



Glenn Procedural Requirements

GLPR 7120.5.20

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Responsible Office: Chief Engineers Office/DT

GRC Project Deviation/Waiver Process w/Change 1 (6/2/10)

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GLPR 7120.5.20
Change History

Rev/Change	Date	Description/Comments
Basic	5/17/2010	This document establishes the requirements at GRC on the implementing organization for performing, supporting, and evaluating deviations or waivers to project requirements in accordance with various Agency and Center directives.
1	6/2/10	Revised D.1- GRC Deviation/Waiver (DW) Form to reflect title change in Acceptance/Concurrence section

Preface

P.1 Purpose

a. The purpose of this document is to clearly articulate and establish the requirements at the NASA Glenn Research Center (GRC) on the implementing organization for performing, supporting, and evaluating deviations or waivers to project requirements in accordance with the NPR 7120.5-NASA Space Flight Program/Project Management Requirements, NPR 7123.1-NASA Systems Engineering Processes and Requirements, and GLPR 7120.5.10-GRC Space Flight Projects Formulation and Implementation Requirements.

P.2 Applicability

a. The requirements of this GLPR apply to those projects, which have been designated NPR 7120.5 compliant by Code M Management or GRC Center Management. This includes when the flight system effort is contracted, when the flight system is a shared responsibility of GRC and a partner, as well as projects implemented in an “in-house” mode.

b. This GLPR applies to the following current and future NASA GRC programs and projects:

(1) Flight Systems and Ground Support (FS&GS) programs/projects

(2) Advanced Technology Development (ATD) programs/projects directly funded by FS&GS programs/projects, or ATD programs/projects with outcomes directly tied to space flight mission success and schedule

c. This GLPR, as well as NPR 8820.2, Facility Project Requirements, applies critical technical facilities specifically developed or significantly modified for space flight systems, and ground systems that are in direct support of space flight operations. The requirements of this GLPR apply to Construction of Facilities (CoF) project work that directly interfaces with flight hardware. Facilities project work up to the defined interface shall conform to the requirements of NPR 8820.2. These interfaces are defined in the Systems Engineering Management Plan (SEMP) as defined in GLPR 7120.5.40-GRC Project and Technical Planning.

d. This GLPR also applies to reimbursable space flight programs/projects performed for non-NASA sponsors.

e. For existing programs and projects, the requirements of this document are applicable to the program's/project's current phase as of the effective date of this GLPR and to phases yet to be completed.

f. Applicable to any projects that the Center Director designates per NPR 7120.5.

g. Exceptions to this GLPR include deviations/waivers that address manufacturing nonconforming product issues. These deviations/waivers will utilize GRC Manufacturing Division Work instruction GLWI-DM-5340.1-Control of Non-Conforming Product and GLWI-DM-8700.1-Inspection and Verification.

P.3 Authority

- a. NPR 7120.5, “NASA Space Flight Program/Project Management Requirements”
- b. NPR 7123.1, “NASA Systems Engineering Processes and Requirements”
- c. GLPR 7120.5.10, “GRC Space Flight Projects Formulation and Implementation Requirements”

P.4 Applicable Documents

- a. GLPR 1410.1, “GRC Directives Management”
- b. GLPR 7120.5.40, “GRC Project and Technical Planning”
- c. GLPR 7123.36, “GRC Engineering Review Board Procedure”
- d. GLPR 7123.11, “Project Requirements Development and Management Procedures”
- e. GLPR 8040.1, “GRC Configuration and Data Management Procedure”

P.5 Measurement/Verification

- a. The GRC Chief Engineer Office (CEO) conducts annual assessments of programs/projects to verify compliance with this document. Compliance will be determined by reviewing the archived artifacts required by this procedure.
- b. Programs/projects should provide comments/feedback to the CEO by using the system provided by the Business Management Office.
- c. Independent internal and external audits of this procedure are also performed as part of the overall GRC Business Management System (BMS) Quality System process per GLPR 8730.5.

P.6 Cancellation

- a. This procedure cancels, GLID 7120.5.20- GRC Project Deviation/Waiver Process, dated January 15, 2010.

/S/

Ramon Lugo
Deputy Director

Chapter 1. Introduction

1.1 Procedure Introduction

3.1
Project DW Disposition / Approval

Figure 1.1–1—Deviation/Waivers Activities

1.1.1 Rationale and Benefit

a. Deviations and waivers (DW) are documented agreements affecting specific requirements that intentionally release a project from meeting that requirement. The DW request will be formally reviewed by technical and programmatic organizations to gain concurrence prior to formal approval by the approving authority. These reviews will allow the appropriate participants to review the DW for impact and acceptability and may be as formal as necessary to perform an adequate review for concurrence. After this review, the approving authority will formally make the decision to approve or not approve the requested DW.

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

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

b. Because of the potential impacts a deviation or waiver may have on a project, the dissenting opinion process may be used at any time during this process.

c. Requirements are defined at various levels of the organization and documented in the following types of documents.

(1) NASA Procedural Requirements (NPR)-Requirements originating at NASA Headquarters (HQ) or higher that are documented in a NPR.

(2) Technical Standards-Mandatory standards originating at NASA HQ are documented as Mandatory Technical Standards. A current list of mandatory standards and the responsible GRC organization is provided in Appendix E (verify the version at <http://nasa.gov/standards> prior to use). Project-specific standards are specified via the appropriate project documentation.

(3) Glenn Procedural Requirement (GLPR)-Institutional and technical requirements, which are applicable to projects at GRC. The GLPRs represent the decomposition of the NPRs into GRC-specific requirements.

(4) Project Requirements-For GRC projects, system/interface requirements are established by the project using GLPR 7123.11, GRC Requirements Development and Management Procedure or other requirement definition process as required by the program/project office. Also, system/interface requirements can flow down to the Configuration Item specifications including drawing and assembly procedures.

1.1.2 Procedure Overview

a. In general, the DW process is governed by the following principles:

- (1) Project deviations and waivers will follow this procedure
- (2) Institutional (nonproject) deviations and waivers will follow GLPR 1410.1-GRC Directives Management.
- (3) The DWs can be initiated by any member of a project team or participant in an institutional process or formal review. The DW can also be initiated as a disposition from the Corrective and Preventive Action Reporting System.
- (4) Technical and programmatic reviews are performed on the DW request; Engineering Review Boards (ERBs) and the Projects Review Board (PRB) should be used as the primary DW request review forums when appropriate.

b. The process to document a DW pertaining to a project requirement consists of requesting, reviewing, concurrence, and approval.

- (1) When a DW is identified as necessary, the initiator will document and submit a request for deviation or waiver.
- (2) The DW request will be formally reviewed by both project and technical authorities for concurrence. If concurrence cannot be reached the dissenting opinion process *shall* be invoked.
- (3) To expedite the request and approval, the technical and project reviews and approval may occur concurrently.
- (4) Once the DW request has been reviewed and concurred by project and technical authorities, the DW request will be forwarded to the approving authority.
- (5) The approving authority may reside at GRC or an outside organization which owns the requirement, such as another NASA Center or HQ.
- (6) Finally, the approved DW will be routed per the configuration plan and the policy of the requirement owner and project.

1.2 Records

1.2.1 Records Management

a. Each project is required to establish and maintain a repository of project records and products accessible by project staff and other appropriate project stakeholders. Each project *shall* include the following DW artifacts in this repository:

- (1) Completed DW form indicating disposition
- (2) If applicable, approval of the DW
- (3) If applicable, DW request submitted to non-GRC organization
- (4) Updated configuration and data management files

1.2.2 Inputs

a. Inputs to the DW activities will come from other program documentation and project processes. These inputs include, but are not limited to, the following:

- (1) Specified requirements document(s)

- (2) Problem identification
- (3) CPAR dispositions

1.2.3 Outputs

a. Outputs from the DW process include, but are not limited to, the following:

- (1) Completed and approved DW documented using the appropriate DW form
- (2) Updated configuration and data management files

1.2.4 Metrics (Used to Measure GLPR Procedure Effectiveness)

a. Requirements

(1) Percentage of fulfilled requirements defined in this document; approved, deviated, or waived requirements equal fulfilled requirements (reference Appendix C-Compliance Matrix, for the list of requirements).

(2) Number of DW requirements

a. Work Products and Templates

(1) Percentage of related, provided templates used during this process

(2) Number of deliverable/work products created without using provided templates

a. Project Configuration Management

(1) Percentage of deliverable/work products submitted to the Project Configuration Management Officer.

1.2.5 Lessons Learned

a. The PM will collect all lessons learned while performing this procedure and provide them to the office responsible for this procedural document.

b. Lessons learned *shall* be handled in accordance with (future directive) GLPR 7120.0.6-Lessons Learned.

Chapter 2. Responsibilities

2.1 Initiator

- a. Initiator is anyone requesting a deviation/waiver (DW) to a documented requirement.
 - (1) Initiator facilitates the flow of the DW request through this procedure, and where available, recommends the consolidation of the reviews to reduce the overall cycle time of this process.
 - (2) Initiator obtains the appropriate DW form and completes the form including identifying the responsible organization and approving authority.
 - (3) Initiator will identify the type of requirement being deviated or waived.
 - (4) Initiator will review the DW request with the responsible organization prior to GRC review and concurrence cycle.
 - (5) Initiator updates or withdraws DW requests; Dissenting Opinion process may be invoked if concurrence cannot be reached.

2.2 Approving Authority

- a. Approving authority has ultimate responsibility for controlling the requirement being deviated or waived. This role can reside inside or outside of GRC depending on where the requirement is held. A project applies many types of requirements that can have different approving authorities, such as project and technical. The approving authority will be defined by who owns the requirement rather than the overall project. The initiator will identify and document the approving authority on the DW form.
 - (1) Approving authority reviews the DW request including the specific details and concurrences that have been documented during the review cycles.
 - (2) Approving authority will approve and forward to the PM, or disapprove and forward to the initiator.

2.3 Projects Review Board (PRB)

- a. The GRC uses the Projects Review Board (PRB) to ensure consistent application of policies, guidelines, processes, standards, and requirements as part of the management review processes.
 - (1) The PM will present results of project review to PRB for concurrence.
 - (2) The PRB chair approves and signs the DW request form or disapproves and returns it to initiator.

2.4 Project Manager (PM)

- a. The PM is responsible for the formulation and implementation of the project per the governing agreement with the program manager. The PM is responsible for the safety, technical integrity, performance, and mission success of the project while meeting programmatic (cost and schedule) commitments.
 - (1) The PM may assign an initiator to document the DW request.
 - (2) The PM will review the DW request for any impacts to the programmatic (cost and schedule) commitments and documents them.

- (3) The PM approves and signs the DW request form or disapproves and returns it to the initiator.
- (4) If the DW is approved, the PM will define the appropriate path for the DW approved request to follow by either submitting it to the Project Configuration Management Officer, or including the DW in the Systems Engineering Management Plan or project plan.
- (5) The PM will identify if the requirement affects an institutional requirement, such as NASA Procedural Requirement (NPR) or Glenn Procedural Requirement (GLPR) and forwards it to the Center Document Manager (CDM) for Center processing and approval per GLPR 1410.1-GRC Directives Management.

2.5 Engineering Management Board (EMB)

a. The GRC uses the EMB to ensure consistent application of policies, guidelines, processes, standards, and requirements as part of the management review processes.

- (1) The EMB chair approves and signs the DW request form or disapproves and returns it to the initiator.

2.6 Project Chief Engineer (PCE)

a. Serves as project level engineering technical authority. Ensures that the project and technical planning is consistent with Agency and Center engineering design processes, specifications, rules, best practices, etc., necessary to fulfill mission performance requirements for the project.

- (1) The PCE may assign an initiator to document the DW request.
- (2) The PCE to present results of technical review to EMB for concurrence.
- (3) The PCE will review the DW request for any impacts to the technical commitments and documents them. The type and rigor of the review is left to the discretion of the PCE and may range from a cursory review to an Engineering Review Board (ERB).
- (4) The PCE approves and signs the DW request form or disapproves and returns it to the initiator.

2.7 Chief Safety and Mission Assurance Officer (CSO)

a. Serves as the project level safety and mission assurance (SMA) Technical Authority. Ensures that project and technical planning and implementation is consistent with Agency and Center SMA design processes, specifications, rules, and best practices as necessary to fulfill the mission and technical performance requirements of the project.

- (1) The CSO may assign an initiator to document the DW request.
- (2) The CSO will review the DW request for any impacts to the technical commitments and documents them. The type and rigor of the review is left to the discretion of the CSO and may range from a cursory review to an ERB.
- (3) The CSO approves and signs the DW request form or disapproves and returns it to the initiator.

2.8 Discipline Lead Engineer (DLE)

a. Works through and with the PCE to ensure proper application and management of discipline-specific engineering requirements and Agency standards.

b. Specifically, for DWs, the DLE:

- (1) Reviews the deviation/waiver request with the PCE to determine if a technical review is required.
- (2) Responsible for validating the feasibility of the DW, establishing an engineering position, and documenting a recommendation. The DLE should review all applicable materials including design and construction standards, engineering requirements, best practices, and lessons learned to form their recommendation.
- (3) Performs technical review to validate the feasibility of the requested DW.

2.9 Center Documentation Manager (CDM)

a. The CDM manages the GRC Business Management Systems (BMS), which includes configuration management of the GLPRs and the interface with NASA HQ for the NPRs.

- (1) The CDM will follow GLPR 1410.1, to document and receive GRC Center DW approval on the institutional requirements.

2.10 Responsible Organization

a. The responsible organization is the organization that has been given responsibility of writing and maintaining that requirement being deviated or waived. This responsibility can be identified in the following ways:

- (1) The NASA Procedural Requirement (NPR)-The GRC requirement owner is identified on the title page as the responsible office.
- (2) Technical Standards-Responsible GRC organization is provided in Appendix E (verify the version at <http://nasa.gov/standards> prior to use).
- (3) Glenn Procedural Requirement (GLPR)-The GRC requirement owner is identified on the title page as the responsible office.
- (4) Project System/Interface Requirements-The project assigns GRC requirement ownership per GLPR 7123.11-GRC Requirement Definitions and Management.

b. The responsible organization reviews the DW request and provides initial agreement to the DW request prior to organizational review.

Chapter 3. Deviation/Waiver (DW) Procedure

3.1 Project DW Disposition/Approval

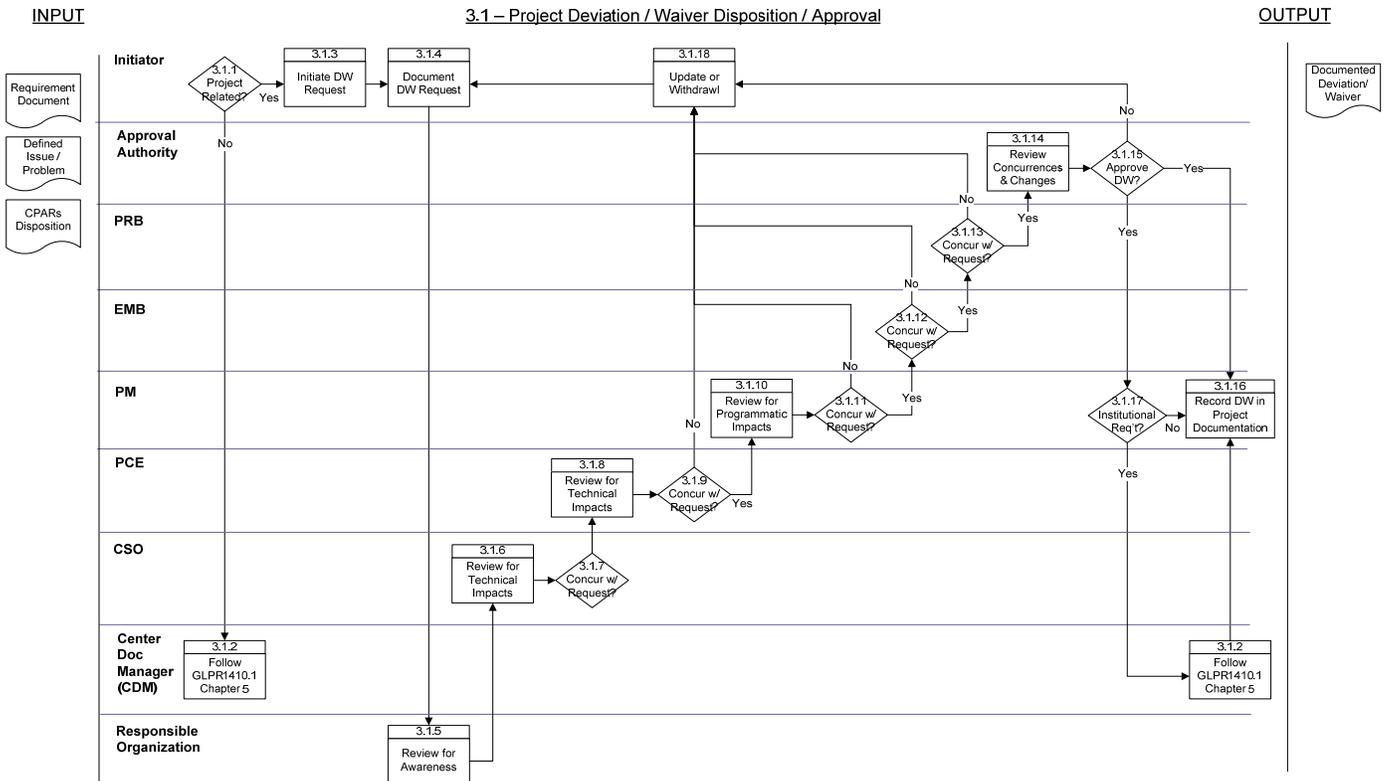


Figure 3.1-1—Deviation/Waiver Request Activity and Tasks

3.1.1 Is the DW Related to a Project?

a. The initiator *shall* identify if the DW is related to a project that includes using Engineering Management Board (EMB) and Projects Review Board (PRB) to review and approve project specific decisions as appropriate.

3.1.2 Nonproject Related DW will follow GLPR 1410.1 for Disposition

a. Initiator will forward the nonproject related DW to the Center Documentation Manager (CDM) to follow GLPR 1410.1-GRC Directive Management to request, disposition, and approve the DW.

3.1.3 Initiate DW

a. A DW can be initiated by anyone (initiator) associated with a project that identifies the need to deviate or waive a requirement imposed on that project. The DW triggers can include, but are not limited to:

- (1) Requirements may not apply to the project subject (e.g., facility requirements).
- (2) Project needs to document how requirements are consolidated.
- (3) Corrective and Preventive Action Reporting (CPAR) identifies a requirement not being met by the project.

b. The initiator can be assigned by the Project Manager (PM), Project Chief Engineer (PCE), Safety Mission and Assurance (SMA) lead, or Lead Systems Engineer (LSE) to address an issue or problem identified by the project, including CPARs.

c. The initiator will analyze the issue or problem and begin to gather information about the requirement(s).

3.1.4 Document DW Request

a. Initiator *shall* obtain the appropriate DW forms.

(1) The initiator will analyze the requirement and define which Center/organization has the approving authority of DW for this requirement; this will help the initiator identify the correct DW form to use.

(2) If the requirement approving authority is the responsibility of GRC, the initiator will use the GRC DW form found in Appendix D.1.

(3) If the requirement approving authority is the responsibility of another Center/organization, the initiator will obtain the appropriate project DW form as described by the project.

b. The initiator *shall* complete a DW form for each request.

(1) The PM may determine that multiple requests may be grouped onto one form, if the nature of the request is similar enough to warrant grouping.

c. Using the appropriate form, the initiator will document the details necessary for GRC to make an informed decision.

d. Initiator will identify the GRC responsible organization.

e. If appropriate, the initiator obtains DW request number from Project Configuration Management Office (PCMO).

f. Initiator will identify the approving authority of the DW; this authority should be documented in the requirements document. The approval will reside in one of the following organizations:

(1) Delegation from NASA Headquarters

(2) The GRC Directorate Offices

(3) Program/Project Office (including offices external to GRC)

g. The initiator will identify the type of requirement(s) being deviated/waived.

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

(2) Technical Requirements-Requirements that pertain to the technical aspects that the program/project must fulfill, such as performance-related issues, reliability issues, and availability issues.

(3) Institutional Requirements-Requirements that are defined at HQ or the Center level that impose requirements necessary to formulate and implement programs/projects. Examples of these would include NASA Procedural Requirements (NPRs), Glenn Procedural Procedures (GLPRs), and NASA Mandatory Standards.

h. All deviation and waiver will be classified as critical, major, or minor as follows. The classification will be noted on the deviation/waiver submittal.

(1) Critical-Involves safety or health

(2) Major-Affects any of the items listed below:

(a) Performance

(b) Interchangeability, reliability, survivability, maintainability, or durability of the item or its repair parts

(c) Effective use or operation

(d) Weight, balance, moment of inertia

(e) Appearance (when a factor)

(3) Minor-Does not involve any of the criteria of critical or major classifications

3.1.5 Review DW Request with Responsible Organization

a. Initiator will review the documented DW request with the responsible organization for understanding and completeness. The responsible organizations are identified in the following ways:

(1) Institutional requirement (NPR and GLPR) responsibilities are documented as the responsible office on the front cover of the specific NPR and GLPR document.

(2) The NASA Technical Standard responsibilities are listed in Appendix E of this document and can also be found at www.nasa.gov/grc/standards.

(3) Project requirement responsibilities are identified by the PM.

b. The initiator should meet with a representative from the responsible organization to review the initial reasons for the DW request and then forward to the PCE/Chief Safety and Mission Assurance Officer (CSO).

3.1.6 CSO Reviews for Technical Impacts

a. The CSO should review the DW request and determine if a formal technical review is necessary.

(1) This review should include analyzing how this DW impacts the project including the cumulative effect from existing DWs.

b. If the CSO determines that a formal technical review is required, an Engineering Review Board (ERB) will be conducted per GLPR 7123.36-Engineering Review Board Procedure on the requested DW to determine the technical impacts.

(1) The results of the ERB will be documented per GLPR 7123.36; this will include the position the ERB recommends to take with the DW.

3.1.7 CSO Concurrence

a. If CSO concurs with the DW request, document any artifacts and sign the DW request form in the appropriate place.

b. If the CSO determines that they do not concur with the DW, document any artifacts and note reasons for the nonconcurrence on the DW request form.

c. The CSO to forward DW request to PCE for review and concurrence.

3.1.8 PCE Review for Technical Impacts

- a. The PCE *shall* review the DW request and determine if a formal technical review is necessary.
 - (1) This review should include analyzing how this DW impacts the project including the cumulative effect from existing DWs.
- b. The PCE will determine the responsible Discipline Lead Engineer (DLE) for the topic area of the DW. The DLE *shall* be involved to disposition the DW request.
- c. If the PCE determines that a formal technical review is required, an ERB will be conducted per GLPR 7123.36 on the requested DW to determine the technical impacts.
 - (1) The results of the ERB will be documented per GLPR 7123.36; this will include the position the ERB recommends to take with the DW.

3.1.9 Technical Authority Concurrence

- a. Combining the disposition of the CSO and PCE will represent the technical authority decision on the DW.
- b. If the technical authority concurs with the DW request, document any artifacts and sign the DW request form in the appropriate place.
- c. The PCE forwards the DW request to PM for review and concurrence.
- d. If the technical authority determines that they do not concur with the DW, document any artifacts and note reasons for the nonconcurrence on the DW request form. The PCE returns the DW request to the initiator.

3.1.10 Review for Programmatic Impacts

- a. The PM *shall* review the DW request for impacts to the project.
 - (1) The PM will determine how formal of a review is necessary.
 - (2) If appropriate, the PM should use formal review process to include all interested project personnel.
 - (3) This review should include analyzing how this DW impacts the project including the cumulative effect from existing DW.
 - (4) The PM will document artifacts and materials used to make disposition.

3.1.11 PM Concurrence

- a. If PM concurs with the DW request, document any artifacts and sign the DW request form in the appropriate place.
- b. The PM will forward the DW request to the EMB for review and concurrence.
- c. If the PM does not concur with the DW, document any artifacts and note reasons for the nonconcurrence on the DW request form and return the DW request to the initiator.

3.1.12 EMB Concurrence

- a. The PCE/CSO presents the DW request to the EMB with background information and artifacts for concurrence.
- b. The EMB will review for concurrence. The rigor of this review may vary depending on the type and impacts of the DW.

(1) The majority of the EMB reviews will include the reviewing the process the PCE/CSO used to render their concurrence; this includes understanding the participants, review process, issues raised, and any dissenting opinions.

(2) The EMB may request the PCE/CSO to provide a more rigorous review if appropriate.

c. If the EMB concurs with the DW request, document any additional artifacts, and the EMB cochairs sign the DW request form in the appropriate place.

d. The PCE/CSO will forward the DW request to the PM for PRB review and concurrence.

e. If the EMB does not concur with the DW, document any additional artifacts, note reasons for the nonconcurrence on the DW request form, and return the DW request to the initiator.

3.1.13 PRB Concurrence

a. The PM presents the DW request to the PRB with background information and artifacts for concurrence.

b. The PRB will review for concurrence. The rigor of this review may vary depending on the type and impacts of the DW.

(1) The majority of the PRB reviews will include reviewing the process the PM used to render their concurrence; this includes understanding the participants, review process, issues raised, and any dissenting opinions.

(2) The PRB may request the PM to provide a more rigorous review if appropriate.

c. If the PRB concurs with the DW request, document any additional artifacts, the PRB chair signs the DW request form in the appropriate place, and forward to the approving authority.

d. If the PRB does not concur with the DW, document any additional artifacts and note reasons for the nonconcurrence on the DW request form. Return the DW request to the initiator.

3.1.14 Review DW Concurrences and Changes

a. The approving authority *shall* review the DW request and the signatures form to validate that the required concurrences have been obtained.

b. Approving authority will review the artifacts and supporting materials as appropriate to confirm the accuracy of the request.

3.1.15 DW Approval

a. Once the concurrences are obtained and the review is complete, the approving authority will approve the DW by signing the DW form.

b. The completed form will be forwarded to the PM for proper records management activity.

c. If the approving authority does not approve the request, document any additional artifacts, note reasons for the not approving the DW request form, and return the DW request to the initiator.

3.1.16 Record DW in Project Documentation

a. If the DW affects the Systems Engineering activity of the project, the DW will be recorded in the Systems Engineering Management Plan (SEMP).

(1) If the SEMP is baselined, the PM *shall* submit the approved DW request and all related DW materials to the PCMO per the project configuration process (future directive) GLPR 7123.34- Configuration Management and Data Management.

(2) If the SEMP is not baselined, the approved DW request will be forwarded to the Lead Systems Engineer (LSE). The LSE *shall* update the SEMP document, and any other effected documents, to include approved DW request.

b. If the DW affects the project planning activity of the project, the DW will be recorded in the project plan.

(1) If the project plan is baselined, the PM *shall* submit the approved DW request and all related DW materials to the PCMO per the project configuration process (future directive) GLPR 7123.34.

(2) If the project plan is not baselined, the approved DW request will be recorded in the project plan. The PM *shall* update the project plan document, and any other effected documents, to include the approved DW request.

3.1.17 Route Institutional Requirements to the Center Documentation Manager

a. If the DW affects either an NPR or GLPR the DW request *shall* be forwarded to the Center Documentation Manager (CDM) in the Office of Strategic Management (OSM) for proper approval at the strategic and executive levels of GRC.

3.1.18 Update or Withdraw the DW Request

a. If the DW request does not receive concurrence or approval from the project and technical reviewers, the initiator will review the comments and either modify or withdraw the request.

b. If concurrence cannot be reached, the Dissenting Opinion process may be invoked.

Chapter 4. Process Tailoring

4.1 General

- a. Projects that anticipate tailoring of the activities in this procedure *shall* generate a tailoring plan, included in the project's Systems Engineering Management Plan (SEMP), for approval by the designated governing authority.
- b. Additionally, see GLPR 7123.1-NASA Systems Engineering Processes and Requirements (Appendix B) for detailed tailoring guidance.

Chapter 5. Process Improvement

5.1 General

- a. The Project Manager, Project Chief Engineer (PCE), and Lead Systems Engineer should analyze the documents resulting from this procedure to determine if any changes or improvements to this procedure would have made results easier, more reliable, or higher quality.
- b. The PCE should provide this feedback to this procedure's author if the analysis indicates changes and/or improvements in this procedure are warranted.

Appendix A. Definitions

A.1 Change (a.k.a., Change Request). A permanent change to a documented requirement for all future efforts to satisfy the requirement. Change requests are outside the scope of this document and will be addressed using a separate configuration management procedural document.

A.2 Designated Governing Authority (DGA). The individual who specifically maintains technical responsibility over establishment of, changes to, and waivers of requirements in a designated area. At GRC, this is the Director of Engineering or the Director's designee.

A.3 Deviation. A documented authorization releasing a program or project from meeting a requirement before the requirement is put under configuration control at the level the requirement will be implemented.

A.4 Discipline Lead Engineer (DLE). The subject matter expert in a specific discipline or related discipline who executes the technical authority with respect to those discipline principles that are applied to any specific project.

A.5 Dissenting Opinion. A substantive disagreement with a decision or action that an individual judges is not in the best interest of NASA and is of sufficient importance that it warrants a review and decision by higher level management. A dissenting opinion must be supportable and based on sound rationale (not on unyielding opposition). The individual must specifically request that the dissent be recorded and resolved by the Dissenting Opinion process as defined in the GRC Technical Authority Implementation Plan.

A.6 Engineering Management Council (EMC). Chaired by the Director of Engineering, this council is chartered to evaluate technical issues, engineering management issues, products and solutions for resolution, as well as provide technical direction, advice, and council to the Project Chief Engineers (PCEs), Project Lead Engineers (PLEs), and DLEs. The council integrates varying engineering positions into a comprehensive engineering solution and makes recommendations to the Center Director, as necessary, for Center Director as the Center technical authority.

A.7 Project. A specific investment having defined requirements, a life cycle cost, a beginning, and an end. A project yields new or revised products that directly address NASA's strategic needs.

A.8 Project Chief Engineer (PCE). The subject matter expert in a specific system or related family of systems. The PCE executes the technical authority for the assigned program, project, or element at the Center. The PCE will serve as the single point of contact for the execution of the technical authority process.

A.9 Projects Review Board (PRB). This board is chaired by the Director of Space Flight Systems. Its primary responsibility is to resolve any program and project issues and risks that are within the Center's control. See Charter for membership and duties.

A.10 Project Lead Engineer (PLE). At GRC the title of PLE might be substituted for PCE within lower level projects or elements that are considered significant enough to require a designated lower level equivalent of the PCE. Organizationally, PCEs will be part of the GRC Chief Engineers Office (CEO) whereas PLEs will reside in their home organization.

A.11 Requirement Baseline. A requirement baseline is established when the project has formally adopted the requirement through board action and/or change request. This could be individual requirements (line by line) or the whole document.

A.12 Requirements, Programmatic. Requirements Set By the Mission Directorate, Program, Project, and PI, If Applicable. These include strategic scientific and exploration requirements, system performance requirements, and schedule, cost, and similar nontechnical constraints. These also include Program/Project Management Requirements, including requirements that focus on how NASA and the Center perform program and project management activities.

A.13 Requirements—Technical. Requirements that pertain to the technical aspects that the program/project must fulfill, such as performance-related issues, reliability issues, and availability issues.

A.14 Requirements—Institutional. Requirements that are defined at Headquarters (HQ) or the Center level that impose requirements necessary to formulate and implement programs/projects. Examples of these would include NASA Procedural Requirements (NPRs), Glenn Procedural Procedures (GLPRs), and NASA Mandatory Standards.

A.15 Research Review Board (RRB). This board is chaired by the Director of Research. Its primary responsibility is to resolve any major research issues and risks that are within the Center's control. See Charter for membership and duties.

A.16 Senior Management Council (SMC). This council is the highest level GRC governing body and is chaired by the Center Director. Its primary responsibility is to oversee and evaluate the Center's project, research, engineering, and institutional activities.

A.17 Tailor. Prior to execution of a project, project management anticipates the need to perform a requirement at less than the maximum scope, frequency, or detail level indicated. Approval for this performance level is obtained before proceeding with project plans.

A.18 Tailoring. The process used to adjust or seek relief from a prescribed requirement to accommodate the needs of a specific activity or task for a project. The tailoring process results in the generation of deviations, waivers, or changes depending on requirement applicability, the risk involved, and the timing of the request.

A.19 Technical Authority. The individual who maintains independent technical authority by setting and controlling technical requirements and approving any deviations, waivers, or changes from such requirements at the level commensurate with his/her authority.

A.20 Waiver. A documented authorization releasing a program or project from meeting a requirement after the requirement is put under configuration control at the level the requirement will be implemented.

Appendix B. Acronyms

- B.1 ATD. Advanced Technology Development
- B.2 BMS. Business Management System
- B.3 CDM. Center Documentation Manager
- B.4 CEO. Chief Engineers Office
- B.5 CoF. Construction of Facilities
- B.6 CMC. Center Management Council
- B.7 CPAR. Corrective and Preventive Action Reporting
- B.8 CSO. Chief Safety and Mission Assurance Officer
- B.9 DGA. Designated Governing Authority. (At GRC = Director of Engineering)
- B.10 DLE. Discipline Lead Engineer
- B.11 DW. Deviation/Waiver
- B.12 EEE. Electrical, Electronic, and Electromechanical
- B.13 EMB. Engineering Management Board
- B.14 EMC. Engineering Management Council
- B.15 ERB. Engineering Review Board
- B.16 FS&GS. Flight Systems and Around Support
- B.17 GLID. Glenn Interim Directive
- B.18 GLPR. Glenn Procedural Requirement
- B.19 GRC. Glenn Research Center
- B.20 GSE. Ground Support Equipment
- B.21 HQ. Headquarters
- B.22 LLIS. Lessons Learned Information System
- B.23 LSE. Lead Systems Engineer
- B.24 MVA. Materials Usage Agreement
- B.25 NPR. NASA Procedural Requirement
- B.26 PA. Project Authority
- B.27 PCE. Project Chief Engineer
- B.28 PCMO. Project Configuration Management Office
- B.29 PLE. Project Lead Engineer
- B.30 PM. Project Manager
- B.31 PRB. Projects Review Board

B.32 SEMP. Systems Engineering Management Plan

B.33 SMC. Senior Management Council

B.34 TWG. Technical Working Group

B.35 RRB. Research Review Board

Appendix C. Compliance Matrix

- a. The following compliance matrix will be used by Center authorities to monitor and report degrees of compliance with this procedure across the body of projects at the Center.
- b. The purpose of this monitoring is to ascertain whether NASA Procedural Requirements (NPRs) are being met at the Center-level.

Req ID	GLPR Section	Requirement Statement	Project Implementation Intent			
			Existing Project Doc/Section	Compliance		
				Full	Partial	None
1	P.2	The requirements of this GLPR apply to Construction of Facilities (CoF) project work that directly interfaces with flight hardware. Facilities project work up to the defined interface shall conform to the requirements of NPR 8820.2. These interfaces are defined in the Systems Engineering Management Plan (SEMP) as defined in GLPR 7120.5.40-GRC Project and Technical Planning.				
2	1.1.2	The DW request will be formally reviewed by both project and technical authorities for concurrence. If concurrence cannot be reached the dissenting opinion process shall be invoked.				
3	1.2.1	Each project shall include the following DW artifacts in this repository: (1) Completed DW form indicating disposition (2) If applicable, approval of the DW (3) If applicable, DW request submitted to non-GRC organization (4) Updated configuration and data management files				
4	1.2.50	b. Lessons learned shall be handled in accordance with (future directive) GLPR 7120.0.6-Lessons Learned.				
5	3.1.1a	The initiator shall identify if the DW is related to a project that includes using Engineering Management Board (EMB) and Projects Review Board (PRB) to review and approve project specific decisions as appropriate.				
6	3.1.4a	Initiator shall obtain the appropriate DW forms.				
7	3.1.4b	The initiator shall complete a DW form for each request.				
8	3.1.6	The CSO should review the DW request and determine if a formal technical review is necessary.				
9	3.1.8	The PCE shall review the DW request and determine if a formal technical review is necessary				
10	3.1.10	a. The PM shall review the DW request for impacts to the project				
11	3.1.14	a. The approving authority shall review the DW request and the signatures form to validate that the required concurrences have been obtained.				

Req ID	GLPR Section	Requirement Statement	Project Implementation Intent			
			Existing Project Doc/Section	Compliance		
				Full	Partial	None
12	3.1.16	a. The approving authority shall review the DW request and the signatures form to validate that the required concurrences have been obtained.				
13	3.1.16	(1) If the SEMP is baselined, the PM shall submit the approved DW request and all related DW materials to the PCMO per the project configuration process (future directive) GLPR 7123.34- Configuration Management and Data Management.				
14	3.1.16	(2) If the SEMP is not baselined, the approved DW request will be forwarded to the Lead Systems Engineer (LSE). The LSE shall update the SEMP document, and any other effected documents, to include approved DW request.				
15	3.1.16	(1) If the project plan is baselined, the PM shall submit the approved DW request and all related DW materials to the PCMO per the project configuration process (future directive) GLPR 7123.34				
16	3.1.16	(2) If the project plan is not baselined, the approved DW request will be recorded in the project plan. The PM shall update the project plan document, and any other effected documents, to include the approved DW request.				
17	3.1.18	a. If the DW affects either an NPR or GLPR the DW request shall be forwarded to the Center Documentation Manager (CDM) in the Office of Strategic Management (OSM) for proper approval at the strategic and executive levels of GRC.				
18	4.1	Projects that anticipate tailoring of the activities in this procedure shall generate a tailoring plan, included in the project's Systems Engineering Management Plan (SEMP), for approval by the designated governing authority.				

Appendix D. Forms

D.1 GRC Deviation/Waiver (DW) Form

GRC Deviation/Waiver		1. DEVIATION/WAIVER REQUEST NUMBER <i>(Assigned by PCMO)</i>	
<input type="checkbox"/> ADDITIONAL INFORMATION IS ATTACHED		2. PROJECT NAME	
3. NAME AND ORGANIZATION OF INITIATOR		4. DATE REQUESTED	5. DATE REQUIRED
6. NAME/LOCATION OF REQUIREMENT OWNER		7. REQUIREMENT TO BE AFFECTED	
8. CLASSIFICATIONS	9. PROJECT DELIVERABLE AFFECTED	10. DEVIATION/WAIVER TO:	
<input type="checkbox"/> CRITICAL	<input type="checkbox"/> NONE	<input type="checkbox"/> GROUND	<input type="checkbox"/> SYSTEM/INTERFACE REQUIREMENT
<input type="checkbox"/> MAJOR	<input type="checkbox"/> FLIGHT	<input type="checkbox"/> SOFTWARE	<input type="checkbox"/> TECHNICAL STANDARD
<input type="checkbox"/> MINOR	<input type="checkbox"/> OTHER <i>(specify)</i>	<input type="checkbox"/> GLPR	<input type="checkbox"/> NPR
<input type="checkbox"/> OTHER <i>(specify)</i>			
11. ORIGINAL REQUIREMENT OF DOCUMENT <i>(List appropriate sections or text)</i>			
12. DEVIATION/WAIVER REQUESTED			
13. REASON/JUSTIFICATION <i>(Attach additional information, if necessary)</i>			
14. IMPACT AND RISK ASSESSMENT OF THE PROGRAM/PROJECT IF APPROVED			
ACCEPTANCE AND CONCURRENCE <i>(Sign and date)</i>			
INITIATOR:		EMB CHAIR:	
PCE:		SMB CHAIR:	
CSO:		PRB CHAIR:	
PM:			
APPROVED <i>(Sign and date)</i>			
APPROVING AUTHORITY: _____			PAGE _____

GRC 2000 (MAY 10)

Appendix E. Mandatory NASA Headquarters (HQ) Standards

Mandatory Standards GRC DLE Assignments

These standards apply to all current and future NASA space flight programs and projects (including spacecraft, launch vehicles, instruments developed for space flight programs and projects, research and technology developments funded by and to be incorporated into space flight programs and projects, critical technical facilities specifically developed or significantly modified for space flight systems, and ground systems that are in direct support of space flight operations). The standards also apply to reimbursable space flight projects performed for non-NASA sponsors. The list of Mandatory/Core Standards will be mandatory for all projects and technical activities at each Center unless a formal waiver or exception has been processed and approved by the cognizant technical authority.

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Discipline	Standard	Title	Application	Citation	GRC POC
Electrical	NASA-STD-4003	Electrical Bonding for NASA Launch Vehicles, Spacecraft, Payloads, and Flight Equipment	All NASA human rated and robotic missions		DPP
Electrical	NASA-STD-4005	Low Earth Orbit Spacecraft Charging Design Standard	All NASA human rated and robotic missions	<ul style="list-style-type: none"> Does not apply to payloads and hardware for atmospheric or sub-orbital flights, including sounding rockets, balloons, and aircraft (either man or unmanned) launch systems. Does not apply to Class D programs/payloads. 	RPV
Electrical	AIAA S-111-2005	Qualification and Quality Requirements for Space Solar Cells	All NASA human rated and robotic missions	<ul style="list-style-type: none"> Not to include nonspace-based applications and atmospheric flight vehicles at flight levels below 100 K ft either manned or unmanned. 	RPV
Electrical	AIAA S-112-2005	Qualification and Quality Requirements for Space Solar Panels	All NASA human rated and robotic missions		RPV
Electrical	MIL-STD-461E	Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment	All NASA human rated and robotic missions		DPE
Human Factors	NASA-STD-3000B Volume I	Man-Systems Integration Standards	All NASA human rated missions		DSV
Human Factors	NASA-STD-3000B Volume II	Man-Systems Integration Standards	All NASA human rated missions		DSV

Mandatory Standards GRC DLE Assignments

These standards apply to all current and future NASA space flight programs and projects (including spacecraft, launch vehicles, instruments developed for space flight programs and projects, research and technology developments funded by and to be incorporated into space flight programs and projects, critical technical facilities specifically developed or significantly modified for space flight systems, and ground systems that are in direct support of space flight operations). The standards also apply to reimbursable space flight projects performed for non-NASA sponsors. The list of Mandatory/Core Standards will be mandatory for all projects and technical activities at each Center unless a formal waiver or exception has been processed and approved by the cognizant technical authority.

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Discipline	Standard	Title	Application	Citation	GRC POC
M&P	NASA-STD-5006	General Fusion Welding Requirements for Aerospace Materials Used in Flight Hardware	All NASA human rated and robotic missions	<ul style="list-style-type: none"> Applies to welds on flight hardware and to the design of welded hardware. All deviations, exceptions, and waivers from the requirements contained in NASA-STD-5006 <i>shall</i> be approved via a Materials Usage Agreement (MUA). An MUA is a formal document, approved by the Responsible Materials and Processes Authority, showing that a noncompliant material is acceptable for the specific application identified. The Responsible Materials and Processes Authority is the designated individual, panel, or group at the NASA center or sponsoring institution responsible for materials and processes control, which has the authority to interpret materials and processes requirements. 	QEA
M&P	NASA-STD-6001	Flammability, Odor, Offgassing and Compatibility Requirements and Test Procedures for Materials in Environments that Support Combustion (Superseding NHB-8060.1C)	All NASA human rated missions	<ul style="list-style-type: none"> Applies to evaluation, testing, and selection of materials that are intended for use in space vehicles, specified test facilities, and specified ground support equipment (GSE). All deviations, exceptions, and waivers from the requirements contained in NASA-STD-6001 <i>shall</i> be approved via a Materials Usage Agreement (MUA). An MUA is a formal document, approved by the Responsible Materials and Processes Authority, showing that a noncompliant material is acceptable for the specific application identified. The Responsible Materials and Processes Authority is the designated individual, panel, or group at the NASA center or sponsoring institution responsible for materials and processes control, which has the authority to interpret materials and processes requirements. 	QEA

Mandatory Standards GRC DLE Assignments

These standards apply to all current and future NASA space flight programs and projects (including spacecraft, launch vehicles, instruments developed for space flight programs and projects, research and technology developments funded by and to be incorporated into space flight programs and projects, critical technical facilities specifically developed or significantly modified for space flight systems, and ground systems that are in direct support of space flight operations). The standards also apply to reimbursable space flight projects performed for non-NASA sponsors. The list of Mandatory/Core Standards will be mandatory for all projects and technical activities at each Center unless a formal waiver or exception has been processed and approved by the cognizant technical authority.

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Discipline	Standard	Title	Application	Citation	GRC POC
M&P	NAS410	National Aerospace Standard Certification and Qualification of Nondestructive Test Personnel	All NASA human rated and robotic missions	<ul style="list-style-type: none"> Does not apply to individuals who only have administrative authority over the personnel identified above, nor does it apply to research personnel developing technology for subsequent approval by a certified Level 3. All deviations, exceptions, and waivers from the requirements contained in NAS410 <i>shall</i> be approved via a Materials Usage Agreement (MUA). An MUA is a formal document, approved by the Responsible Materials and Processes Authority, showing that a noncompliant material is acceptable for the specific application identified. The Responsible Materials and Processes Authority is the designated individual, panel, or group at the NASA center or sponsoring institution responsible for materials and processes control, which has the authority to interpret materials and processes requirements. 	QEA
Structures/MEQ	NASA-STD-5001	Structural Design and Test Factors of Safety for Spaceflight Hardware	All NASA human rated and robotic missions	<ul style="list-style-type: none"> Requirements specifically excluded from this standard are design loads determination, fracture control, pressure vessels, pressurized components, engines, rotating hardware, solid propellant, insulation, ground support equipment, facilities, specific configuration factors such as fitting factors, buckling knockdown factors, and load uncertainty factors. 	DES
Structures/MEQ	NASA-STD-5002	Load Analyses of Spacecraft and Payloads	All NASA human rated and robotic missions	<ul style="list-style-type: none"> Does not apply to payloads and hardware for atmospheric or sub-orbital flights, including sounding rockets, balloons, and aircraft (either man or unmanned) launch systems. Does not apply to Class D programs/ payloads. 	DEV

Mandatory Standards GRC DLE Assignments

These standards apply to all current and future NASA space flight programs and projects (including spacecraft, launch vehicles, instruments developed for space flight programs and projects, research and technology developments funded by and to be incorporated into space flight programs and projects, critical technical facilities specifically developed or significantly modified for space flight systems, and ground systems that are in direct support of space flight operations). The standards also apply to reimbursable space flight projects performed for non-NASA sponsors. The list of Mandatory/Core Standards will be mandatory for all projects and technical activities at each Center unless a formal waiver or exception has been processed and approved by the cognizant technical authority.

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Discipline	Standard	Title	Application	Citation	GRC POC
Structures/ MEQ	NASA-STD-5017	Design and Development Requirements for Mechanisms	All NASA human rated and robotic missions	<ul style="list-style-type: none"> Applies to Flight Mechanisms. Specifically does not address human factors requirements. Does not except a mechanism from any safety, fault tolerance, or hazard control requirements. 	DER
Structures/ MEQ	AIAA S-080-1998	Space Systems, Metallic Pressure Vessels, Pressurized Structures, and Pressure Components	All NASA human rated and robotic missions	<ul style="list-style-type: none"> Applies to spaceflight metallic pressurized hardware used in Space Flight Systems such as spacecraft and launch vehicles. 	DES
Structures/ MEQ	AIAA S-081A-2006	AIAA Standard for Space Systems—Composite Overwrapped Pressure Vessels (COPVs)	All NASA human rated and robotic missions	<ul style="list-style-type: none"> Applies to composite overwrapped pressure vessels (COPVs) containing a metallic liner used for pressurized, hazardous, or nonhazardous liquid or gas storage in space systems including spacecraft and launch vehicles. 	DES
Operations	AFSPCMAN 91-710	Range Safety User Requirements Manual	All NASA human rated and robotic missions	<ul style="list-style-type: none"> Applies to all activities from or onto Air Force Space Command ranges, including the Western Range at Vandenberg Air Force Base, California, and the Eastern Range at Patrick Air Force Base, Florida. Does not apply to launches from Wallops Flight Facility in Virginia. 	DPS
Program Control	NASA-STD-6002	Applying Data Matrix Identification Symbols on Aerospace Parts	All NASA human rated and robotic missions	<ul style="list-style-type: none"> NASA projects that do not require marking of parts are exempt from this standard. Applies to identification of all flight hardware and ground support equipment. Shall not be used for electrical, electronic, and electromechanical (EEE) parts identification and marking requirements due to concerns relating to electrostatic discharge and component degradation; EEE part marking and identification are addressed in the military standards for the 	DSV

Mandatory Standards GRC DLE Assignments

These standards apply to all current and future NASA space flight programs and projects (including spacecraft, launch vehicles, instruments developed for space flight programs and projects, research and technology developments funded by and to be incorporated into space flight programs and projects, critical technical facilities specifically developed or significantly modified for space flight systems, and ground systems that are in direct support of space flight operations). The standards also apply to reimbursable space flight projects performed for non-NASA sponsors. The list of Mandatory/Core Standards will be mandatory for all projects and technical activities at each Center unless a formal waiver or exception has been processed and approved by the cognizant technical authority.

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Discipline	Standard	Title	Application	Citation	GRC POC
				<ul style="list-style-type: none"> specific part types. Human-readable markings applied to NASA aircraft maintained under FAA certificate such as Part 121 or Part 135 <i>shall</i> comply with Title 14 of the Code of Federal Regulations. 	
Test & Verification	NASA-STD-7001	Payload Vibroacoustic Test Criteria	All NASA human rated and robotic missions	<ul style="list-style-type: none"> Does not apply to launch vehicles, payloads launched by sounding rockets, aircraft and balloons, and ground support equipment. Does not apply to Class D programs/ payloads. 	DEV
Test & Verification	NASA-STD-7002	Payload Test Requirements	All NASA human rated and robotic missions	<ul style="list-style-type: none"> Applies to payload hardware launched on expendable or reusable launch vehicles (both free-flyer and attached payloads). The levels of assembly for which the standard applies are the payload, modular subsystem (which includes large instruments), and component levels. Excludes payloads launched on sounding rockets, balloons, and aircraft, as well as the launch vehicle hardware itself. Does not apply to Class D programs/ payloads. 	DSV
Test & Verification	NASA-STD-7003	Pyroshock Test Criteria	All NASA human rated and robotic missions	<ul style="list-style-type: none"> Applies to development of pyroshock test criteria for NASA spacecraft, space flight payloads, and launch vehicle hardware. Not to include pyroshock testing of nonspaced-rated vehicles, payloads, and transport systems designed for atmospheric flight below 200 k ft including rocketsondes, balloons, and aircraft (either man and unmanned) launch systems. 	DEV