

Standard

Performance-Based Failure Reporting, Analysis & Corrective Action System (FRACAS) Requirements

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American National Standard

Performance-Based Failure Reporting, Analysis & Corrective Action System (FRACAS) Requirements

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Abstract

This standard provides the basis for developing the performance-based Failure Reporting, Analysis & Corrective Action System (FRACAS) to resolve the problems and failures of individual products along with those of their procured elements. The requirements for contractors, the planning and reporting needs, along with the analytical tools are established. The linkage of this standard to the other standards in the new family of performance-based reliability and maintainability (R&M) standards is described, and a large number of keyword data element descriptions (DED) for use in automating the FRACAS process are provided.

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Foreword

Although the terms quality and reliability are often used interchangeably, they have different meanings. *Quality*, as used in this standard, is the ability of a product to meet the workmanship criteria established by an organization. A different but often used definition of quality is, “the set of all desired attributes that can be put in a product.” In this sense, quality cannot be achieved without achieving the desired reliability. *Reliability* is the ability of a product or system to perform its intended function(s) for a specified time or number of operating cycles. A high-quality product may not be a high-reliability product even though it conforms to stringent workmanship specifications. The ISO 9000 series of standards that establish the ability of an organization to consistently produce high-quality products do not necessarily establish that same organization’s ability to consistently deliver high-reliability products. Consequently, the ISO 9000 series certification process, which serves as the main international reference for quality program requirements in business-to-business dealings, is not the appropriate reference for international or domestic reliability program requirements. A more suitable reference is the suite of AIAA S-102 performance-based reliability and maintainability (R&M) standards, which provides a framework for quantifying and improving the performance of R&M practices.

Annex A lists the 35 standards in the AIAA S-102 performance-based R&M standards document tree. These standards provide criteria for rating the capability of R&M practices, and they represent proven approaches for planning and implementing the product life cycle R&M Program. The S-102 R&M capability-rating criteria allow organizations to:

- specify a level of R&M Program performance,
- plan the activities to achieve a level of R&M Program performance,
- appraise the performance of an R&M Program or individual practice, and
- identify the activities necessary to improve the performance of an R&M Program or individual practice.

The S-102 R&M capability-rating criteria (Annex B in all S-102 standards) are intended to aid organizations in assuring that their R&M Programs are a “value-added” contribution to the product development effort. *There is no intent to prescribe a universal methodology for quantifying the evaluation or improvement of R&M Programs or individual practices.* The S-102 R&M capability-rating criteria reflect the collective body of knowledge of the S-102 Working Group, which was chartered by the AIAA Standards Executive Council to develop and approve the S-102 standards. The S-102 Working Group is composed of R&M experts that represent the government and industry sectors affected by the S-102 standards.

This standard establishes uniform requirements and criteria for a performance-based FRACAS process. The principles of FRACAS as promoted in a performance-based approach can be learned from this document alone, but its proper use requires careful planning, for which the prerequisite is understanding associated S-102 documents and identifying the desired FRACAS data products for the systems engineering process. What distinguishes this standard from all past and present FRACAS standards are the following.

- It provides consistent criteria for rating the “capability” of the reliability modeling process.
- It provides consistent criteria for rating the “maturity” of the reliability modeling data products.
- It calls for the use of knowledge-based approaches to identify, analyze, and manage system-level to component-level reliability characteristics that pose unacceptable risk.
- For a Capability Level 3 or above FRACAS process, it calls for the collection and review of existing lessons learned, and the generation and formal approval of new lessons learned.

- For a Capability Level 4 or above FRACAS process, it calls for the use of predefined R&M data parameters to facilitate the exchange of FRACAS data products among computer-aided analysis tools and other project databases.

At the time of approval, the members of the AIAA Performance-Based Reliability & Maintainability Standards Working Group were:

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|------------------------|---------------------------------------|
| Tyrone Jackson (Chair) | SRS Technologies |
| Lily Lau | The Aerospace Corporation |
| David Oberhettinger | NASA Jet Propulsion Laboratory |
| Walt Willing | Northrop Grumman Electronic Systems |
| Steve Harbater | Northrop Grumman Integrated Systems |
| Alazel Jackson | Raytheon Space and Airborne Systems |
| Jan Swider | Pratt & Whitney Rocketdyne, Inc |
| Dev Raheja | Design for Competitiveness |
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| Ken Gibson | Boeing Space and Intelligence Systems |
| James French | RMS Partnership |
| Dawson Coblin | Lockheed Martin Space Systems Company |
| Ari Jain | Reliability Consulting |
| Terry Hardy | Federal Aviation Administration |

The above consensus body approved this document in June 2006.

The AIAA Standards Executive Council (Mr. Amr E. Savy, Chairman) accepted the document for publication in July 2008.

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1 Scope

This standard establishes uniform requirements and criteria for a performance-based Failure Reporting, Analysis & Corrective Action System (FRACAS). The performance-based aspect of this standard requires that the organization's FRACAS capability be rated according to predetermined criteria for process capability and data maturity. Although it is a common industry practice for the FRACAS to employ automated systems that rely on computer database applications, this standard does not mandate any particular computer architecture for FRACAS data documentation, storage, or retrieval.

1.1 Purpose

The primary purpose of the FRACAS is to establish and manage a closed-loop system adequate to use by the project in the processing and management of hardware and software anomaly reports. The baseline FRACAS assures that problems and failures occurring throughout the system lifecycle are properly documented and resolved. Even the most severely tailored development project will typically retain a FRACAS as an element of a minimal set of project functions.

1.2 Application

This standard applies to acquisitions for the design, development, fabrication, test, and operation of commercial, civil, and military systems, equipment, and associated computer programs. Annex B of this standard provides capability-rating criteria that are intended to categorize the capability of sets of activities commonly found in FRACAS processes. The capability-level criteria provide the logical order of activities for improving the effectiveness of an existing FRACAS process in stages. Therefore, an existing FRACAS process may be improved by using the FRACAS capability level criteria to develop a list of minimally acceptable activities that are then compared to the established set of activities within the existing process. This comparison identifies the activities that need to be added to the existing FRACAS process.

This standard also applies to the integration of the FRACAS database with a project R&M database system. However, specification of this standard should not require the contractor to use a specific computerized tool, such as a commercial computer-aided design (CAD) system. Rather, the FRACAS database should be implemented using the computerized tools of the contractor's choosing given that those tools are validated to process input data and generate output data that are compatible with the data definitions in this standard.

2 Applicable Documents

2.1 Normative References

The versions of the following reference documents of the issue in effect on the date of invitation for bid or request for proposal form a part of this standard to the extent required:

- 1) AIAA S-102 (Draft) Performance-Based R&M Program General Requirements

AIAA S-102.1 Performance-Based R&M Management

- 2) AIAA S-102.1.1 (Draft) R&M Program Planning Requirements
- 3) AIAA S-102.1.2 (Draft) Subcontractor and Supplier Monitoring and Control Requirements
- 4) AIAA S-102.1.3 (Draft) R&M Program Working Groups and Review Requirements
- 5) AIAA S-102.1.5 Failure Review Board Requirements
- 6) AIAA S-102.1.6 (Draft) R&M Criticality Item Risk Management Requirements
- 7) AIAA S-102.1.7 (Draft) Project R&M Database System Requirements