



Department of Defense INSTRUCTION

NUMBER 4151.22

October 16, 2012

Incorporating Change 2, August 31, 2018

USD(A&S)

SUBJECT: Condition Based Maintenance Plus (CBM⁺) for Materiel Maintenance

References: See Enclosure 1

1. PURPOSE. This Instruction:

a. Reissues DoD Instruction (DoDI) 4151.22 (Reference (a)) in accordance with the authority in DoD Directive (DoDD) 5134.01 (Reference (b)) to update policy for CBM⁺ as an essential readiness enabler and a primary strategy for achieving cost-effective weapon system life cycle sustainment.

b. Updates established policy, assigns responsibilities, and provides procedures for the Military Departments and Defense Agencies for implementation of CBM⁺ pursuant to DoDD 4151.18 and DoDI 5000.02 (References (c) and (d)).

2. APPLICABILITY. This Instruction applies to the OSD, the Military Departments, the Office of the Chairman of the Joint Chiefs of Staff and the Joint Staff, the Combatant Commands, the Office of the Inspector General of the Department of Defense, the Defense Agencies, the DoD Field Activities, and all other organizational entities within the DoD.

3. DEFINITIONS. See Glossary.

4. POLICY. It is DoD policy that CBM⁺ shall be:

a. Implemented in accordance with the CBM⁺ definition in the Glossary and guidance detailed in Enclosure 2.

b. Used as a principal consideration in the selection of maintenance concepts, technologies, and processes for all new weapon systems, equipment, and materiel programs based on readiness

requirements, life cycle cost goals, and reliability centered maintenance (RCM)-based functional analysis formulated in a comprehensive reliability and maintainability (R&M) engineering program.

c. Documented in the program Systems Engineering Plan and Life Cycle Sustainment Plan and assessed during acquisition process reviews and evaluations in accordance with Reference (d) and the Defense Acquisition Guidebook (Reference (e)).

d. Included in the development of mandatory sustainment key performance parameter (KPP) and supporting key system attributes (KSAs) required for Acquisition Category (ACAT) I programs. ACAT II and below programs with materiel solutions shall include CBM⁺ in the development of the sustainment KPP or sponsor defined sustainment metrics in accordance with the Joint Capabilities Integration and Development System Manual (Reference (f)).

e. Adequately resourced for implementation, to include product development, procurement, and sustainment.

f. Integrated in current weapon systems, equipment, and materiel sustainment programs where it is technically feasible and beneficial.

g. Incorporated as part of maintenance plans and into contracts for systems and programs supported in organic or commercial sectors (e.g., performance-based life cycle product support arrangements) in accordance with DoDD 5000.01 and Defense Acquisition University and OSD guides (References (g), (h), and (i)).

h. Measured for outcomes using:

(1) The two availability metrics of the sustainment KPP: materiel availability and operational availability.

(2) The supporting KSAs: reliability and operation and support cost.

5. RESPONSIBILITIES. See Enclosure 3.

6. RELEASABILITY. UNLIMITED. This Instruction is approved for public release and is available on the Internet from the DoD Issuances Website at <http://www.dtic.mil/whs/directives>.

7. SUMMARY OF CHANGE 2. This change reassigns the office of primary responsibility for this Instruction the Under Secretary of Defense Acquisition and Sustainment in accordance with the July 13, 2018 Deputy Secretary of Defense Memorandum (Reference (j)).

8. EFFECTIVE DATE. This Instruction is effective October 16, 2012.

A handwritten signature in black ink, appearing to read 'Frank Kendall', with a long horizontal flourish extending to the right.

Frank Kendall
Under Secretary of Defense for Acquisition,
Technology, and Logistics

Enclosures

1. References
2. Guidance
3. Responsibilities

Glossary

ENCLOSURE 1

REFERENCES

- (a) DoD Instruction 4151.22, “Condition Based Maintenance Plus (CBM⁺) for Materiel Maintenance,” December 2, 2007 (hereby cancelled)
- (b) DoD Directive 5134.01, “Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)),” December 9, 2005, as amended
- (c) DoD Directive 4151.18, “Maintenance of Military Materiel,” March 31, 2004
- (d) DoD Instruction 5000.02, “Operation of the Defense Acquisition System,” January 7, 2015, as amended
- (e) Defense Acquisition University, “Defense Acquisition Guidebook,” current edition¹
- (f) Defense Acquisition University, JCIDS Manual, “Manual for the Operation of the Joint Capabilities Integration and Development System,” current edition²
- (g) DoD Directive 5000.01, “The Defense Acquisition System,” May 12, 2003
- (h) Defense Acquisition University, “Performance Based Logistics: A Program Manager’s Product Support Guide,” March 2005
- (i) Office of the Secretary of Defense, “Designing and Assessing Supportability in DoD Weapon Systems: A Guide to Increased Reliability and Reduced Logistics Footprint,” October 24, 2003
- (j) Deputy Secretary of Defense Memorandum, “Establishment of the Office of the Under Secretary of Defense for Research and Engineering and the Office of the Under Secretary of Defense for Acquisition and Sustainment,” July 13, 2018
- (k) DoD Manual 8910.01, “DoD Information Collections Manual,” dates varies by volume
- (l) Deputy Under Secretary of Defense for Logistics and Materiel Readiness, “Condition Based Maintenance Plus DoD Guidebook,” May 2008
- (m) DoD 4151.22-M, “Reliability Centered Maintenance (RCM),” June 30, 2011
- (n) DoD Directive 5010.42, “DoD-Wide Continuous Process Improvement (CPI)/Lean Six Sigma (LSS) Program,” May 15, 2008
- (o) DoD Instruction 4151.19, “Serialized Item Management (SIM) for Materiel Maintenance,” January 9, 2014
- (p) Principal Deputy Assistant Secretary of Defense for Logistics and Materiel Readiness, “DoD Product Support Business Case Analysis Guidebook,” April 2011

¹ Available at <https://dag.dau.mil/Pages/Default.aspx>

² Available at <https://acc.dau.mil/communitybrowser.aspx?id=267116>

ENCLOSURE 2

GUIDANCE

1. Effective CBM⁺ implementation will:

a. Enhance maintenance efficiency and effectiveness and integrate all functional aspects of life cycle management processes for materiel requirements, such as systems engineering, development, acquisition, distribution, supply chain management, sustainment, and modernization.

b. Establish integrated, predictive maintenance approaches, which minimize unscheduled repairs, eliminate unnecessary maintenance, and employ the most cost-effective system health management processes.

c. Implement an optimum mix of maintenance technologies (e.g., condition monitoring, diagnostics, and prognostics), best practices, RCM-based processes, and enablers (e.g., total asset visibility) within the integrated total life cycle framework.

d. Implement data collection and analysis requirements in accordance with DoD Manual 8910.01 (Reference (k)) to measure equipment sustainment performance characteristics and supporting measures of effectiveness throughout life cycle sustainment.

e. Enhance materiel availability and life cycle system readiness by reducing equipment failures during mission periods and identifying the best time to perform required maintenance, thereby increasing the operational assets.

f. Leverage open architectures and open standards to facilitate the broad application of CBM⁺ enablers in a net centric approach using the Department of Defense Architecture Framework, as defined in the Glossary.

g. Improve materiel reliability through the disciplined analysis of failure data to modify designs and operating practices to ensure equipment meets target performance standards within operational context.

h. Optimize life cycle logistics processes and minimize mean downtime by providing timely condition information, precise failure mode identification, and accurate technical data that will expedite repair and support processes.

i. Reduce operation and support costs by eliminating unnecessary maintenance activities and accurately positioning resources for an effective logistics footprint in support of warfighting requirements.

2. CBM⁺ is pursued through the examination, evaluation, and implementation of enabling technologies, tools, and process improvements from public and private sources in accordance with the Condition Based Maintenance Plus DoD Guidebook (Reference (l)). The decision to

incorporate CBM⁺ is based on any of the following:

- a. Failure modes and effects analysis and other R&M analysis.
- b. RCM analysis in accordance with DoD 4151.22-M (Reference (m)).
- c. Continuous process improvement initiatives in accordance with DoDD 5010.42 (Reference (n)).
- d. Serialized item management applications in accordance with DoDI 4151.19 (Reference (o)).
- e. Predictive reliability engineering methods.
- f. Technology assessments.
- g. Business case analyses in accordance with Reference (l) and the DoD Product Support Business Case Analysis Guidebook (Reference (p)).

ENCLOSURE 3

RESPONSIBILITIES

1. ASSISTANT SECRETARY OF DEFENSE FOR LOGISTICS AND MATERIAL READINESS (ASD(L&MR)). The ASD(L&MR), under the authority, direction, and control of the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)), shall:

- a. Develop policy and provide guidance for CBM⁺ pursuant to References (c) and (d).
- b. Monitor and review the implementation of these policies to ensure CBM⁺ effectiveness across maintenance, acquisition, engineering, logistics, and industrial communities.

2. ASSISTANT SECRETARY OF DEFENSE FOR ACQUISITION (ASD(A)). The ASD(A), under the authority, direction, and control of the USD(AT&L), shall:

- a. As part of program oversight responsibilities, ensure that CBM⁺ technologies, processes, and enablers are integrated with program acquisition and technical planning.
- b. Consider CBM⁺ during program support reviews and other oversight reviews.

3. ASSISTANT SECRETARY OF DEFENSE FOR RESEARCH AND ENGINEERING (ASD(R&E)). The ASD(R&E), under the authority, direction, and control of the USD(AT&L), shall advance CBM⁺ by:

- a. Supporting identified critical technologies through studies and analyses.
- b. Reviewing plans and projects to eliminate unpromising or duplicative programs.
- c. Guiding science and technology programs, advanced component development, and prototypes programs to achieve CBM⁺ capabilities.

4. SECRETARIES OF THE MILITARY DEPARTMENTS AND DIRECTORS OF THE DEFENSE AGENCIES. The Secretaries of the Military Departments and the Directors of the Defense Agencies shall:

- a. Incorporate the requirement for CBM⁺ in appropriate policy and guidance.
- b. Develop and establish enterprise level requirements for implementing CBM⁺.
- c. Provide resources for CBM⁺ requirements developed at enterprise and weapon systems levels.

- d. Designate a focal point for CBM⁺ efforts.
- e. Participate in joint DoD CBM⁺ activity.
- f. Review and monitor programs for CBM⁺ implementation and outcomes.
- g. Identify life cycle sustainment challenges and use CBM⁺ solutions, as appropriate, to maintain the readiness of new and fielded equipment.
- h. Integrate common CBM⁺ technologies, processes, and procedures for similar platforms and components.
- i. Require implementation of RCM and other appropriate reliability and maintainability analyses.
- j. Ensure logistics information systems support CBM⁺ objectives.
- k. Require program managers design, develop, demonstrate, deploy, and sustain equipment in accordance with CBM⁺ policy and guidance to achieve required materiel readiness at best value.

GLOSSARY

PART I. ABBREVIATIONS AND ACRONYMS

ACAT	acquisition category
ASD(A)	Assistant Secretary of Defense for Acquisition
ASD(L&MR)	Assistant Secretary of Defense for Logistics and Materiel Readiness
ASD(R&E)	Assistant Secretary of Defense for Research and Engineering
CBM ⁺	Condition Based Maintenance Plus
DoDD	DoD Directive
DoDI	DoD Instruction
KPP	key performance parameter
KSA	key system attribute
R&M	reliability and maintainability
RCM	reliability centered maintenance
USD(AT&L)	Under Secretary of Defense for Acquisition, Technology, and Logistics

PART II. DEFINITIONS

These terms and their definitions are for the purpose of this Instruction.

CBM⁺. CBM⁺ is the application and integration of appropriate processes, technologies, and knowledge-based capabilities to achieve the target availability, reliability, and operation and support costs of DoD systems and components across their life cycle. At its core, CBM⁺ is maintenance performed based on evidence of need, integrating RCM analysis with those enabling processes, technologies, and capabilities that enhance the readiness and maintenance effectiveness of DoD systems and components. CBM⁺ uses a systems engineering approach to collect data, enable analysis, and support the decision-making processes for system acquisition, modernization, sustainment, and operations.

Department of Defense Architecture Framework. An architecture is the fundamental organization of a system or process embodied in its components, their relationships to each other and to the environment, and the principles guiding its design and evolution. The Department of Defense Architectural Framework defines a common approach for architecture description development, presentation, and integration for both DoD warfighting operations and for business operations and processes. The framework is intended to ensure design descriptions and interfaces can be compared and related throughout the product or process life cycle across organizational and functional boundaries, including joint and multinational boundaries.