DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
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IN REPLY REFER TO
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OPNAV INSTRUCTION 4790.16A

From: Chief of Naval Operations

Subj: CONDITION-BASED MAINTENANCE (CBM) POLICY

Ref: (a) OPNAVINST 4780.6E
(b) OPNAVINST 4700.7 Series
(c) NAVAIRINST 4790.20
(d) SECNAVINST 5400.15B
(e) Surface Ship and Carrier Entitled Process for Modernization (SSCEPM) Management and Operations Manual (SL720-AA-MAN-30)

Encl: (1) CBM Definitions

1. Purpose. To establish policy and responsibility for the implementation and integration of Condition-Based Maintenance (CBM) for naval ship, submarine, aircraft systems, equipment and infrastructure.

2. Cancellation. OPNAVINST 4790.16.

3. Scope. This instruction applies to acquisition, logistics, and maintenance activities for all new and legacy programs. CBM concepts apply to all active and reserve naval ships, aircraft, and the systems associated with them, as well as the infrastructure which supports them. Throughout this instruction, the term "ship" refers to all surface ships, aircraft carriers, submarines, and those patrol and service craft specified in reference (a). The purpose of the CBM strategy is to perform maintenance only when there is objective evidence of need, while ensuring safety, equipment reliability, equipment availability, and reduction of total ownership cost. The fundamental goal of CBM is to optimize readiness while reducing maintenance and manning requirements.

4. Definitions. Applicable definitions are in enclosure (1)

5. Background.

a. Maintenance comprises a major portion of total ownership costs for Navy weapons systems. Unnecessary maintenance contributes to inflated ownership costs and reduced readiness of deployable assets. Proper application of CBM strategies, as part of an overall acquisition or modernization plan will reduce Operating and Support (O&S) costs and manpower requirements by providing a basis for maintenance decisions that focus limited resources on that maintenance most needed to ensure safety and mission readiness. In doing so, it provides a means to manage the risk of mission degrading failures.

b. At the core of Navy maintenance, Reliability-Centered Maintenance (RCM), defined in references (b) and (c), provides the principles and rigorous methodology needed to select the appropriate type of maintenance. Recent advances in technologies, (such as advanced signal processing techniques, e.g. neural networks and fuzzy logic, high speed image processing, dynamic modeling and simulation, micro-electromechanical systems (MEMS), wireless data communications, and health monitoring systems) are expected to provide significant improvements in safety, reliability, availability, and affordability. When implemented effectively, these and other CBM enabling technologies can reduce maintenance and manning requirements.

6. Policy. CBM strategy shall be used to determine maintenance decisions and reduce scheduled maintenance and manpower requirements, while reducing O&S costs and ensuring the appropriate maintenance is performed. The transition to CBM involves changes in policy, processes, procedures, and logistics support. To this end, maintenance programs shall incorporate CBM strategy to the maximum possible extent.

a. All RCM methods shall continue to be used to determine the evidence to select the appropriate type of maintenance for Navy equipment and systems. RCM shall also be used to extend periodicity or eliminate unnecessary scheduled maintenance requirements based on operating experience, as applicable.

b. CBM policy shall be incorporated into existing maintenance programs and into the Integrated Logistics Support (ILS) program elements for systems and equipment under acquisition.

c. For legacy systems, rapid system demonstration and testing is desired to implement CBM technologies. Initial logistics support need only be sufficient to ensure valid testing and proof-of-concept. Prior to comprehensive and repetitive installation of CBM-supported systems or equipment, complete logistics support is required.

d. It is essential that full CBM implementation include training for maintenance managers, technicians afloat, and technical support personnel ashore. All new and unique training requirements (including embedded and onboard capabilities) as well as the impact of the introduction of new training technology shall be identified in training plan documentation.

e. CBM enabling technologies shall comply with Defense Information Infrastructure (DII) initiatives and related standards concerning interoperability and openness.

(1) CBM enabling information systems (data collection and information analysis) shall be integrated with maintenance management and logistics support information systems. The impact of information systems data collection, processing, and warehousing requirements on afloat and ashore resources shall be considered in system design, development, and life-cycle planning.

(2) Under the principles of open systems architecture, acquisition managers shall fully consider the advantage of common interface standards for afloat and ashore information systems.

f. Chief of Naval Operations (CNO) will fund naval programs, processes, and enabling technologies proven applicable and effective in supporting the maintenance, manning, and cost reduction objectives of this instruction, in accordance with the Entitled Process, reference (e).

g. CNO will develop and prioritize a Navy CBM investment funding strategy (called the Modernization Plan) predicated upon advice from Director for Material, Readiness, and Logistics (N4), OPNAV resource sponsors, Fleet Commanders, Systems Commands, and Program Executive Offices (PEOs).

7. Responsibilities.

a. Director Fleet Readiness Division (N43).

(1) Provide Navy policy for the development of CBM.

b. CNO (N6, N42, N85, N86, N87, N88).

(1) Establish requirements and specific platform guidance for the development, test and evaluation, and implementation of CBM.

(2) Evaluate the installation and testing results of CBM technologies, with the goal of further refinement and follow-on installation of those items with the greatest potential for cost and manpower savings.

(3) Provide resource sponsorship for the installation of approved CBM enabling technologies in cognizant platforms, systems, and equipment, as well as CBM enabling processes and procedures.

(4) Identify and promote the application of appropriate common CBM processes, procedures, and technologies across applicable naval platforms.

c. Deputy CNO for Manpower, Personnel, Education and Training (N1).

(1) Coordinate the implementation of innovative manpower reduction initiatives resulting from the implementation of CBM policies, processes, and procedures, and the installation of CBM enabling technologies.

(2) Develop and issue manpower documents reflecting changes in manpower requirements resulting from installation of CBM enabling technologies and from workload reductions resulting from other CBM related initiatives.

d. Office of Naval Research (N091).

(1) Identify Science and Technology (S&T) requirements for advancing CBM enabling technologies in close coordination with CNO, PEOs, SYSCOMs, and FLT Commanders through the Round Table Process.

(2) Plan, develop, and coordinate the transitioning of technologies responding to
CBM S&T requirements.

(3) Coordinate with all SYSCOMs and PEOs the demonstration and rapid transition of requirements-driven CBM enabling technologies in weapons systems and platforms.

(4) As the S&T resource sponsor, conduct periodic assessments of ONR's CBM Science and Technology program with respect to requirements.

e. SYSCOMs.

(1) Support CNO and PEOs in the testing and assessment of CBM processes, procedures, and enabling technologies.

(2) Provide technical support for installation, compatibility, and interface of shipboard information management systems and CBM automated health monitoring systems. Promote compliance with Networks and Information Integration (NII) initiatives and standards for shipboard information, local area network (LAN), and CBM enabling technologies.

(3) Support the integration of CBM technologies into modernization and engineering development efforts.

(4) Provide procedures and training for the implementation of CBM, with the goal of reducing maintenance costs, extending periodicities or eliminating unnecessary scheduled maintenance requirements for applicable systems and equipment.

(5) Review and coordinate platform specific CBM initiatives that would reduce maintenance and manning requirements, personnel workload, and/or life cycle costs.

(6) Provide engineering support for CBM implementation on cognizant platforms and promote application of proven CBM technologies across all applicable platforms to CNO, PEOs, FLT Commanders, and other SYSCOMs.

f. PEO.

(1) Act for and exercise the authority of the Assistant Secretary of the Navy (Research, Development, and Acquisition) (ASN RD&A) to manage assigned programs and related technical support in accordance with provisions of reference (d).

(2) Support program offices through coordination and promotion of common CBM technologies and processes with multi-platform applications.

(3) Provide recommendations for further development or improvement of CBM equipment and systems installed for testing and evaluation.

(4) Promote full scale implementation of appropriate CBM technologies on existing and new construction platforms.

g. Director, Naval Nuclear Propulsion Program (N00N/SEA 08).

(1) As outlined in OPNAVINST 5430.48 (series), OPNAV Organizational Manual, E.O. 12344 (42 U.S.C. 71580) established the responsibilities and authorities of the Director, Naval Nuclear Propulsion, CNO (N00N) who also serves as the Deputy Commander, Naval Sea Systems Command (SEA 08), and as Deputy Assistant Secretary for Reactors, U.S. Department of Energy, over all facilities and activities which comprise the Naval Nuclear Propulsion Program. These responsibilities and authorities include all matters pertaining to maintenance, repair, and modification of naval propulsion plants and associated nuclear capable facilities. Nothing in this instruction supersedes or changes these responsibilities and authorities. Accordingly, the Director, Naval Nuclear Propulsion shall determine policies and practices pertaining to implementation of this instructions for matters under his cognizance.

h. Fleet Commanders.

(1) Identify and promote the implementation of proven CBM processes, procedures, and enabling technologies to appropriate SYSCOMs.

(2) Provide operational assessment of CBM effectiveness to the Program Executive Office and SYSCOM recommending changes to CBM implementation plans and policy.

(3) Coordinate platform availability for the development and demonstration of emerging CBM technologies.

8. Action. Wide dissemination of this instruction is directed to ensure all concerned are thoroughly acquainted with and adhere to the revised Condition Based Maintenance policies.

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CBM DEFINITIONS

Condition Based Maintenance (CBM): CBM is a maintenance strategy derived from analysis, preferably using RCM. CBM includes maintenance processes and capabilities derived from real or near-real time assessments obtained from embedded sensors and/or external tests and measurements using either portable equipment or actual inspection. The objective of CBM is to perform maintenance based upon the evidence of need while ensuring safety, reliability, availability, and reduced total ownership cost.

Continuous Process Improvement (CPI): DOD's strategic approach for developing a culture of continuous improvement in the areas of reliability, process cycle times, costs in terms of less total resource consumption, quality, and productivity. In DOD, CPI comprises the application of a broad range of tools and methods, such as Lean, Six Sigma, and Theory of Constraints.

Maintenance Processes maintenance can be performed using a wide variety of approaches. Two main categories of maintenance - reactive and proactive - are provided to describe the range of options available.

Reactive maintenance is performed for items that are selected to run to failure or those items that fail in an unplanned or unscheduled manner. Run to failure is often the planned maintenance strategy for items that have little readiness or safety impact, e.g., a house light bulb. An item may be on a schedule for periodic maintenance, but if it fails prematurely, it will require maintenance to fix.

Proactive maintenance can be considered either preventive or predictive in nature and the maintenance performed can range from an inspection, test, or servicing to an overhaul or complete replacement.

Preventive or scheduled maintenance can be based on calendar, equipment-operating time or a cycle, such as number of starts, air vehicle landings, rounds fired, or miles driven.

Predictive maintenance can be categorized as either diagnostic or prognostic. Diagnostic identifies an impending failure while prognostics add the capability to

forecast the remaining equipment life. Knowing the remaining life is an obvious benefit to enable optimum mission and maintenance planning.

Reliability Centered Maintenance (RCM): A logical, structured process used to determine the optimal failure management strategies for any system, based upon system reliability characteristics and the intended operating context. RCM defines what must be done for a system to achieve the desired levels of safety, environmental soundness, and operational readiness at best cost.

Serialized Item Management (SIM): SIM programs provide accurate and timely item-related data that identify populations of select items (parts, components, and end items) and mark all items in the population with a unique identification number to enable the generation, collection and analysis of maintenance data about each specific item. Candidate item populations include: repairable items down to and including sub-component repairable unit level; life-limited, time-controlled, or items with records (e.g., logbooks, aeronautical equipment service records, etc.); and items that require technical directive tracking at the part number level.

Unique Identification (UID): DOD program that enables easy access to information about DoD possessions that will make acquisition, repair, and deployment of items faster and more efficient. UID permanently identifies an individual item and is a mandatory requirement for all DOD solicitations issued on or after 1 January 2004.