

Submitted for recognition as an American National Standard

Maintainability Program Standard

Foreword—In March 1997, the SAE G-11 Reliability, Maintainability, Supportability, and Logistics (RMSL) Division standards section chartered a subcommittee to create a maintainability program standard. The subcommittee was formed from a representative cross-section of commercial industries and military (DOD and Government). In response to that charter, this standard has been developed.

The subcommittee has endeavored to develop a standard that would reflect current commercial and military practices and meet the objectives of the United States Department of Defense Acquisition reform initiative. This performance-based standard was developed in recognition of today's intense and competitive market demands for world class maintainability, low cost, and speed to market.

This standard relies heavily upon the supplier-customer dialogue, and it intentionally allows suppliers great freedom to uniquely tailor maintainability programs. However, it was recognized that, in addition to the requirements of this standard, guidance for developing maintainability programs is frequently required. Consequently, the subcommittee has also been chartered to produce a Maintainability Program Standard Implementation Guide, which sets forth current, world class proven maintainability best practices and provides activities and processes that may be used to satisfy the requirements of this standard. In addition, the Standard and Implementation Guide are intended to become part of a set of comprehensive RMSL program and task standards planned by the G-11 Division to replace selected Military Standards and Specifications.

The professionals in the subcommittee gratefully acknowledge the support from their companies and from the many individuals and organizations, who made contributions and provided recommendations to the subcommittee.

1. Scope

1.1 Purpose—This SAE Standard establishes the requirement for suppliers to plan a maintainability program that satisfies the following three requirements:

- The supplier and customer shall reach agreement on program requirements.
- The supplier shall meet customer requirements.
- The supplier shall assure that customer requirements have been met.

1.2 Applicability—This document applies to activities related to the specification, design, development, and assurance of any system (hardware and/or software) product or processes.

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1.3 Tailoring—This document does not specify the activities, tasks or methods to be included in the program. Rather, the content of each program must be tailored to satisfy customer requirements using the most appropriate means.

2. References

2.1 Related Publications—The following publications are provided for information purposes only and are not a required part of this document.

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE JA1010-1 (Draft)—Maintainability Program Standard Implementation Guide
SAE JA1004—Software Supportability Program Standard

2.1.2 MILITARY PUBLICATIONS—Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robins Avenue, Philadelphia, PA 19111-5094.

MIL-HDBK-470A Designing and Developing Maintainability Products and Systems (Volumes I and II)

3. Definitions

3.1 Activity—A defined action that uses one or more methods to satisfy a maintainability program requirement.

3.2 Customer—The recipient of a product (e.g., the customer may be the purchaser, beneficiary, ultimate consumer or user.)

3.3 Life Cycle—A series of stages a product or process passes through during its lifetime, from concept through decommission.

3.4 Process—A series of activities leading to a desired result.

3.5 Product—The output of a process.

3.6 Qualification—Activities that constitute formal evidence the product or process specifications have met customer requirements, including quantitative and qualitative measures.

3.7 Maintainability—Maintainability is a characteristic of design, installation, and operation, usually expressed as the probability that an item can be retained in, or restored to, a specific operating condition within a specified interval of time, when maintenance is performed in accordance with prescribed procedures and resources.

NOTE—In some industries, such as automotive, maintainability is referred to as serviceability.

3.8 Requirement

- a. Customer Requirements—The expressed or inferred needs and wants that a customer desires from a product.
- b. Product Requirements—Acceptable levels of specific performance parameters for a given set of conditions.
- c. Program Requirements—The three requirements identified in 1.1.

3.9 Resources—The means available to an organization for developing a product or process including, but not limited to, materials, facilities, personnel, capital, time, equipment, hardware, and software.

3.10 Supplier—An organization, either internal or external, that provides a product or service to a customer.

3.11 Task—An assigned piece of work to be accomplished within a specified time.

4. Program Requirements

4.1 The Supplier Shall Ascertain Customer Requirements—The maintainability program shall contain documented activities to ensure that customer requirements are fully understood and defined. Customer requirements shall include, but are not limited to, conditions of use, operating environment, maintenance concept, service requirements, and product specifications.

4.1.1 ESTABLISH SUPPLIER-CUSTOMER DIALOGUE—A documented supplier-customer dialogue shall be initiated, no later than conceptual design and prior to development of the maintainability program, to establish mutually understood requirements. Where requirements are not known, assumptions of requirements shall be made by the supplier, verified by the customer, and mutually agreed upon.

4.1.2 IDENTIFY CONDITIONS OF USE—The supplier, with input from the customer, shall identify all relevant product usage information for all stages of its life cycle, operational profile, environment conditions, resources required, and any maintenance and service policies, which are used in determining maintainability requirements.

4.1.3 DEFINE MAINTENANCE AND SERVICE—The supplier and customer shall mutually agree upon any maintenance and service requirements.

4.1.4 ESTABLISH METRICS—Metrics, which assesses the ability of the product to meet customer requirements, shall be identified by the supplier and agreed upon by the customer. These metrics shall be tracked throughout the program.

4.1.5 DEVELOP PRODUCT SPECIFICATION—The supplier and customer shall mutually agree upon a product or process specification, which adequately reflects the intended performance and use of the product.

4.1.6 OPERATING ENVIRONMENT—The supplier, with input from the customer, shall identify all available product, mission, and life cycle environment conditions necessary for product/processes maintainability.

4.2 The Supplier Shall Meet Customer Requirements—The maintainability program shall contain activities to ensure customer requirements are met.

4.2.1 CHARACTERIZE RESOURCES—The supplier shall identify the resources, including their capabilities, used in developing the product. The supplier and customer shall mutually agree upon the level of detail required to document resources.

4.2.2 ASSESS AND MANAGE RISK—On an on-going basis, the supplier shall evaluate program risks to identify program risks to the customer. The supplier shall restructure the maintainability program, with customer concurrence to reduce risks to an acceptable level.

4.2.3 DESIGN TO ACHIEVE MAINTAINABILITY—The supplier shall determine appropriate maintainability design and development methods for the maintainability program. When selecting methods, product performance, cost, and schedule shall be considered.

4.3 The Supplier Shall Assure That Customer Requirements Have Been Met—The maintainability program shall contain activities to assure that customer requirements have been met.

4.3.1 QUALIFY THE PRODUCT AND PROCESS—The supplier shall select appropriate methods for product and process qualification.

- 4.3.2 ESTABLISH PROCESS CONTROL—Process monitor and controls shall be established to ensure continuous conformance to requirements.
- 4.3.3 PURSUE CONTINUOUS PROCESS IMPROVEMENT—Process improvement activities shall be established to continuously reduce variation.
- 4.3.4 ESTABLISH DATA COLLECTION AND REPORTING—The supplier and customer shall agree upon methodology to continuously assess product maintainability and cost effectiveness.

5. **Program Elements**—The supplier shall prepare and implement a maintainability program to satisfy the three requirements identified in 1.1. The Maintainability Program shall be mutually agreed upon by the customer and supplier, and should include the following elements:

a. Organization and Management

- 1. Organization and management of maintainability program including the interactions/interfaces with other appropriate organizations/disciplines.
- 2. Schedule/duration of the activities/tasks.
- 3. Indication of critical activities.
- 4. Resource allocation (including planned customer supplied resources such as, but not limited to, proving grounds and test facilities, maintenance and/or service facilities, support equipment, etc.)
- 5. Method of reconciling issues when requirements are not met or cost effective.

b. Program Description

- 1. Program milestones (including interfaces with program management).
- 2. Description of the activities/tasks.
- 3. Quantitative maintainability models pertinent to the program.
- 4. Maintainability methodology used, either quantitative or qualitative used to influence the design.

c. Program Documentation

- 1. Evidence that requirements have been met.
- 2. Documentation of the rationale for program changes.

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