United States Military Standard

A United States **defense standard**, often called a **military standard**, "**MIL-STD**", "**MIL-SPEC**", or (informally) "**MilSpecs**", is used to help achieve standardization objectives by the U.S. Department of Defense.

Standardization is beneficial in achieving interoperability, ensuring products meet certain requirements, commonality, reliability, total cost of ownership, compatibility with logistics systems, and similar defense-related objectives [1].

Defense standards are also used by other non-defense government organizations, technical organizations, and industry. This article discusses definitions, history, and usage of defense standards. Related documents, such as **defense handbooks** and **defense specifications**, are also addressed.

Definition of document types

Although the official definitions differentiate between several types of documents, all of these documents go by the general rubric of "military standard", including defense specifications, handbooks, and standards. Strictly speaking, these documents serve different purposes. According to the Government Accountability Office (GAO), military specifications "describe the physical and/or operational characteristics of a product", while military standards "detail the processes and materials to be used to make the product." Military handbooks, on the other hand, are primarily sources of compiled information and/or guidance. The GAO acknowledges, however, that the terms are often used interchangeably.

Official definitions are provided by DoD 4120.24-M, [2], *Defense Standardization Program (DSP) Policies and Procedures,* March 2000, OUSD (Acquisition, Technology and Logistics):

Acronym	Type	Definition [3]
MIL-HDBK	**Defense Handbook**	A guidance document containing standard procedural, technical, engineering, or design information about the material, processes, practices, and methods covered by the DSP. MIL-STD-967 covers the content and format for defense handbooks.
MIL-SPEC	**Defense Specification**	A document that describes the essential technical requirements for purchased materiel that is military unique or substantially modified commercial items. MIL-STD-961 covers the content and format for defense specifications.
MIL-STD	**Defense Standard**	A document that establishes uniform engineering and technical requirements for military-unique or substantially modified commercial processes, procedures, practices, and methods. There are five types of defense standards: interface standards, design criteria standards, manufacturing process standards, standard practices, and test method standards. MIL-STD-962 covers the content and format for defense standards.
MIL-PRF	**Performance Specification**	A performance specification states requirements in terms of the required results with criteria for verifying compliance, but without stating the methods for achieving the required results. A performance specification defines the functional requirements for the item, the environment in which it must operate, and interface and interchangeability characteristics.
MIL-DTL	**Detail Specification**	A specification that specifies design requirements, such as materials to be used, how a requirement is to be achieved, or how an item is to be fabricated or constructed. A specification that contains both performance and detail requirements is still considered a detail specification.

For purposes of this article, "defense standards" will include standards, specifications and handbooks.

Formats

The DOD has standards about the format of standards:

- MIL-STD-961E(1), Defense and Program-Unique Specifications Format and Content, 2 April 2008, Dept. of Defense [4]
- MIL-STD-962D(1), Defense Standards Format and Content, 2 April 2008, Dept. of Defense [5]
- MIL-STD-967(1), Defense Handbooks Format and Content, 2 April 2008, Dept. of Defense [6]

Origins and evolution

Defense standards evolved from the need to ensure proper performance, maintainability and reparability (ease of MRO), and logistical usefulness of military equipment. The latter two goals (MRO and logistics) favor certain general concepts, such as interchangeability, standardization (of equipment and processes, in general), cataloguing, communications, and training (to teach people what is standardized, what is at their discretion, and the details of the standards). In the late 18th century and throughout the 19th, the American and French militaries were early adopters and longtime developmental sponsors and advocates of interchangeability and standardization. By World War II (1939-1945), virtually all national militaries and trans-national alliances of the same (Allied Forces, Axis powers) were busy standardizing and cataloguing. The U.S. AN- cataloguing system (Army-Navy) and the British Defence Standards (DEF-STAN) provide examples.

For example, due to differences in dimensional tolerances, in World War II American screws, bolts, and nuts did not fit British equipment properly and were not fully interchangeable.[7] Defense standards provide many benefits, such as minimizing the number of types of ammunition, ensuring compatibility of tools, and ensuring quality during production of military equipment. This results, for example, in ammunition and food cases that can be opened without tools; vehicle subsystems that can be quickly swapped into the place of damaged ones; and small arms and artillery that are less likely to find themselves with an excess of ammunition that does not fit their bores and a lack of ammo that does.

However, the proliferation of standards also has some drawbacks. The main one is that they impose what is functionally equivalent to a regulatory burden upon the defense supply chain, both within the military and across its civilian suppliers. Almost nothing can be done according to sound case-by-case judgment, and almost everything requires constant, extensive study of the rules and verification that they are being followed "to a T". Workflows frequently pause (causing snowballing schedule delays) for reasons that are sometimes essentially trivial, and unit costs rise.

In the U.S. during the 1980s and early 1990s, it was argued that the large number of standards, nearly 30,000 by 1990, imposed unnecessary restrictions, increased cost to contractors (and hence the DOD, since the costs in the end pass along to the customer), and impeded the incorporation of the latest technology. Responding to increasing criticism, Secretary of Defense William Perry issued a memorandum in 1994 that prohibited the use of most defense standards without a waiver.[8] This has become known as the "Perry memo". Many defense standards were canceled. In their place, the DOD encouraged the use of industry standards, such as ISO 9000 series for quality assurance (see COTS), SAE standards such as the AS and AMS series (e.g., AS9100, AMS 2404), and others. Weapon systems were required to use "performance specifications" that described the desired features and performance of the weapon, as opposed to *how* those goals would be reached (that is, exactly which technology and which materials would be used). In 2005 the DOD issued a new memorandum[9] which eliminated the requirement to obtain a waiver in order to use defense standards. The 2005 memo did not reinstate any canceled defense standards.

According to a 2003 issue of *Gateway*, published by the Human Systems Information Analysis Center [10], the number of defense standards and specifications have been reduced from 45,500 to 28,300. However, other sources noted that the number of standards just before the Perry memorandum was issued was less than 30,000, and that thousands have been canceled since then. This may be due to differences in what is counted as a "military standard".

Another potential drawback of carrying standardization to an extreme is a threat analogous to monoculture (where lack of biodiversity creates higher risk of pandemic disease) or a ship without bulkhead compartmentalization (where even a small hull leak threatens to fill the whole vessel). If an enemy discovers a drawback in a standardized system, the system's uniformity leaves it vulnerable to complete incapacitation via what might otherwise have been a limited compromise. (See Security through obscurity which may be considered poor practice via the U.S. Navy KISS principle.) Also, materiel overrun by advancing enemy lines is potentially easier for the enemy to make use of if it is extensively standardized; but this threat is somewhat academic, as even poorly standardized materiel presents a likelihood of supplying an enemy if overrun.

Non-exhaustive list of documents

- Cataloging Handbook H2,[11] definitions for NATO Stock Number Federal Supply Groups and Federal Supply Classes
- Cataloging Handbook H4, a handbook containing vendor CAGE code details
- Cataloging Handbook H6, Item Name Directory for the NATO Codification System
- Cataloging Handbook H8, another handbook containing vendor CAGE code details
- MIL-E-7016F, pertains to the analysis of AC and DC loads on an aircraft.
- MIL-STD-105, Sampling Procedures and Tables for Inspection by Attributes (withdrawn)
- MIL-STD-167, Mechanical Vibration of Shipboard Equipment
- MIL-STD-188, a series related to telecommunications
- MIL-STD-196, a specification of the Joint Electronics Type Designation System (JETDS)
- MIL-STD-202, test methods for electronic and electrical parts.
- MIL-STD 461, "Requirements for the control of electromagnetic interference characteristics of subsystems and equipment"
- MIL-STD-498, on software development and documentation
- MIL-STD-499, on Engineering Management (System Engineering)
- MIL-STD-806, Graphical Symbols for Logic Diagrams, originally a USAF standard [12]
- MIL-STD-810, test methods for determining the environmental effects on equipment
- MIL-HDBK-881, Work Breakdown Structures for Defense Materiel Items (WBS)
- MIL-STD-882, standard practice for system safety
- MIL-STD-883, test method standard for microcircuits [13]
- MIL-S-901, Shock Testing for Shipboard Equipment.
- MIL-STD-1168, a classification system for ammunition production that replaced the Ammunition Identification Code (AIC) system used during World War II.
- MIL-STD-1234, sampling, inspection, and testing of pyrotechnics
- MIL-STD-1246C, particle and molecular contamination levels for space hardware (has been replaced with IEST-STD-CC1246D).
- MIL-STD-1388-1A, Logistics support analysis (LSA) (canceled and s/s by MIL-HDBK-502, Acquisition Logistics)
- MIL-STD-1388-2B, DOD requirements for a logistic support analysis record (canceled and s/s by MIL-PRF-49506, Logistics Management Information)
- MIL-STD-1394, this is concerned with the construction quality of hats and is often confused with IEEE 1394.
- MIL-STD-1397, Input/Output Interfaces, Standard Digital Data, Navy Systems
- MIL-STD-1472F, Human Engineering
- MIL-STD-1474, a sound measurement for small arms standard
- MIL-STD-1553, a digital communications bus
- MIL-STD-1589, JOVIAL programming language
- MIL-STD-1750A, an instruction set architecture (ISA) for airborne computers

- MIL-STD-1760, smart-weapons interface derived from MIL-STD-1553
- MIL-STD-1815, Ada programming language
- MIL-STD-1913, Picatinny rail, a mounting bracket on firearms
- MIL-STD-2045-47001, Connectionless Data Transfer Application Layer
- MIL-STD-2196, pertains to optical fiber communications
- MIL-STD-2361, pertains to digital development, acquisition, and delivery of Army administrative, training and doctrine, and technical equipment publications in SGML.
- MIL-STD-2525, Common Warfighting Symbology (APP-6A)
- MIL-STD-3011, Joint Range Extension Application Protocol (JREAP)
- MIL-STD-6011, Tactical Data Link (TDL) 11/11B Message Standard (Link-11)
- MIL-STD-6013, Army Tactical Data Link-1 (ATDL-1)
- MIL-STD-6016, Tactical Data Link (TDL) 16 Message Standard (Link-16)
- MIL-STD-6017, Variable Message Format (VMF)
- MIL-STD-6040, United States Message Text Format (USMTF)
- MIL-DTL-13486
- MIL-PRF-38534, General Specification For Hybrid Microcircuits.
- MIL-PRF-38535, General Specification For Integrated Circuits (Microcircuits) Manufacturing.

References

[1] http://www.dsp.dla.mil/APP_UIL/policy.aspx?action=content&accounttype=displaypolicy&contentid=33
[2] http://www.dtic.mil/whs/directives/corres/pdf/412024m.pdf
[3] DOD 4120.24-M, (2000), "DSP Policies & Procedures", Office of the Undersecretary of Defense (Acquisition, Technology and Logistics)
[4] http://quicksearch.dla.mil/basic_profile.cfm?ident_number=36063
[5] http://quicksearch.dla.mil/basic_profile.cfm?ident_number=36064
[6] http://quicksearch.dla.mil/basic_profile.cfm?ident_number=213528
[7] British hardware since the early 20th century was made to BS standards, while American Hardware was made to ASA standards. Though similar, fasteners could often not be interchanged in high-precision, demanding applications until the development of the Unified Thread Standard in the late 1940s.
[8] https://acc.dau.mil/CommunityBrowser.aspx?id=32397 SECDEF Memo *Specifications & Standards - A New Way of Doing Business*, DTD 29 Jun 94
[9] Elimination of Waivers to Cite Military Specifications and Standards [ACC] (https://acc.dau.mil/CommunityBrowser.aspx?id=152529&lang=en-US)
[10] http://iac.dtic.mil/hsiac/GW-docs/gw_xiv_2.pdf
[11] http://www.fs.fed.us/fire/partners/fepp/h2book.pdf
[12] The Magazine of standards, Volumes 30-31, American National Standards Institute, 1959, p.351, accessed at Google Books 2012-09-27
[13] http://www.dscc.dla.mil/programs/milspec/ListDocs.asp?BasicDoc=MIL-STD-883

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- van Opstal, Debra, (1994), "Roadmap for MILSPEC reform: A national imperative", *Program Manager*, v 23, no. 1:10-13.

External links

- Acquisition Streamlining and Standardization Information System (ASSIST) (https://assist.dla.mil/) – the official source for defense and federal specifications and standards, military handbooks, commercial item description, data item descriptions, and related standardization documents either prepared by, or adopted by, the Department of Defense
- Defense Standards (Gov IT Wiki) (http://govitwiki.com/wiki/Defense_Standards) – where to obtain defense standards and specifications
- Defense Standardization Program (http://dsp.dla.mil/)
- Defense Technology Information Center (DTIC) (http://www.dtic.mil/dtic/)
- EverySpec.com repository for military standards, specs, and handbooks (http://www.everyspec.com/)

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