AEROSPACE STANDARD

AS13004™	
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Process Failure Mode and Effects Analysis (PFMEA) and Control Plans

RATIONALE

This standard was created to establish a common practice for effective process risk identification, assessment, mitigation, and prevention. It defines a methodology to mitigate risk using Process Flow Diagrams (PFDs), Process Failure Mode and Effects Analysis (PFMEA), and Control Plans. It is to be used by organizations throughout the life cycle of a product.

FOREWORD

To assure customer satisfaction, the aviation, space, and defense industry organizations have to produce and continually improve safe, reliable products that equal or exceed customer and regulatory authority requirements. The globalization of the industry and the resulting diversity of regional/national requirements and expectations have complicated this objective. End-product organizations face the challenge of assuring the quality of and integration of product purchased from suppliers throughout the world and at all levels within the supply chain. Industry suppliers face the challenge of delivering product to multiple customers having varying quality expectations and requirements.

The Aerospace Engine Supplier Quality (AESQ) Committee was established as the G-22 Technical Committee under the SAE Aerospace Council to develop, specify, maintain, and promote quality standards relating to the aerospace engine supply chain. The principles defined within this standard may be applicable to other segments of the aviation, space, and defense industries.

The AESQ strategy is to create a series of related quality standards for use within the aerospace engine supply chain with the intention of exceeding customer expectations through effective application of the full series of interrelated AESQ quality standards (see Appendix A).

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
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1. SCOPE

This standard defines requirements for the identification, assessment, mitigation, and prevention of risk in the manufacturing process through the application of Process Flow Diagrams (PFDs), Process Failure Mode and Effects Analysis (PFMEA) and Control Plans throughout the life cycle of a product.

This standard aligns and collaborates with the requirements of AS9100, AS9102, AS9103, and AS9145.

The requirements specified in this standard apply in conjunction with and are not alternative to contractual and applicable statutory and regulatory requirements. In case of conflict between the requirements of this standard and applicable statutory or regulatory requirements, the latter shall take precedence.

2. APPLICABLE DOCUMENTS

The following referenced documents are important for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AS13000 Problem Solving Requirements for Suppliers

AS13002 Requirements for Developing and Qualifying Alternate Inspection Frequency Plans

AS13003 Measurement Systems Analysis Requirements for the Aero Engine Supply Chain

AS9100* Quality Management Systems - Requirements for Aviation, Space, and Defense Organizations

AS9101* Quality Management Systems - Audit Requirements for Aviation, Space, and Defense Organizations

AS9102* Aerospace First Article Inspection Requirement

AS9103* Aerospace Series - Quality Management Systems - Variation Management of Key Characteristics

AS9131* Aerospace Series - Quality Management Systems - Nonconformance Data Definition and Documentation

AS9145* Aerospace Series - Requirements for Advanced Product Quality Planning and Production Part Approval Process

NOTE: *Developed under the auspices of the IAQG and listed here as SAE International “AS” publications. Equivalent versions may be published by other standards bodies [e.g., European Committee for Standardization (CEN), Japanese Standards Association/Society of Japanese Aerospace companies (JSA/SJAC)].

2.2 Other Publications

Copies of these documents are available online at http://webstore.ansi.org/.

ISO 9000 Quality Management Systems - Fundamentals and Vocabulary

3. TERMS AND DEFINITONS

In this Aerospace Standard, the following verbal forms are used:

- “shall” indicates a requirement;
- “should” indicates a recommendation;
- “may” indicates a permission;
- “can” indicates a possibility or a capability.

Information marked as “NOTE:” is for guidance in understanding or clarifying the associated requirement.

For the purpose of this standard, terms and definitions stated in ISO 9000 and the following definitions apply. An acronym log for this document is detailed within Appendix I.

ALTERNATIVE PROCESSES: Alternative processes are different approved processes used to achieve the same output (e.g., backup equipment, secondary source, alternative approved sequence).

CHARACTERISTICS MATRIX: An analytical technique for displaying the relationship between process parameters and manufacturing stations.

CONTAINMENT PLAN: Action to control and mitigate the impact of a nonconformity and protect the customer's operation (stop the problem from getting worse); includes correction, immediate corrective action, immediate communication, and verification that the nonconforming situation does not further degrade (refer to AS9101).

CONTROL PLAN: A documented description linking manufacturing process steps to key inspection and control activities. The intent of a Control Plan is to control the design characteristics and the process variables to ensure product quality.

CRITICAL ITEMS (CI): Those items (e.g., functions, parts, software, characteristics, processes) having significant effect on the provision and use of the products and services; including safety, performance, form, fit, function, producibility, service life, etc., that require specific actions to ensure they are adequately managed. Examples of critical items include safety critical items, fracture critical items, mission critical items, key characteristics, etc. (refer to AS9100).

CUSTOMER: Person or organization that could or does receive a product or a service that is intended for or required by this person or organization (refer to ISO 9000).

Example: Consumer, client, end-user, retailer, receiver of product or service from an internal process, beneficiary, and purchaser.

DESIGN CHARACTERISTICS: Those dimensional, visual, functional, mechanical, and material features or properties, which describe and constitute the design of the article, as specified by drawing or Digital Product Definition requirements. These characteristics can be measured, inspected, tested, or verified to determine conformance to the design requirements. Dimensional features include in process locating features (e.g., target-machined or forged/cast dimensions on forgings and castings, weld/braze joint preparation necessary for acceptance of finished joint). Material features or properties may include processing variables and sequences, which are specified by the drawing or Digital Product Definition (e.g., heat treat temperature, fluorescent penetrant class, ultrasonic scans, and sequence of welding and heat treat). These provide assurance of intended characteristics that could not be otherwise defined (refer to AS9102).

NOTE: For the purpose of this standard Design Characteristic is also known as Product Characteristic.

DESIGN RECORDS: The records of the engineering definition/specification, which fully define the product (system, part, component, or assembly), including physical or electronic/digital drawings, electronic/digital models, software, or other associated information. This includes records of authorized engineering changes not yet incorporated into the released engineering definition/specification.