Ames Procedural Requirements

APR 8735.3
Effective Date: August 15, 2023
Expiration Date: August 15, 2028

COMPLIANCE IS MANDATORY

Subject: Control of Nonconforming Products and Services

Responsible Office: Code Q / Safety and Mission Assurance Directorate

CHANGE LOG

Status [Baseline /Revision /Cancelled]	Document Revision	Date of Change	Description
Baseline	-	8/15/2023	New baseline. Incorporated APD 8735.3 into this APR, streamlined signature requirements defined within and as reflected in the PRACA tool, and streamlined NCR categories to Low, Medium, and High in the Nonconformance Criticality Matrix.

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PREFACE

P.1 PURPOSE

a. This document defines the requirements and responsibilities to ensure Ames Research Center (ARC) verifies that products and services meet requirements before delivery to ARC from an outside organization, from ARC to an outside organization, or from one ARC organization to another ARC organization. This verification ensures the Nonconformance Report (NCR) element of the quality assurance ensemble of core processes, which include the Corrective Action Request (CAR), and Deviation/Waivers (D/Ws) for use in the case where requirements are limited or not fully met, are identified and properly controlled. This includes the remediation, documentation, and disposition of nonconforming products and services ("nonconformances") discovered before or after delivery to the customer. In total, these integrated core processes are intended to ensure that customer requirements are met and documented in the most effective and efficient manner possible.

b. Use of this document ensures suspect nonconformances are identified and documented; are investigated and root cause is determined; that corrective action is identified, and assigned; that severity of impact (residual risk) is understood and recurrence is controlled; and that the nonconformance is dispositioned and verified (see Appendix A for definition) to be compliant with specifications and (if necessary) validated (see Appendix A for definition) to ensure requirements are met and closed with appropriate rationale.. In addition, use of this document ensures that any CAPs stemming from nonconforming products or services receive validation and verification for their effectiveness.

c. ARC's Problem Reporting and Corrective Action (PRACA) system is used to implement this document and electronically generate, manage, and archive NCRs, CARs, and D/Ws.

d. NCRs of developmental hardware or non-critical facilities with low residual risk to flight hardware or critical facilities may use other tools defined by the Project tracking and closure of the NCRs.

P.2 APPLICABILITY

a. This procedural requirement is applicable to ARC and associated facilities.

b. This procedural requirement applies to contractors, grant recipients, or parties to agreements only to the extent specified or referenced in the appropriate contracts, grants, or agreements.

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

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

e. The requirements in this APR apply to programs and projects led by ARC and critical facilities. In this directive, the "flight system" includes:

(1) Materials, machinery, equipment, subsystems, platforms, parts, and assemblies used in airborne and space flight systems.

(2) Facilities specifically developed or significantly modified for flight systems and/or ground systems that are in direct support of flight operations.

f. For those activities wherein ARC is responsible for a task within a project led by an external organization, ARC will support the governance policies and requirements of the lead organization and tailor ARC processes in coordination with the lead organization. This tailoring will be approved by ARC Technical Authorities and formally documented in the Customer Agreement or Statement of Work.

P.3 AUTHORITY

a. NPD 1280.1, NASA Integrated Management System Policy

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

P.4 APPLICABLE DOCUMENTS AND FORMS

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

b NPR 7120.8, NASA Research and Technology Program and Project Management Requirements

b. APR 7120.3, Development and Operation of Center Critical Facilities and Infrastructure

c. APR 8000.4, Risk Management Process Requirements

d. APR 8735.2, Deviation and Waiver Process

P.5 MEASUREMENT/VERIFICATION

a. Verification of conformance to requirements in this directive are measured through Center and Responsible Organizational management reviews, self-assessments, and subsequent analysis and reports of conformance to requirements, as well as periodic internal audits.

P.6 CANCELLATION

a. APD 8735.3, Verification of Product/Service Conformance to Requirements, dated May 7, 2018.

b. APR 8735.3, Control of Nonconforming Products and Services, dated April 24, 2018.

Eugene Tu
Director

DISTRIBUTION STATEMENT:

Internal and external distribution.

CHAPTER 1 RESPONSIBILITIES

1.1 **Organizational Directors** shall:

a. Assure the recording and remediation of products for space flight and flight-related hardware, critical facilities, and services that do not meet documented requirements using the Center-wide nonconformance reporting process defined in Chapter 2 below

b. Ensure the corrective actions required for the closure of NCRs are completed by the planned dates or appropriate extension is reviewed and approved.

1.2 **All Personnel** shall:

a. Identify and segregate suspect nonconforming items to prevent unintended use, and protect nonconforming items with appropriate labeling, packaging, and storage to preclude damage or deterioration.

b. Notify the Project Manager or Line Manager of the suspected nonconformance.

c. Document and describe nonconformities using the nonconformance reporting process prescribed in Chapter 2 below and identify the vendor or supplier of the non-conforming product/service.

d. Document immediate action(s) taken in the NCR.

1.3 **Project Managers (PMs)** shall:

a. Assure that reports of nonconformances identify the vendor or supplier, are accurate, submitted, evaluated, and acted upon.

b. Assure a target completion date is provided for corrective action(s) and disposition(s) of the NCR:

(1) For hardware and software, NCRs will be completed prior to Pre-Ship Review unless the discrepent work will be completed at the receiving destination as forward work. This work should be addressed as part of the Pre-Ship Review.

(2) For Critical Facilities, NCRs will be completed prior to recertification/authorization to run.

Note: In the event of a nonconformance identified after launch, the appropriate authority listed in Section 2.4 will agree to and establish the target completion date.

c. Assure in-process and final verification activities (inspections/tests etc.) are documented and conducted by personnel specifically qualified in accordance with planned methods and acceptance criteria.

d. Asssure verification activities are implemented as planned:

(1) Acquisitions (e.g., Customer-supplied items, purchases, etc.) are to be verified during receiving inspections and tests, or during acceptance at the supplier's facility by Ames SMA representatives.

(2) These verifications may be tailored based on the criticality of the acquisition to its application, the degree of control exercised during production, and the availability of conformance records from the supplier.

e. Assure no delivery of any product or service until all planned inspections, tests, verification and validation activities, and reviews have been satisfactorily completed and recorded including the availability of all associated data and documentation.

f. Assure products/services released for urgent use before completion of verification activities are:

(1) Suitably identified and recorded as having incomplete verification.

(2) Not precluded from subsequent completion of planned verification activities (such as due to assembly or including within an assembly).

(3) Processed on a Deviation/Waiver in accordance with APR 8735.2.

g. Assure records of verification completion status and acceptance status are maintained, including identifying the person(s) who authorized acceptance or delivery of the product/service.

h. Coordinate the formation and membership of a Control Board (CB) for NCRs rated above a criticality of Low in accordance with Section 2.3.

i. Assess the residual risk resulting from dispositioning an NCR in accordance with APR 8000.4.

j. Categorize all NCRs stemming from NPR 7120.5 or NPR 7120.8 project workfor the NCR's level of criticality according to Table 2 (see Chapter 2), such that the NCR is given the criticality level corresponding to the highest level of any of the five impact areas

k. Assure that identified nonconforming materials and products are controlled as defined in this procedure so that they are not delivered to a customer unless authorized by the customer in writing.

l. Assure that all stakeholders are notified and provided follow-on communications through final disposition of the nonconformance. Dispositioning of NCRs shall be accomplished by a Subject Matter Expert (SME) or an engineer of the appropriate engineering discipline, or the project’s Lead System Engineer.

m. Assure remedial disposition of nonconformities are implemented within the assigned target date and are based on:

(1) Root cause analysis.

(2) Analysis of impact on design margins and residual risk.

(3) Evaluation of impact on safety, functionality, and customer satisfaction.

(4) Consideration of cost and schedule impact.

(5) Identification of less demanding alternative applications for nonconforming items.

(6) Obtaining a customer approved D/W for acceptable nonconformities when required.

n. Ensure that repair and use-as-is remedial actions (i.e., product/service won't meet original requirements) are:

(1) Approved by the relevant engineering function, and in the case of a repair, alternative acceptance criteria are defined.

(2) Approved by the relevant SMA representative.

Note: Customers may reserve the right to approve repair and use-as-is remedial actions since they result in delivery of nonconforming items (e.g., if an NCR is initiated due to a material surface or cosmetic issue that will not impact performance).

o. Assure SMA, with any other authorized personnel inspect and release nonconforming materials or products after repair or rework.

p. Assure submittal of Lessons Learned in ARC's Lessons Learned Database (LLDB) at https://nasa.sharepoint.com/sites/arc- lldb/Lists/LLDB/SearchLLs.aspx and Government-Industry Data Exchange Program (GIDEP) failure reporting (as applicable). Reference APR 8735.1 for GIDEP.

q. Assure NCR report closure after authorized remedial actions and final disposition of the nonconformance have been fully implemented, including any re-inspection, re-test, or re-analysis.

r. Coordinate MRB membership with the System Safety and Mission Assurance (SSMA) Division Chief or, if delegated, the MAM/CSO.

s. Assure the Line Manager of the PM's organization is notified for NCRs with criticality equal to or greater than Medium.

t. Submit documented justification to the PRACA Manager, with SMA/CSO concurrence, for a PRACA record to be administratively closed (e.g., project is cancelled, re-engineered hardware, etc.), to the PRACA Manager.

1.4 Line Managers shall be responsible for nonconformances as follows:

a. For a nonconformance that occurred in an institution's facilities or a Construction of Facilities project, the owning facility's Line Manager is responsible as a Project Manager specified in section 1.3.

b. For a nonconformance that occurred in flight programs and projects, the Line Manager of the Project Manager's organization is responsible for cognizance of NCRs with a criticality greater than or equal to Medium by participating in periodic project reviews.

1.5 PRACA Manager shall:

a. Administratively close PRACA records as requested with the appropriate documentation called out in this APR.

b. Assess patterns and trends in Center-wide NCR data and provide quarterly report to Ames Quality Management System (AQMS) Office and SSMA Division Chief.

c. Recommend corrective actions and improvements actions to SMA Director, AQMS Office, and SSMA Division Chief, based on assessment of trends in NCR data.

1.6 Project MAM or CSO shall:

a. Ensure that the Agency, Center, or customer-directed requirements for SMA activities are addressed in all NCRs.

b. Ensure NCRs have the required documentation and signatures corresponding to each NCR's criticality level.

c. Provide verification and validation of all NCR dispositions including corrective actions when applicable and authorize closure after all necessary information and signatures have been collected.

d. Complete acceptance of any open test or manufacturing operations that supported the issuance of the NCR.

e. Chair the CB and coordinate its membership with the Project Manager and/or the Line Manager.

1.7 The Control Board shall:

a. Include members representing Project, Engineering, and SMA functions.

b. Authorize a disposition for each nonconformance, based on evaluations provided by Subject Matter Experts.

c. Define usage restrictions on the PRACA record when the product is re-graded for a less demanding application.

d. Define processing requirements and re-inspection criteria on the PRACA record when a rework or repair disposition is authorized.

e. Determine whether Corrective Action should be initiated to preclude/minimize similar nonconformities.

f. Issue a CAR when it is determined that a correction should be initiated.

g. Document in the PRACA record when the CB determines that no Corrective Action is required.

1.8 **The Control Board Chair** shall coordinate CB activities, in accordance with requirements of this APR.

1.10 The Ames Chief Engineer (as the Center's Engineering Technical Authority) shall review and approve or disapprove NCRs with a criticality level of high that they deem applicable to their purview.

1.11 The Safety and Mission Assurance Directorate (as the Center's SMA Technical Authority and Health and Medical Technical Authority) shall:

a. Review and approve or disapprove NCRs with a criticality level of high that they deem applicable to their purview.

b. Appoint PRACA Manager.

1.12 The Deputy Center Director shall review and approve or disapprove NCRs with a criticality level of High.

CHAPTER 2 PROCEDURAL REQUIREMENTS

2.1 Workflow

Figure 2 represents the workflow to be followed in exercising the responsibilities of Chapter 1.

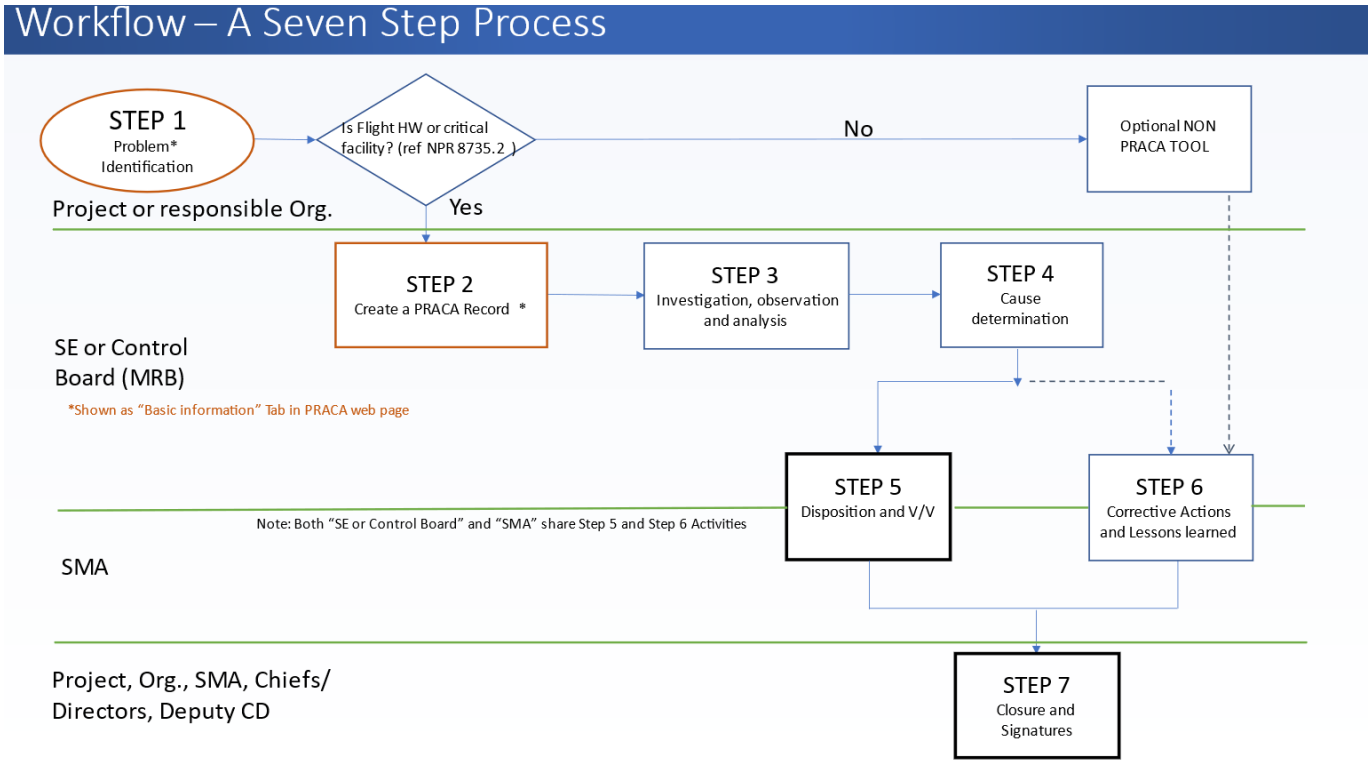

Figure 2. Control of Nonconforming Products and Services Workflow

2.2 Control Board Formation

2.2.1 The formation of a Control Board (CB) will be established (e.g., Material Review Board (MRB), Anomaly Review Board (ARB) a Parts Control Board (PCB), or a Software Change Control Board (SCCB)) with the System Safety and Mission Assurance (SSMA) Division Chief or, if delegated, the MAM/CSO, for NCRs rated above a criticality of Low based on the following:

a. Nonconformities against processes, procedures, plans, or products of research that impact a hardware or software system.

b. Nonconformities of hardware or software systems including materials, machinery, equipment, subsystems, platforms, parts, assemblies, or facilities.

Note 1: Nonconformities against processes, procedures, plans, or products of research that do not impact a hardware or software system do not require a CB.

Note 2: For nonconformances related to Institute of Electrical and Electronics Engineers Standards Association (IEEE parts) the PCB takes the place of an MRB and is chaired by the Ames Chief Engineer (reference APR 8739.10).

2.3 Categorizing NCRs

2.3.1 Project Managers shall categorize NCRs according to Table 2 (reference NPR 8000.4, NPR 8621.1, and APR 8000.4), such that the NCR is given the criticality level corresponding to the highest level of any of the five impact areas.

2.3.2 For all work, Table 2 is the minimum guidance to be followed. If a Project Manager or Line Manager decides an NCR should be escalated beyond these requirements, it will be done with coordination of the Ames SMA Directorate (Code Q) CSO or Mission Assurance Manager (MAM).

Table 2. Nonconformance Criticality Matrix

Attribute (How NC Impacts the 5 areas identified below)		**NCR Criticality Level**		
		LOW	**MEDIUM**	**HIGH**
Non-Human Safety Risks	Cost	Overrun of < 5%	Overrun of 5%-15%	Overrun of > 15%
	Schedule	Overrun of < 5% Or No impact to Critical Path	Overrun of 5% - 15% Or < 1 Month impact to critical path/milestones Or No Impact to critical path	Overrun of > 15% Or > 1 Month impact to critical path/milestones
	[1]Mission Success (Technical Performance)	Loss of < 5% success/exit criteria	Loss of 5% - 15% success/exit criteria	Loss of > 15% success/exit criteria
	Facilities, Equipment, or other Assets	More than normal wear and tear < $1K	Property damage $1K - $25K	Destruction of critical assets or damage > $25K
Human Safety Risks	Human Safety	Injury or illness with no adverse or long-term health effects or lost time.	Injury or illness resulting in adverse or long-term health effects or lost time	Injury or illness resulting in permanent or disabling health effects

[1] The mission should be considered from both a local and a global perspective. Thus, should a project element suffer a performance loss due to a nonconformance of less than 5%, the propagation of this loss to other project elements should be considered when deciding the NCR's criticality level such that the appropriate level of review and approval are invoked.

2.4 NCR Review and Final Disposition Approval/Authorization

2.4.1 NCR review and final disposition approval/authorization shall correspond to the NCR's criticality level:

a. Low - with low or medium residual risk after disposition – System Engineer and Mission Assurance Manager (MAM)/Chief Safety or Mission Assurance Officer (CSO).

b. Medium with any residual risk after disposition, and low with high residual risk – Project Manager or Line Manager, Lead System Engineer, and MAM/CSO.

c. High - Project Manager or line manager, Lead Systems Engineer, the Control Board (CB) if applicable, Responsible Directorate, MAM/CSO, and all Center Authorities:

(1) Engineering Technical Authority - ARC Chief Engineer

(2) Programmatic Authority - ARC Deputy Director

(3) Safety and Mission Assurance Technical Authority (including occupational and health) - SMA Director

(4) Health and Medical Technical Authority - Center Chief Medical Officer, if applicable

Note: Projects and/or Programs may levy additional requirements for NCR review/authorization beyond those listed above (i.e., Program offices may want to review all material nonconformances regardless of the ARC assigned NCR criticality level).

APPENDIX A. DEFINITIONS

Administrative Close	A PRACA Record that is closed due to non-standard circumstances (e.g., project is cancelled, hardware with a NCR is re-engineered, etc.).
Control Board	The board of responsible persons from appropriate disciplines (i.e., Quality Assurance, Engineering, Software, Line or Project Managers, etc.) that determines the dispositions of nonconforming product. Either a MRB, PCB, or software change control board.
Critical Facility	See APR 7120.3, Chapter 1.
Disposition	The action taken on a nonconformance. See Rework, Repair, Regrade, Return to Supplier, Use-As-Is, and Scrap as examples of disposition.
Flight-Related	Ground systems or components in direct support of space flight operations.
Material	Raw material, component, hardware, software, or subassembly intended for use in or is used in a product.
Nonconformance	Resulting condition when a process, product or service is identified as not meeting or fulfilling specified requirements.
Material Review Board (MRB)	The Material Review Board controls and dispositions non-conforming products. It consists of a Code Q Quality Assurance representative, design Engineer(s), and a Project Manager or Line Manager.
Parts Control Board	MRB for EEE parts that is chaired by the Ames Chief Engineer.
Product	The results of ARC activities and processes to include hardware, software, data (including research results), services, and processed materials.
Responsible Manager	Civil servant Project or Line Manager with responsibility for cost, schedule, and performance.
Remedial Action	Action taken to fix a current problem that might or might not address the root cause or minimize/prevent the reoccurrence of the problem.
Regrade	Assign a product to another application where less demanding requirements can be met considering its performance characteristics.
Repair	Action taken on a nonconforming product to render it acceptable for the intended use. Repair may affect or change parts of the nonconforming product, for example as a part of maintenance. Requires MRB authority.
Residual Risk	The remaining risk, exceeding that which would have existed absent the nonconformance that exists after all mitigation actions have been implemented or exhausted in accordance with the risk management process.

Rework	Action taken on a nonconforming product to render it conforming to all original requirements.
Space Flight Projects	Projects that include: • Spacecraft, instruments, and experimental payloads, designated technology developments to be incorporated by space flight 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.
Scrap	A product's permanent removal or an action which precludes it from its originally intended use. In a nonconforming service situation, use is precluded by discontinuing the service.
Software Change Control Board	A committee that makes decisions regarding whether or not proposed changes to a software project should be implemented in light of an NCR.
Use-As-Is	Accepting a nonconformance for use or approving the use of a nonconforming product without resort to rework or repair.
Validation	Confirmation, through the provision of objective evidence, that the requirements for a specific intended use, application, or action plan have been fulfilled. May require a SME to conduct.
Verification	Confirmation, typically performed through analysis, demonstration, inspection, or testing, that specified requirements have been fulfilled.

APPENDIX B. ACRONYMS

APR	Ames Procedural Requirement
AQMS	Ames Quality Management System
ARC	Ames Research Center
CAP	Corrective Action Plan
CAR	Corrective Action request
CB	Control Board (Material Review, Parts, Software Change)
CSO	Chief Safety Officer
D/W	Deviation/Waiver
GIDEP	Government-Industry Data Exchange Program
IEEE	Institute of Electrical and Electronics Engineers Standards Association
MAM	Mission Assurance Manager
MRB	Material Review Board
NCR	Nonconformance Report
NPD	NASA Policy Directive
NPR	NASA Procedural Requirements
PCB	Program/Project Control Board
PRACA	Problem Reporting and Corrective Action System
SMA	Safety and Mission Assurance (Code Q)
SSMA	System Safety and Mission Assurance

APPENDIX C. REFERENCES

C.1 NPR 7150.2, NASA Software Engineering Requirements

C.2 NPR 8000.4, Agency Risk Management Procedural Requirements

C.3 NPR 8621.1, NASA Procedural Requirements for Mishap and Close Call Reporting, Investigating, and Recordkeeping

C.4 NPR 8715.3, NASA General Safety Program Requirements

C.5 APD 1280.1, Ames Quality Management System (AQMS) Policy

C.6 APD 8700.1, Problem, Nonconformance, Preventive and Corrective Action Policy

C.7 APR 1280.4, Ames Quality Management System (AQMS) Requirements

C.8 APR 1440.1, Records Management Program Requirements

C.9 APR 5100.1, Purchasing

C.10 APR 7120.3, Development and Operation of Center Critical Facilities and Infrastructure

C.11 APR 8705.1, System Safety and Mission Assurance

C.12 APR 8735.1, Procedures for Preparation and Handling of NASA Advisories and Government-Industry Data Exchange Program (GIDEP) Alerts, Safe Alerts, and Problem Advisories

C.13 APR 8739.10, Ames EEE Parts Control Requirements

APPENDIX D. RECORDS

Records will be retained as defined in Table D Record Retention.

Table D. Record Retention Requirements

Record	Retained By	Minimum Retention
Nonconformance Report	Center PRACA Manager	5 years after product delivery, project, service, or research completion
Deviations/Waivers	Center PRACA Manager	5 years after product delivery, project, service, or research completion
Corrective Action Request Corrective Action Plans	Center PRACA Manager	5 years after product delivery, project, service, or research completion