ol> </li> <li>6. Other PDR technical products (as applicable) for hardware, software, and human system elements have been made available to the cognizant participants prior to the review:                         <ol style="list-style-type: none"> <li>a. Subsystem design specifications (hardware and software), with supporting trade-off analyses and data, as required, that are ready to be baselined after review comments are incorporated.</li> <li>b. *Updated technology readiness assessment.</li> <li>c. *Updated Technology Development Plan.</li> <li>d. *Updated risk assessment and mitigation.</li> <li>e. *Life-Cycle Cost and Integrated Master Schedule (IMS) that are ready to be baselined after review comments are</li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>1. The top-level requirements including mission success criteria, TPMs, and any sponsor-imposed constraints are agreed upon, finalized, stated clearly, and consistent with the preliminary design.</li> <li>2. The flow down of verifiable requirements is complete and proper or, if not, an adequate plan exists for timely resolution of open items. Requirements are traceable to mission goals and objectives.</li> <li>3. The program cost, schedule, and JCL analysis (when required) are credible and within program constraints and ready for NASA commitment.</li> <li>4. The preliminary design is expected to meet the requirements at an acceptable level of risk.</li> <li>5. Definition of the technical interfaces (both external entities and between internal elements) is consistent with the overall technical maturity and provides an acceptable level of risk.</li> <li>6. Any required new technology has been developed to an adequate state of readiness, or backup options exist and are supported to make them viable alternatives.</li> <li>7. The project risks are understood and have been credibly assessed, and plans, a process, and resources exist to effectively manage them.</li> <li>8. Safety and mission assurance (e.g., safety, reliability, maintainability, quality, and Electrical, Electronic, and Electromechanical (EEE) parts) have been adequately addressed in preliminary designs and any applicable SandMA products (e.g., PRA, system safety analysis, and failure modes and effects analysis) meet requirements, are at the appropriate maturity level for this phase of the program's life cycle, and indicate that the program safety/reliability residual risks will be at an acceptable</li> </ol>

<p>incorporated. When required, the Joint Confidence Level (JCL) analysis.</p> <p>f. *Baseline ILSP.</p> <p>g. Applicable technical plans that are ready to be baselined after review comments are incorporated (e.g., technical performance measurement plan, contamination control plan, parts management plan, environments control plan, Electromagnetic Interference/ Electromagnetic Compatibility (EMI/EMC) control plan, payload-to-carrier integration plan, producibility/manufacturability program plan, reliability program plan, quality assurance plan).</p> <p>h. Applicable standards that have been identified and incorporated.</p> <p>i. *Updated safety analyses and plans.</p> <p>j. Preliminary engineering drawing tree.</p> <p>k. Interface control documents that are ready to be baselined after review comments are incorporated.</p> <p>l. * Verification/validation plan that is ready to be baselined after review comments are incorporated.</p> <p>m. Plans to respond to regulatory requirements (e.g., Environmental Impact Statement), as required, that are ready to be baselined after review comments are incorporated.</p> <p>n. Preliminary Disposal Plan.</p> <p>o. Updated technical resource utilization estimates and margins.</p> <p>p. *Baseline operations concept.</p> <p>q. Updated Human Systems Integration Plan.</p> <p>r. *Updated Human Rating Certification Package.</p> <p>s. Software criteria and products, per NASA-HDBK-2203, NASA Software Engineering Handbook.</p>	<p>level.</p> <p>9. Adequate technical and programmatic margins (e.g., mass, power, memory) and resources exist to complete the development within budget, schedule, and known risks.</p> <p>10. The operational concept is technically sound, includes (where appropriate) human systems, and includes the flow down of requirements for its execution.</p> <p>11. Technical trade studies are mostly complete to sufficient detail and remaining trade studies are identified, plans exist for their closure, and potential impacts are understood.</p> <p>12. The program/project has demonstrated compliance with applicable NASA and implementing Center requirements, standards, processes, and procedures.</p> <p>13. TBD and TBR items are clearly identified with acceptable plans and schedule for their disposition.</p> <p>14. Preliminary analysis of the primary subsystems has been completed and summarized, highlighting performance and design margin challenges.</p> <p>15. Appropriate modeling and analytical results are available and have been considered in the design.</p> <p>16. Heritage designs have been suitably assessed for applicability and appropriateness.</p> <p>17. Manufacturability has been adequately included in design.</p> <p>18. Software components meet the exit criteria defined in NASA-HDBK-2203, NASA Software Engineering Handbook.</p>
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**G.7 Critical Design Review**

The CDR demonstrates that the maturity of the design is appropriate to support proceeding with full-scale fabrication, assembly, integration, and test. CDR determines that the technical effort is on track to complete the system development, meeting performance requirements within the identified cost and schedule constraints.

**Table G-7 - CDR Entrance and Success Criteria**

<b>Critical Design Review</b>	
<b>Entrance Criteria</b>	<b>Success Criteria</b>

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| <ol style="list-style-type: none"> <li>1. The project has successfully completed the previous planned milestone reviews, and responses have been made to all RFAs and RIDs or a timely closure plan exists for those remaining open.</li> <li>2. A preliminary CDR agenda, success criteria, and instructions to the review board have been agreed to by the technical team, project manager, and review chair prior to the CDR.</li> <li>3. All planned lower level CDRs and peer reviews have been successfully conducted, and RID/RFA/Action Items have been addressed with the concurrence of the originators.</li> <li>4. Programmatic products are ready for review at the maturity levels stated in the governing program/project management NPR.</li> <li>5. The following primary products are ready for review:             <ol style="list-style-type: none"> <li>a. **A baselined detailed design that can be shown to meet requirements and key technical performance measures.</li> <li>b. Updated trending information on the mass margins (for projects involving hardware), power margins (for projects that are powered), and closure of review actions (RFA, RID and/or Action Items).</li> </ol> </li> <li>6. Other CDR technical work products (as applicable) for hardware, software, and human system elements have been made available to the cognizant participants prior to the review:             <ol style="list-style-type: none"> <li>a. Product build-to specifications along with supporting trade-off analyses and data that are ready to be baselined after review comments are incorporated.</li> <li>b. Fabrication, assembly, integration, and test plans and procedures are being developed and are ready to be baselined after review comments are incorporated.</li> <li>c. Technical data package (e.g., integrated schematics, spares provisioning list, interface control documents, engineering analyses, and specifications).</li> <li>d. Defined operational limits and</li> </ol> </li> </ol> | <ol style="list-style-type: none"> <li>1. The detailed design is expected to meet the requirements with adequate margins.</li> <li>2. Interface control documents are sufficiently mature to proceed with fabrication, assembly, integration, and test, and plans are in place to manage any open items.</li> <li>3. The program cost and schedule estimates are credible and within program constraints.</li> <li>4. High confidence exists in the product baseline, and adequate documentation exists or will exist in a timely manner to allow proceeding with fabrication, assembly, integration, and test.</li> <li>5. The product verification and product validation requirements and plans are complete.</li> <li>6. The testing approach is comprehensive, and the planning for system assembly, integration, test, and launch site and mission operations is sufficient to progress into the next phase.</li> <li>7. Adequate technical and programmatic margins (e.g., mass, power, memory) and resources exist to complete the development within budget, schedule, and known risks.</li> <li>8. Risks to mission success are understood and credibly assessed, and plans and resources exist to effectively manage them.</li> <li>9. Safety and mission assurance (e.g., safety, reliability, maintainability, quality, and EEE parts) have been adequately addressed in system and operational designs, and any applicable SandMA products (e.g., PRA, system safety analysis, and failure modes and effects analysis) meet requirements, are at the appropriate maturity level for this phase of the program's life cycle, and indicate that the program safety/reliability residual risks will be at an acceptable level.</li> <li>10. The program/project has demonstrated compliance with applicable NASA and implementing Center requirements, standards, processes, and procedures.</li> <li>11. TBD and TBR items are clearly identified with acceptable plans and schedule for their disposition.</li> <li>12. Engineering test units, life test units, and/or modeling and simulations have been developed and tested per plan.</li> <li>13. Material properties tests are completed along with analyses of loads, stress, fracture control, contamination generation, etc.</li> <li>14. EEE parts have been selected, and planned testing and delivery will support build schedules.</li> <li>15. The operational concept has matured, is at a CDR level of detail, and has been considered in test planning.</li> <li>16. Manufacturability has been adequately included in design.</li> </ol> |
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- constraints.
- e. Updated technical resource utilization estimates and margins.
- f. Acceptance plans that are ready to be baselined after review comments are incorporated.
- g. Command and telemetry list.
- h. \*Updated verification plan.
- i. \*Updated validation plan.
- j. Preliminary launch site operations plan.
- k. Preliminary checkout and activation plan.
- l. Preliminary disposal plan (including decommissioning or termination).
- m. \*Updated technology readiness assessment.
- n. \*Updated Technology Development Plan.
- o. \*Updated risk assessment and mitigation.
- p. Updated Human Systems Integration Plan (HSIP).
- q. \*Updated Human Rating Certification Package.
- r. Updated reliability analyses and assessments.
- s. \* Updated Life-Cycle Costs and IMS.
- t. \*Updated ILSP.
- u. Subsystem-level and preliminary operations safety analyses that are ready to be baselined after review comments are incorporated.
- v. Systems and subsystem certification plans and requirements (as needed) that are ready to be baselined after review comments are incorporated.
- w. \*System safety analysis with associated verifications that is ready to be baselined after review comments are incorporated.
- x. Software criteria and products, per NASA-HDBK-2203, NASA Software Engineering Handbook.

'' . Software components meet the exit criteria defined in NASA-HDBK-2203, NASA Software Engineering Handbook.

\* Product is required for programs/projects covered by NPR 7120.5. If there is disagreement between this table and NPR 7120.5, NPR 7120.5 takes precedence.

\*\* Product is required per NPR 7123.1.

G.8 Production Readiness Review (PRR)

For projects developing or acquiring multiple or similar systems greater than three or as determined by the project. The PRR determines the readiness of the system developers to efficiently produce the required number of systems. It ensures that the production plans, fabrication, assembly, integration enabling products, operational support, and personnel are in place and ready to begin production.

**Table G-8 - PRR Entrance and Success Criteria**

<b>Production Readiness Review</b>	
<b>Entrance Criteria</b>	<b>Success Criteria</b>
<ol style="list-style-type: none"> <li>1. The significant production engineering problems and nonconformances encountered during development are resolved.</li> <li>2. The design documentation needed to support production is available.</li> <li>3. The production plans and preparation to begin fabrication are developed.</li> <li>4. The production-enabling products are ready.</li> <li>5. Resources are available, have been allocated, and are ready to support end product production.</li> <li>6. Updated costs and schedules.</li> <li>7. Risks have been identified, credibly assessed, and characterized, and mitigation efforts have been defined.</li> <li>8. The bill of materials is available and critical parts identified.</li> <li>9. Delivery schedules are available.</li> <li>10. In-process inspections have been identified and planned.</li> <li>11. Software criteria and products, per NASA-HDBK-2203, NASA Software Engineering Handbook.</li> </ol>	<ol style="list-style-type: none"> <li>1. High confidence exists that the system requirements will be met in the final production configuration.</li> <li>2. Adequate resources are in place to support production.</li> <li>3. The program cost and schedule estimates are credible and within program constraints.</li> <li>4. Design-for-manufacturing considerations have been incorporated to ensure ease and efficiency of production and assembly.</li> <li>5. The product is deemed manufacturable. Evidence is provided that the program/project is compliant with NASA and Implementing Center requirements, standards, processes, and procedures.</li> <li>6. TBD and TBR items are clearly identified, with acceptable plans and schedule for their disposition. Alternate sources for resources have been identified for key items.</li> <li>7. Adequate spares have been planned and budgeted.</li> <li>8. Required facilities and tools are sufficient for end product production.</li> <li>9. Specified special tools and test equipment are available in proper quantities.</li> <li>10. Production and support staff are qualified.</li> <li>11. Drawings and/or production models are approved/certified.</li> <li>12. Production engineering and planning are sufficiently mature for cost-effective production.</li> <li>13. Production processes and methods are consistent with quality requirements and compliant with occupational health and safety, environmental, and energy conservation regulations.</li> <li>14. Qualified suppliers are available for materials that are to be procured.</li> </ol>

	15. Software components meet the exit criteria defined in NASA-HDBK-2203, NASA Software Engineering Handbook.
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G.9 System Integration Review (SIR)

An SIR ensures segments, components, and subsystems are on schedule to be integrated into the system, and integration facilities, support personnel, and integration plans and procedures are on schedule to support integration.

**Table G-9 - SIR Entrance and Success Criteria**

<b>System Integration Review</b>	
<b>Entrance Criteria</b>	<b>Success Criteria</b>
<ol style="list-style-type: none"> <li>1. The project has successfully completed the previous planned milestone reviews, and responses have been made to all RFAs and RIDs or a timely closure plan exists for those remaining open.</li> <li>2. A preliminary SIR agenda, success criteria, and instructions to the review board have been agreed to by the technical team, project manager, and review chair prior to the SIR.</li> <li>3. The following primary products are ready for review:                         <ol style="list-style-type: none"> <li>a. **Integration plans baselined at PDR that have been updated and approved.</li> <li>b. Updated trending information on the mass margins (for projects involving hardware), power margins (for projects that are powered), and closure of review actions (RFA, RID, and/or Action Items).</li> <li>c. **Preliminary VandV results from any lower tier products that have been verified.</li> </ol> </li> <li>4. Programmatic products are ready for review at the maturity levels stated in the governing program/project management NPR.</li> <li>5. Integration procedures have been identified and are scheduled for completion prior to their need dates.</li> <li>6. Segments and/or components are on schedule to be available for integration.</li> <li>7. Mechanical and electrical interfaces for hardware necessary to start system integration have been verified against the interface control documentation and plans for verification of remaining hardware exist.</li> <li>8. All functional, unit-level, subsystem, and qualification testing has been conducted successfully or is on track to be conducted prior to scheduled integration.</li> <li>9. Integration facilities, including clean rooms,</li> </ol>	<ol style="list-style-type: none"> <li>1. Integration plans and procedures are on track for completion and approval to support system integration.</li> <li>2. Previous component, subsystem, and system test results form a satisfactory basis for proceeding to integration.</li> <li>3. The program cost and schedule estimates are credible and within program constraints.</li> <li>4. Risks are identified and accepted by program/project leadership, as required.</li> <li>5. The program/project has demonstrated compliance with applicable NASA and implementing Center requirements, standards, processes, and procedures.</li> <li>6. TBD and TBR items are clearly identified with acceptable plans and schedule for their dispositions.</li> <li>7. The integration procedures and work flow have been clearly defined and documented or are on schedule to be clearly defined and documented prior to their need date.</li> <li>8. The review of the integration plans, as well as the procedures, environment, and configuration of the items to be integrated, provides a reasonable expectation that the integration will proceed successfully.</li> <li>9. Integration personnel have received appropriate training in the integration and health and safety procedures.</li> <li>10. Software components meet the exit criteria defined in NASA-HDBK-2203, NASA Software Engineering Handbook.</li> </ol>

<p>ground support equipment, handling fixtures, overhead cranes, and electrical test equipment, are ready or will be available when required.</p> <p>10. Support personnel have been trained.</p> <p>11. Handling and safety requirements have been documented.</p> <p>12. All known system discrepancies have been identified, dispositioned, and are on schedule for closure.</p> <p>13. The quality control organization is ready to support the integration effort.</p> <p>14. Other SIR technical products (as applicable) for hardware, software, and human system elements have been made available to the cognizant participants prior to the review:</p> <ul style="list-style-type: none"> <li>a. * Updated Life-Cycle Costs and IMS.</li> <li>b. * Updated design solution definition.</li> <li>c. Updated interface definition(s).</li> <li>d. * Updated verification and validation plans.</li> <li>e. Final transportation criteria and instructions.</li> <li>f. *Preliminary mission operations plans.</li> <li>g. Preliminary decommissioning plans.</li> <li>h. Preliminary disposal plans.</li> <li>i. Software criteria and products, per NASA-HDBK-2203, NASA Software Engineering Handbook.</li> </ul>	
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\* Product is required for programs/projects covered by NPR 7120.5. If there is disagreement between this table and NPR 7120.5, NPR 7120.5 takes precedence.

\*\* Product is required per NPR 7123.1.

G.10 Test Readiness Review (TRR)

A TRR for each planned test or series of tests ensures that the test article (hardware/software), test facility, support personnel, and test procedures are ready for testing and data acquisition, reduction, and control.

**Table G-10 - TRR Entrance and Success Criteria**

<b>Test Readiness Review</b>	
<b>Entrance Criteria</b>	<b>Success Criteria</b>
<ol style="list-style-type: none"> <li>1. A preliminary TRR agenda, success criteria, and instructions to the review team have been agreed to by the technical team, project manager, and review chair prior to the TRR.</li> <li>2. The objectives of the testing have been clearly defined and documented.</li> <li>3. Approved test plans, test procedures, test environment, and configuration of the test item(s) that support test objectives are available.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adequate test plans are completed and approved for the system under test.</li> <li>2. Adequate identification and coordination of required test resources are completed.</li> <li>3. The program/project has demonstrated compliance with applicable NASA and implementing Center requirements, standards, processes, and procedures.</li> <li>4. TBD and TBR items are clearly identified with acceptable plans and schedule for their disposition.</li> </ol>

<ul style="list-style-type: none"> <li>4. All test interlaces have been placed under configuration control or have been defined in accordance with an agreed to plan, and version description document(s) for both test and support systems have been made available to TRR participants prior to the review.</li> <li>5. All known system discrepancies have been identified and dispositioned in accordance with an agreed-upon plan.</li> <li>6. All required test resources (including a designated test director), facilities, test articles, test instrumentation, and other test-enabling products have been identified and are available to support required tests.</li> <li>7. Roles and responsibilities of all test participants are defined and agreed to.</li> <li>8. Test safety planning has been accomplished, and all personnel have been trained.</li> </ul>	<ul style="list-style-type: none"> <li>5. Risks have been identified, credibly assessed, and appropriately mitigated.</li> <li>6. Residual risk is accepted by program/project leadership as required.</li> <li>7. Plans to capture any lessons learned from the test program are documented.</li> <li>8. The objectives of the testing have been clearly defined and documented, and the review of all the test plans, as well as the procedures, environment, and configuration of the test item, provides a reasonable expectation that the objectives will be met.</li> <li>9. The test cases have been analyzed and are consistent with the test plans and objectives.</li> <li>10. Test personnel have received appropriate training in test operation and health and safety procedures.</li> </ul>
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G.11 System Acceptance Review (SAR)

The SAR verifies the completeness of the specific end products in relation to their expected maturity level, assesses compliance to stakeholder expectations, and ensures that the system has sufficient technical maturity to authorize its shipment to the designated operational facility or launch site.

**Table G-11 - SAR Entrance and Success Criteria**

<b>System Acceptance Review</b>	
<b>Entrance Criteria</b>	<b>Success Criteria</b>
<ul style="list-style-type: none"> <li>1. The project has successfully completed the previous planned milestone reviews, RFA/RIDs have been closed, and plans to complete open work are defined.</li> <li>2. A preliminary SAR agenda, success criteria, and instructions to the review team have been agreed to by the technical team, project manager, and review chair prior to the review.</li> <li>3. The following SAR technical products have been made available to the cognizant participants prior to the review:                             <ul style="list-style-type: none"> <li>a. Results of the SARs conducted at the major suppliers.</li> <li>b. Product verification results.</li> <li>c. Product validation results.</li> <li>d. Documentation that the delivered system complies with the established acceptance criteria.</li> <li>e. Documentation that the system will perform properly in the expected operational environment.</li> <li>f. Technical data package that has been updated to include all test results.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>1. Required tests and analyses are complete and indicate that the system will perform properly in the expected operational environment.</li> <li>2. Risks are known and manageable.</li> <li>3. System meets the established acceptance criteria.</li> <li>4. The program/project has demonstrated compliance with applicable NASA and implementing Center requirements, standards, processes, and procedures.</li> <li>5. TBD and TBR items are resolved.</li> <li>6. Technical data package is complete and reflects the delivered system.</li> <li>7. All applicable lessons learned for organizational improvement and system operations are captured.</li> <li>8. Software components meet the exit criteria defined in NASA-HDBK-2203, NASA Software Engineering Handbook.</li> </ul>

<ul style="list-style-type: none"> <li>g. Final Certification Package.</li> <li>h. Baselined as-built hardware and software documentation.</li> <li>i. Updated risk assessment and mitigation.</li> <li>j. Required safe shipping, handling, checkout, and operational plans and procedures.</li> <li>k. Software criteria and products, per NASA-HDBK-2203, NASA Software Engineering Handbook.</li> </ul>	
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**G.12 Operational Readiness Review (ORR)**

The ORR ensures that all system and support (flight and ground) hardware, software, personnel, procedures, and user documentation accurately reflect the deployed state of the system and are operationally ready.

**Table G-12 - ORR Entrance and Success Criteria**

<b>Operational Readiness Review</b>	
<b>Entrance Criteria</b>	<b>Success Criteria</b>
<ol style="list-style-type: none"> <li>1. All planned ground-based testing has been completed.</li> <li>2. Test failures and anomalies from verification and validation testing have been resolved, and the results/mitigations/work-arounds have been incorporated into supporting and enabling operational products.</li> <li>3. All operational supporting and enabling products (e.g., facilities, equipment, documents, software tools, databases) that are necessary for nominal and contingency operations have been tested and delivered/installed at the site(s) necessary to support operations.</li> <li>4. Programmatic products are ready for review at the maturity levels stated in the governing program/project management NPR.</li> <li>5. Operations documentation (handbook, procedures, etc.) has been written, verified, and approved.</li> <li>6. Users/operators have been trained on the correct operation of the system.</li> <li>7. Operational contingency planning has been completed, and operations personnel have been trained on their use.</li> <li>8. The following primary products are ready for review:                         <ul style="list-style-type: none"> <li>a. **Updated operations plans.</li> <li>b. **Updated operational procedures.</li> <li>c. **Preliminary decommissioning plan.</li> </ul> </li> <li>9. Other ORR technical products have been made available to the cognizant participants prior to the review:</li> </ol>	<ol style="list-style-type: none"> <li>1. The system, including all enabling products, is determined to be ready to be placed in an operational status.</li> <li>2. All applicable lessons learned for organizational improvement and systems operations have been captured.</li> <li>3. All waivers and anomalies have been closed.</li> <li>4. Systems hardware, software, personnel, and procedures are in place to support operations.</li> <li>5. Operations plans and schedules are consistent with mission objectives.</li> <li>6. Mission risks have been identified, planned mitigations are adequate, and residual risks are accepted by the program/project manager.</li> <li>7. Testing is consistent with the expected operational environment.</li> <li>8. The program/project has demonstrated compliance with applicable NASA and implementing Center requirements, standards, processes, and procedures.</li> <li>9. TBD and TBR items are resolved.</li> <li>10. Software components meet the exit criteria defined in NASA-HDBK-2203, NASA Software Engineering Handbook.</li> </ol>

<ul style="list-style-type: none"> <li>a. *Updated cost and schedule.</li> <li>b. Updated as-built hardware and software documentation.</li> <li>c. *Preliminary VandV results.</li> <li>d. Preliminary disposal plan.</li> <li>e. Preliminary certification for flight/use.</li> <li>f. *Updated Human Rating Certification Package.</li> <li>g. Software criteria and products, per NASA-HDBK-2203, NASA Software Engineering Handbook.</li> </ul>	
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\* Product is required for programs/projects covered by NPR 7120.5. If there is disagreement between this table and NPR 7120.5, NPR 7120.5 takes precedence.

\*\* Product is required per NPR 7123.1.

G.13 Flight Readiness Review (FRR)

The FRR examines tests, demonstrations, analyses, and audits that determine the system's readiness for a safe and successful flight or launch and for subsequent flight operations. The FRR also ensures that all flight and ground hardware, software, personnel, and procedures are operationally ready.

**Table G-13 - FRR Entrance and Success Criteria**

<b>Flight Readiness Review</b>	
<b>Entrance Criteria</b>	<b>Success Criteria</b>
<ul style="list-style-type: none"> <li>1. The system and support elements are ready and have been properly configured for flight.</li> <li>2. System and support element interfaces have been demonstrated to function as expected.</li> <li>3. The system state supports a launch "go" decision based on the established go/no-go criteria.</li> <li>4. Programmatic products are ready for review at the maturity levels stated in the governing program/project management NPR.</li> <li>5. Flight failures and anomalies from previously completed flights and reviews have been resolved, and the results/mitigations/work-arounds have been incorporated into supporting and enabling operational products.</li> <li>6. The following primary products are ready for review:                             <ul style="list-style-type: none"> <li>a. **Final certification for flight/use.</li> <li>b. *Baselined VandV results.</li> <li>c. **Disposal plan that is ready to be baselined after review comments are incorporated.</li> <li>d. Other FRR technical products have been made available to the cognizant participants prior to the review:</li> <li>e. *Updated cost.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>1. The flight vehicle is ready for flight.</li> <li>2. The hardware is deemed acceptably safe for flight.</li> <li>3. Certification that flight operations can safely proceed with acceptable risk has been achieved.</li> <li>4. Flight and ground software elements are ready to support flight and flight operations.</li> <li>5. Interfaces have been checked and demonstrated to be functional.</li> <li>6. The program/project has demonstrated compliance with applicable NASA and implementing Center requirements, standards, processes, and procedures.</li> <li>7. TBD and TBR items are resolved.</li> <li>8. Open items and waivers have been examined and residual risk from these is deemed to be acceptable.</li> <li>9. The flight and recovery environmental factors are within constraints.</li> <li>10. All open safety and mission risk items have been addressed, and the residual risk is deemed acceptable.</li> <li>11. Supporting organizations are ready to support flight.</li> <li>12. Software components meet the exit criteria defined in NASA-HDBK-2203, NASA</li> </ul>

<ul style="list-style-type: none"> <li>f. Updated schedule.</li> <li>g. Updated as-built hardware and software documentation.</li> <li>h. Updated operations procedures.</li> <li>i. Preliminary decommissioning plan.</li> <li>j. Software criteria and products, per NASA-HDBK-2203, NASA Software Engineering Handbook.</li> </ul>	<p>Software Engineering Handbook.</p>
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\* Product is required for programs/projects covered by NPR 7120.5. If there is disagreement between this table and NPR 7120.5, NPR 7120.5 takes precedence.

G.14 Post-Launch Assessment Review (PLAR)

A PLAR evaluates the readiness of the spacecraft systems to proceed with full, routine operations after post-launch deployment. The review also evaluates the status of the project plans and the capability to conduct the mission with emphasis on near-term operations and mission-critical events.

**Table G-14 - PLAR Entrance and Success Criteria**

<p align="center"><b>Post-Launch Assessment Review</b></p>	
<p align="center"><b>Entrance Criteria</b></p>	<p align="center"><b>Success Criteria</b></p>
<ol style="list-style-type: none"> <li>1. The launch and early operations performance, including (when appropriate) the early propulsive maneuver results, are available.</li> <li>2. The observed spacecraft and science instrument performance, including instrument calibration plans and status, are available.</li> <li>3. The launch vehicle performance assessment and mission implications, including launch sequence assessment and launch operations experience with lessons learned, are completed.</li> <li>4. Programmatic products are ready for review at the maturity levels stated in the governing program/project management NPR.</li> <li>5. The mission operations and ground data system experience, including tracking and data acquisition support and spacecraft telemetry data analysis is available.</li> <li>6. The mission operations organization, including status of staffing, facilities, tools, and mission software (e.g., spacecraft analysis and sequencing), is available.</li> <li>7. In-flight anomalies and the responsive actions taken, including any autonomous fault protection actions taken by the spacecraft or any unexplained spacecraft telemetry, including alarms, are documented.</li> <li>8. The need for significant changes to procedures, interface agreements, software, and staffing has been documented.</li> <li>9. Documentation is updated, including any updates originating from the early operations</li> </ol>	<ol style="list-style-type: none"> <li>1. The observed spacecraft and science payload performance agrees with prediction, or if not, is adequately understood so that future behavior can be predicted with confidence.</li> <li>2. All anomalies have been adequately documented and their impact on operations assessed. Further, anomalies impacting spacecraft health and safety or critical flight operations have been properly dispositioned.</li> <li>3. The mission operations capabilities, including staffing and plans, are adequate to accommodate the actual flight performance.</li> <li>4. The program/project has demonstrated compliance with applicable NASA and implementing Center requirements, standards, processes, and procedures.</li> <li>5. Open items, if any, on operations identified as part of the ORR have been satisfactorily dispositioned.</li> </ol>

experience. 10. Plans for post-launch development have been addressed.	
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**G.15 Critical Event Readiness Review (CERR)**

A CERR evaluates the readiness of the project and the flight system to execute the critical event during flight operation.

**Table G-15 - CERR Entrance and Success Criteria**

<b>Critical Event Readiness Review</b>	
<b>Entrance Criteria</b>	<b>Success Criteria</b>
<ol style="list-style-type: none"> <li>1. Critical event/activity requirements and constraints have been identified.</li> <li>2. Critical event/activity design and implementation are complete.</li> <li>3. Critical event/activity testing is complete.</li> <li>4. Programmatic products are ready for review at the maturity levels stated in the governing program/project management NPR.</li> <li>5. Critical event/activity operations planning, including contingencies, is complete.</li> <li>6. Operations personnel training for the critical event/activity has been conducted.</li> <li>7. Critical event/activity sequence verification and validation is complete.</li> <li>8. Flight system is healthy and capable of performing the critical event/activity.</li> <li>9. Flight failures and anomalies from critical event/activity testing have been resolved, and the results/mitigations/work-arounds have been incorporated into supporting and enabling operational products.</li> <li>10. The following technical products have been made available to the cognizant participants prior to the review:                         <ol style="list-style-type: none"> <li>a. Final certification for critical event readiness.</li> <li>b. Updated operations procedures.</li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>1. The critical activity design complies with requirements. The preparation for the critical activity, including the verification and validation, is thorough.</li> <li>2. The project (including all the systems, supporting services, and documentation) is ready to support the activity.</li> <li>3. The requirements for the successful execution of the critical event(s) are complete and understood and have flowed down to the appropriate levels for implementation.</li> <li>4. The program/project is compliant with NASA and Implementing Center requirements, standards, processes, and procedures.</li> <li>5. Any TBD and TBR items have been resolved.</li> <li>6. All open risk items have been addressed and the residual risk is deemed acceptable.</li> </ol>

**G.16 Post-Flight Assessment Review (PFAR)**

The PFAR evaluates how well mission objectives were met during a mission and identifies all flight and ground system anomalies that occurred during the flight and determines the actions necessary to mitigate or resolve the anomalies for future flights of the same spacecraft design.

**Table G-16 - PFAR Entrance and Success Criteria**

<b>Post-Flight Assessment Review</b>	
<b>Entrance Criteria</b>	<b>Success Criteria</b>

<ol style="list-style-type: none"> <li>1. All anomalies that occurred during the mission, as well as during preflight testing, countdown, and ascent, are dispositioned.</li> <li>2. All flight and post-flight documentation applicable to future flights of the spacecraft or the design is available.</li> <li>3. All planned activities to be performed post-flight have been completed.</li> <li>4. Programmatic products are ready for review at the maturity levels stated in the governing program/project management NPR.</li> <li>5. Problem reports, corrective action requests, and post-flight anomaly records are completed.</li> <li>6. All post-flight hardware and flight performance data evaluation reports are completed.</li> <li>7. Plans for retaining assessment documentation and imaging have been made.</li> </ol>	<ol style="list-style-type: none"> <li>1. Formal final report documenting flight performance and recommendations for future missions is complete and adequate.</li> <li>2. All anomalies have been adequately documented and dispositioned.</li> <li>3. The impact of anomalies on future flight operations has been assessed and documented.</li> <li>4. Reports and other documentation have been retained for performance comparison and trending.</li> </ol>
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G.17 Decommissioning Review (DR)

A DR confirms the decision to terminate or decommission the system and assesses the readiness of the system for the safe decommissioning and disposal of system assets.

**Table G-17 - DR Entrance and Success Criteria**

<b>Decommissioning Review</b>	
<b>Entrance Criteria</b>	
<ol style="list-style-type: none"> <li>1. The requirements associated with decommissioning are defined.</li> <li>2. Plans are in place for decommissioning and any other removal from service activities.</li> <li>3. Resources are in place to support and implement decommissioning.</li> <li>4. Programmatic products are ready for review at the maturity levels stated in the governing program/project management NPR.</li> <li>5. Health and safety, environmental, and any other constraints have been identified.</li> <li>6. Current system capabilities relating to decommissioning are understood.</li> <li>7. Off-nominal operations, all contributing events, conditions, and changes to the originally expected baseline have been considered and assessed.</li> <li>8. The following primary product is ready for review:                         <ol style="list-style-type: none"> <li>a. **Decommissioning plan that is ready to be baselined after review comments are incorporated.</li> </ol> </li> <li>9. Other DR technical products have been made available to the cognizant participants</li> </ol>	<ol style="list-style-type: none"> <li>1. The rationale for decommissioning is documented.</li> <li>2. The decommissioning plan is complete, meets requirements, is approved by appropriate management, and is compliant with applicable Agency safety, environmental, and health regulations.</li> <li>3. Operations plans for decommissioning, including contingencies, are complete and approved.</li> <li>4. Adequate resources (schedule, budget, and staffing) have been identified and are available to successfully complete all decommissioning activities.</li> <li>5. All required support systems for decommissioning are available.</li> <li>6. All personnel have been properly trained for the nominal and contingency decommissioning procedures.</li> <li>7. Safety, health, and environmental hazards have been identified, and controls have been verified.</li> <li>8. Risks associated with the decommissioning have been identified, and adequately mitigated</li> </ol>

<p>prior to the review:</p> <ul style="list-style-type: none"> <li>a. *Updated cost</li> <li>b. Updated schedule.</li> <li>c. *Updated disposal plan.</li> </ul>	<ul style="list-style-type: none"> <li>9. Residual risks have been accepted by the required management.</li> <li>10. The program/project is compliant with NASA and Implementing Center requirements, standards, processes, and procedures.</li> <li>11. Any TBD and TBR items are clearly identified with acceptable plans and schedule for their disposition.</li> <li>12. Plans for archival and subsequent analysis of mission data have been defined and approved, and arrangements have been finalized for the execution of such plans.</li> <li>13. Plans for the capture and dissemination of appropriate lessons learned during the project life cycle have been defined and approved.</li> <li>14. Plans for transition of personnel have been defined and approved.</li> </ul>
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\* Product is required for programs/projects covered by NPR 7120.5. If there is disagreement between this table and NPR 7120.5, NPR 7120.5 takes precedence.

\*\* Product is required per NPR 7123.1.

G.18 Disposal Readiness Review (DRR)

A DRR confirms the readiness for the final disposal of the system assets.

**Table G-18 - Disposal Readiness Review Entrance and Success Criteria**

<b>Disposal Readiness Review</b>	
<b>Entrance Criteria</b>	<b>Success Criteria</b>
<ul style="list-style-type: none"> <li>1. Requirements associated with disposal are defined.</li> <li>2. Plans are in place for disposal and any other removal from service activities.</li> <li>3. Resources are in place to support disposal.</li> <li>4. Programmatic products are ready for review at the maturity levels stated in the governing program/project management NPR.</li> <li>5. Safety, environmental, health, and any other constraints are described.</li> <li>6. Current system capabilities related to disposal are described and understood.</li> <li>7. Off-nominal operations, all contributing events, conditions, and changes to the originally expected baseline have been considered and assessed.</li> <li>8. *Updated cost.</li> <li>9. Updated schedule.</li> <li>10. The following primary product is ready for review:                             <ul style="list-style-type: none"> <li>a. **Updated disposal plan.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>1. The rationale for disposal is documented.</li> <li>2. The disposal plan is complete, meets requirements, is approved by appropriate management, and is compliant with applicable Agency safety, environmental, and health regulations.</li> <li>3. Operations plans for disposal, including contingencies, are complete and approved.</li> <li>4. All required support systems for disposal are available.</li> <li>5. All personnel have been properly trained for the nominal and contingency disposal procedures.</li> <li>6. Safety, health, and environmental hazards have been identified, and controls have been verified.</li> <li>7. Risks associated with the disposal have been identified and adequately mitigated.</li> <li>8. Residual risks have been accepted by the required management.</li> <li>9. If hardware is to be recovered from orbit:                             <ul style="list-style-type: none"> <li>a. Return site activity plans have been defined and approved.</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>b. Required facilities are available and meet requirements, including those for contamination control, if needed.</li> <li>c. Transportation plans are defined and approved.</li> <li>d. Shipping containers and handling equipment, as well as contamination and environmental control and monitoring devices, are available.</li> </ul> <ul style="list-style-type: none"> <li>10. Plans for disposition of mission-owned assets (i.e., hardware, software, and facilities) have been defined and approved.</li> <li>11. Adequate resources (schedule, budget, and staffing) have been identified and are available to successfully complete all disposal activities.</li> <li>12. All mission and project data and documentation has been archived per disposal plan.</li> <li>13. The program/project is compliant with NASA and Implementing Center requirements, standards, processes, and procedures.</li> <li>14. TBD and TBR items have all been dispositioned.</li> </ul>
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\* Product is required for programs/projects covered by NPR 7120.5. If there is disagreement between this table and NPR 7120.5, NPR 7120.5 takes precedence

\*\* Product is required per NPR 7123.1.

G.19 Peer Reviews

Peer reviews provide the technical insight essential to ensure product and process quality. Peer reviews are focused, in-depth technical reviews that support the evolving design and development of a product, including critical documentation or data packages. The participants in a peer review are the technical experts and key stakeholders for the scope of the review. Another purpose of the peer review is to add value and reduce risk through expert knowledge infusion, confirmation of approach, identification of defects, and specific suggestions for product improvements.

**Table G-19 - Peer Review Entrance and Success Criteria**

<b>Peer Review</b>	
<b>Entrance Criteria</b>	<b>Success Criteria</b>
<ul style="list-style-type: none"> <li>1. 1. The product to be reviewed (document, process, model, design details, etc.) has been identified and made available to the review team.</li> <li>2. 2. Peer reviewers independent from the project have been selected for their technical background related to the product being reviewed.</li> <li>3. 3. A preliminary agenda, success criteria, and instructions to the review team have been agreed to by the technical team and project manager.</li> <li>4. 4. Rules have been established to ensure consistency among the team members</li> </ul>	<ul style="list-style-type: none"> <li>1. 1. Peer review has thoroughly evaluated the technical integrity and quality of the product.</li> <li>2. 2. Any defects have been identified and characterized.</li> <li>3. 3. Results of the Peer Review are communicated to the appropriate project personnel.</li> </ul>

involved in the peer review process.

**G.20 Program Implementation Reviews (PIR) and Program Status Reviews (PSR)**

PIRs or PSRs are periodically conducted, as required by the Decision Authority and documented in the program plan, during the Implementation phase to evaluate the program's continuing relevance to the Agency's Strategic Plan. These reviews assess the program performance with respect to expectations and determine the program's ability to execute the implementation plan with acceptable risk within cost and schedule constraints.

**Table G-20 - PIR/PSR Entrance and Success Criteria**

<b>Program Implementation and Program Status Reviews</b>	
<b>Entrance Criteria</b>	<b>Success Criteria</b>
<ol style="list-style-type: none"> <li>1. A preliminary PIR agenda, success criteria, and instructions to the review team have been agreed to by the technical team, project manager, and review chair prior to the review.</li> <li>2. The current status of the overall technical effort is available and ready to be reviewed.</li> <li>3. Programmatic products are ready for review at the maturity levels stated in the governing program/project management NPR.</li> <li>4. Current actual and estimated costs, including any Earned Value and JCL information, if applicable, are available and compared to the expected plan.</li> <li>5. Current schedule is available showing remaining work planned.</li> <li>6. Trending of the selected Technical Performance Parameters relevant to the current Program phase is available.</li> <li>7. Updated technical plans are available.</li> </ol>	<ol style="list-style-type: none"> <li>1. Program still meets Agency needs and should continue.</li> <li>2. The program cost and schedule estimates are credible and within program constraints.</li> <li>3. Risks are identified and accepted by program/project leadership, as required.</li> <li>4. Technical trends are within acceptable bounds.</li> <li>5. Adequate progress has been made relative to plans, including the technology readiness levels.</li> <li>6. Technologies have been identified that are ready to be transitioned to another project or to an organization outside the Agency.</li> </ol>

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