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SURFACE VEHICLE/ AEROSPACE STANDARD

SAE JA1011 AUG2009

Issued 1999-08
Revised 2009-08

Superseding JA1011 AUG1999

(R) Evaluation Criteria for Reliability-Centered Maintenance (RCM) Processes

RATIONALE

The document was updated as a result of the normal 5 year review cycle. Changes were made to clarify the origin of the Reliability Centered Maintenance process and purpose of this document. Additionally, terminology was updated to reflect current usage in the user community and to remove items that might have been considered biased to individual commercial processes. The overall technical process remains unchanged.

FOREWORD

Reliability-Centered Maintenance (RCM) was initially developed by the commercial aviation industry to improve the safety and reliability of their equipment. It was first documented in a report written by F.S. Nowlan and H.F. Heap and published by the U.S. Department of Defense in 1978. Since then, RCM has been used to help formulate physical asset management strategies in almost every area of organized human endeavor, and in almost every industrialized country in the world. The process defined by Nowlan and Heap served as the basis of various application documents in which the RCM process has been developed and refined over the ensuing years. Most of these documents retain the key elements of the original process. However the widespread use of the term “RCM” has led to the emergence of a number of processes that differ significantly from the original Process. As a result, there has been a growing international demand for a standard that sets out the criteria that any process must comply with in order to be called “RCM.” This document meets that need.

The criteria in this SAE Standard are based primarily upon the RCM process and concepts established in Nowlan and Heap's 1978 report, “Reliability-Centered Maintenance.” Additionally, three other documents that closely followed the original tenets of Nowlan and Heap, (1) US naval aviation's MIL-STD-2173(AS) (Reliability-Centered Maintenance Requirements of Naval Aircraft, Weapons Systems and Support Equipment) and its successor, U.S. Naval Air Systems Command Management Manual 00-25-403 (Guidelines for the Naval Aviation Reliability-Centered Maintenance Process), (2) NES 45—Naval Engineering Standard 45, “Requirements for the Application of Reliability-Centred Maintenance Techniques to HM Ships, Royal Fleet Auxiliaries and other Naval Auxiliary Vessels” (Restricted-Commercial) and (3) “Reliability-Centered Maintenance (RCM 2),” by John Moubray were used extensively as sources for this document.

This document describes the minimum criteria that any process must possess to be deemed a compliant RCM process. It does not attempt to define a specific RCM process.

This document is intended to provide a means for evaluating whether a given process remains true to the tenets of RCM as it was originally conceived. It is especially useful to people who wish to purchase RCM services (training, analysis, facilitation, consulting, or any combination thereof).

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1. SCOPE

This SAE Standard for Reliability Centered Maintenance (RCM) is intended for use by any organization that has or makes use of physical assets or systems that it wishes to manage responsibly.

1.1 Purpose

RCM is a specific process used to identify the policies which must be implemented to manage the failure modes which could cause the functional failure of any physical asset in a given operational context. This document is intended to be used to evaluate any process that purports to be an RCM process, in order to determine whether it follows the original tenets of RCM as defined by Nowlan and Heap. This document supports such an evaluation by specifying the minimum criteria that a process must have in order to be an RCM process.

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

SAE JA1012 A Guide to Reliability-Centered Maintenance (RCM) Standard

2.1.2 U.S. Department of Commerce Publications

Available from NTIS, Port Royal Road, Springfield, VA 22161, Tel: (703) 605-6000, www.ntis.gov.

Nowlan, F. Stanley, and Howard F. Heap, “Reliability-Centered Maintenance,” Department of Defense, Washington, D.C. 1978. Report Number AD-A066579.

2.1.3 U.S. Department of Defense Publications

Available from the Document Automation and Production Service (DAPS), Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-6257, http://assist.daps.dla.mil/quicksearch/.

NAVAIR 00-25-403	Guidelines for the Naval Aviation Reliability Centered Maintenance Process (U.S. Naval Air System Command) can be obtained at https://acc.dau.mil/CommunityBrowser.aspx?id=151918.
S9081-AB-GIB-010/MAINT	Reliability-Centered Maintenance Handbook (U.S. Naval Sea Systems Command) can be obtained at https://acc.dau.mil/CommunityBrowser.aspx?id=152397.
MIL-P-24534	Planned Maintenance System: Development of Maintenance Requirement Cards, Maintenance Index Pages, and Associated Documentation (U.S. Naval Sea Systems Command)
MIL-STD-1629	Procedures for Performing a Failure Mode, Effects and Criticality Analysis, Department of Defense, Washington, DC, 1984 (NOTE: Cancelled without Replacement, August 1998)
MIL-STD-1843	Reliability Centered Maintenance for Aircraft, Engines, and Equipment, United States Air Force (NOTE: Cancelled without Replacement, August 1995)
MIL-STD-2173(AS)	Reliability-Centered Maintenance Requirements for Naval Aircraft, Weapons Systems, and Support Equipment (NOTE: Cancelled without Replacement, September 1999)

2.1.4 U.K. Ministry of Defence Publication

Available from Reliability-centred Maintenance Implementation Team, Ships Support Agency, Ministry of Defence (Navy), Room 22, Block K, Foxhill, Bath, BA1 5AB United Kingdom, www.mod.uk.

NES 45 Naval Engineering Standard 45, "Requirements for the Application of Reliability-Centred Maintenance Techniques to HM Ships, Royal Fleet Auxiliaries and other Naval Auxiliary Vessels" (Restricted-Commercial)

2.1.5 Other Publications

Anderson, Ronald T. and Neri, Lewis, "Reliability-Centered Maintenance: Management and Engineering Methods," Elsevier Applied Science, London and New York, 1990

Blanchard, B.S., Verma, D., and Peterson, E.L., "Maintainability: A Key to Effective Serviceability and Maintenance Management," John Wiley and Sons, New York, 1995

"Dependability Management—Part 3-11: Application Guide—Reliability Centred Maintenance," International Electrotechnical Commission, Geneva, Document No. 56/651/FDIS.

Jones, Richard B., "Risk-Based Management: A Reliability-Centered Approach," Gulf Publishing Company, Houston, TX, 1995

Moubray, John, "Reliability-Centered Maintenance," Industrial Press, Inc. New York City, 1997

MSG-3, "Maintenance Program Development Document," Air Transport Association, Washington DC, Revision 2007.1

Smith, Anthony M., "Reliability Centered Maintenance," McGraw-Hill, New York, 1993

Zwingelstein, G., "Reliability Centered Maintenance, A Practical Guide for Implementation," Hermés, Paris, 1996

3. DEFINITIONS

3.1 Age

A measure of exposure to stress computed from the moment an item enters service or first begins to degrade, either from new or re-entering service after a task designed to restore its initial capability. Age can be measured in terms of calendar time, running time, distance traveled, duty cycles, or units of output or throughput.

3.2 Applicable Task

A task that is capable of preventing or mitigating the consequences of failure based on the technical characteristics of that failure.

3.3 Desired Performance

The level of performance desired by the owner or user of a physical asset or system.

3.4 Effective Task

A task that reduces the probability or consequences of failure to an acceptable level and is feasible to perform.

3.5 Economic Consequences

A classification assigned to failure modes, or multiple failures in the case of hidden failure modes, that do not adversely affect safety, the environment, or operations, but increase cost either from repair or from lost or degraded operations.