Defense Acquisition University (DAU)

Integrated Product Support (IPS) Elements Guidebook

March 2021

Table of Contents

Foreword

In October 2009, Section 805 of Public Law 111-84 established the key leadership position of Product Support Manager (PSM) and reiterated DoD's commitment to life cycle product support management. By 2010, the Office of the Assistant Secretary of Defense (ASD) Logistics and Materiel Readiness (L&MR) concluded the seminal work to develop and implement a Product Support Business Model (PSBM) and published a series of Guidebooks to assist the Product Support Manager (PSM) in the execution of his or her duties. These Guidebooks included the "DoD Product Support Manager Guidebook," the "DoD Product Support Business Case Assessment (BCA) Guidebook" and the "DoD Logistics Assessment (LA) Guidebook."

Since 2010, the existing Product Support Guidebooks have been updated and a few new ones have been developed to fill information gaps. This Integrated Product Support (IPS) Elements Guidebook has now also been extensively updated to reflect current policy and guidance. It picks up where the Product Support Manager Guidebook Appendix A left off in describing the 12 IPS Elements.

Program Managers (PM), Product Support Managers and Life Cycle Logisticians should use this Guidebook as a reference source and training aid supporting their responsibilities, tailored to the needs of each program.

The term "Integrated" in the term "Integrated Product Support Element" is critical. The Product Support Manager must understand how each element is affected by and linked with the others and should employ all of them in an integrated fashion to reach the goal of optimizing Warfighter requirements for suitability and affordability.

The value proposition of this IPS Element Guidebook is that it:

- Serves as a one stop shop for detailed information about each of the twelve Integrated Product Support Elements;
- Provides DoD approved standard definitions for each of the IPS elements and sub-elements;
- Identifies key activities and products for each IPS element; and
- Provides much-needed information on who, what, why, how, where and when these activities and products are accomplished throughout the life cycle.

The reader is directed to the Preface section which provides additional information on the purpose, scope, background and use of the IPS Element Guidebook.

Preface

Purpose

This guidebook is a Defense Acquisition University training asset to supplement and further explain implementation of new Product Support Manager guidance published by the Office of the Secretary of Defense. The focus is on the PSM Guidebook Appendix A, "Integrated Product Support Elements."

The intended audience is primarily the Product Support Manager (PSM) and senior Life Cycle Logisticians. The level of detail is to assist the PSM "Journeyman" in better understanding the scope, products, deliverable scheduling, and associated activities that are within the scope of the PSM position. Adding to the learning value of the Guidebook are a high number of references, many of them actively hyperlinked, within the text of each topical discussion. Additionally, the material in this Guidebook reflects and links with content of DAU courseware where applicable and further references DAU training materials with which the readers can further expand their knowledge of a specific topic.

Scope

The scope of this Guidebook is intended to be a DAU training asset to explain the policy and implementation guidance associated with each of the topical areas within each of the Integrated Product Support Elements as defined in the Product Support Manager Guidebook, Appendix A. In some cases, the topical areas are broken down through three or more levels of increasing detail.

While the focus of this content is on DoD level policy, Service or Agency level policy is often cited for clarity, as examples and to assist the reader in locating relevant information. The DoD Services representatives assisted in identifying relevant content during the development of this Guidebook.

This Guidebook takes the Appendix A one step further by:

- Breaking down the IPS Element sub-topics into their individual products and processes;
- Explaining the who, what, where, when, how and why for the major deliverables of each IPS Element by life cycle acquisition phase;
- Highlighting the importance of full integration among the Elements;
- Providing sources for additional training, communities of practice and references for each IPS Element.

What's New in this Update

- Alignment to the PSM Guidebook Appendix A outline. Those sections which are "numbered," i.e., 2.3 or 5.6, are matched to the respective line item in the PSM Guidebook, Appendix A. Those sections of content with no numbering are sub-topic areas relevant to the IPS Element chapter.

- Discussion and examples of integration among the twelve IPS Elements in a new, separate Annex.
- Identification of references for relevant product support metrics which are recommended by DoD policy and guidance are in a new separate Annex.
- The Computer Resources IPS Element has been redesignated as the Information Technology (IT) Systems Continuous Support IPS Element. The new content has been incorporated in to this guidebook.
- DoD policy and guidance references have been updated as of the publication of this document. Additionally, a new separate references annex has been created to show major applicability of references to one or more of the twelve IPS Elements.

New DoD Organization Changes

This Guidebook reflects the new DoD organization changes in the topics Proponency section of each IPS Element Chapter. Readers should be aware that as of February 1, 2018, Section 901 of National Defense Authorization Act for Fiscal Year 2017 abolished the roles of the Under Secretary of Defense for Acquisition, Technology and Logistics (AT&L) and subsidiary Assistant Secretaries. It established an Undersecretary for Research & Engineering, who will assume most of the duties currently exercised by the Assistant Secretary of Defense for Research & Engineering, and an Undersecretary of Defense for Acquisition and Sustainment who will define the policies, procedures, and direction of the acquisition process. Also established is a Chief Management Officer at the Undersecretary level who will conduct the business operations of the Department, including the actual acquisition of goods and services and products.

Please note that DoD organizational changes may result in changes to Office designations and Proponency responsibilities that may not match the content in this Guidebook.

More information on these organizational changes can be found on the OUSD(A&S) and OUSD(R&E) websites.

The DoD Adaptive Acquisition Framework (AAF)

The DoD AAF, shown in Figure P-1, represents a set of acquisition pathways to enable the workforce to tailor strategies to deliver better solutions faster.

The 5000 series policies were updated to reflect the new set of key tenets of the Defense Acquisition System with new policies for each acquisition pathway and functional area. The AAF website integrates the policies, guides, and resources for the acquisition workforce to navigate their program lifecycle.

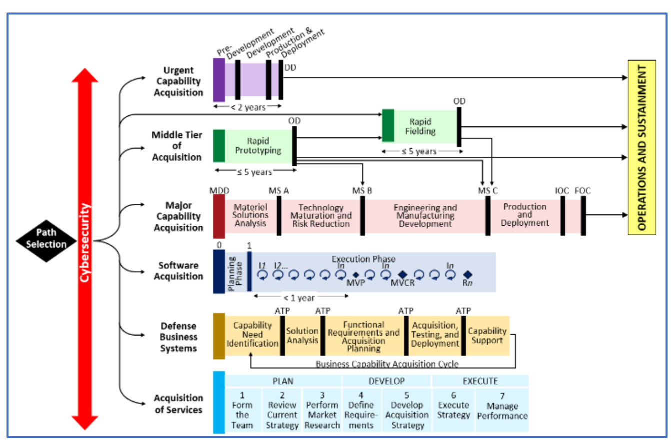


Figure P-1. The DoD AAF

The AAF is important to logisticians as it fully incorporates life cycle sustainment into all DoD acquisition approaches. Logisticians should review the pathway relevant policy and guidance for how to best address life cycle logistics planning, management, and goals into a specific acquisition program.

Decision authorities and program managers tailor program strategies and oversight, phase content, the timing and scope of decision reviews, and decision levels based on the characteristics of the capability being acquired, including complexity, risk, and urgency to satisfy user requirements.

The Use of “Golden Source” References

There are some sources of information which may be termed “golden sources.” These sources are considered of the highest reliability in that they contain validated documents and provide the most recent or current revision of a document. This Guidebook is committed to using only those information sources of the highest validity. In those instances when an alternate source is used, the reference will be cited along with a disclaimer.

Readers should review Annex C, References, for more detailed information regarding reference sources and applicability of references across the twelve IPS Elements. Please note that due to the high rate of change occurring in policy and guidance, the letter designations found as part of a reference will be removed in this guide. Readers are encouraged to check the DoD reference source on a frequent basis to ensure they are using the current reference version.

The primary DoD sources of references used for this Guidebook are listed below:

- Official websites of the U.S Government
- Executive Services Directorate, DoD Directives Division
- Official DoD Websites of the Major Elements of OSD, Military Departments and Unified Combatant Commands
- DoD Assist Database
- Official websites for DoD sanctioned industry standards
    - ANSI for U.S. Government Agencies
    - SAE International
    - IEEE
- IPS Element CoP
- Joint Electronic Library
- DAU Glossary
- Joint Publication 1-02, DoD Dictionary of Military and Associated Terms
- DAU Logistics Functional Area Gateway, shown in ***Figure P-2.*** below.

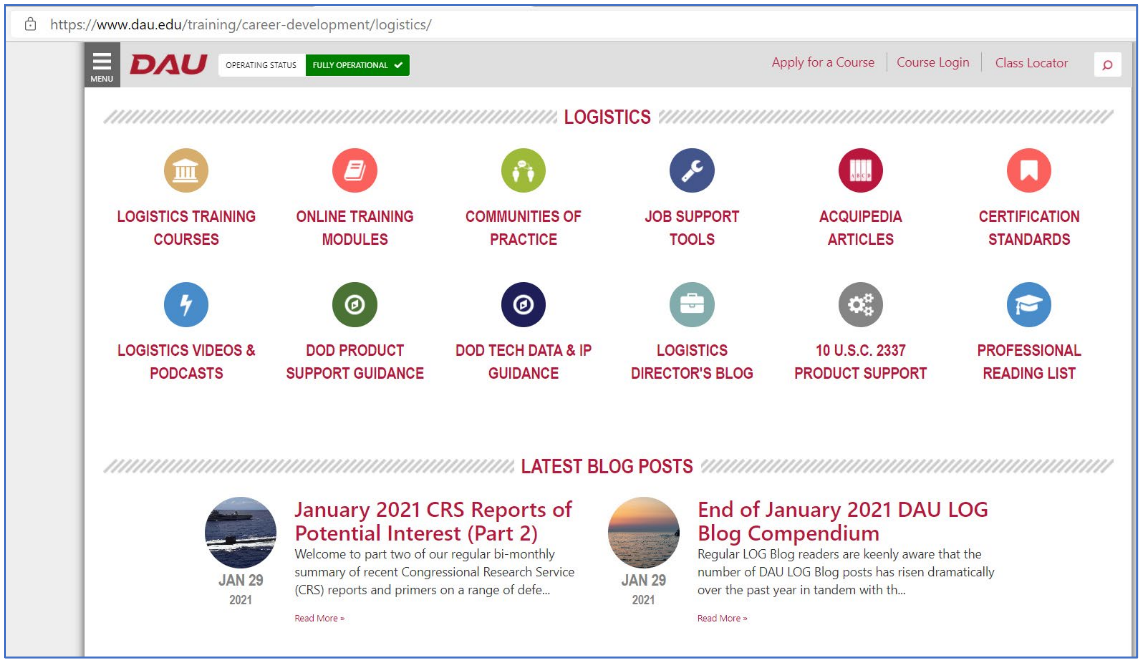


Figure P-2. Screenshot of the Logistics Functional Area Gateway Website Homepage

- DAU maintains an Online Library & Research Community that offers a knowledge repository, a professional reading program, quick access to DoD publications, a “News and Events” section and information on conducting research on DoD capabilities. There is also an “Ask a Professor” for asking acquisition and logistics questions concerning policies and practices.

- The Defense Acquisition Management Information Retrieval (DAMIR) is a DoD initiative that provides enterprise visibility to acquisition program information. Note: Access to DAMIR is restricted to approved users within the DoD acquisition community.

- The Government Accountability Office (GAO) website has a “Key Issues” section that provides links for exploring into specific topics across all US Government Agencies. The Defense Department link shows 27 key issues, some issues being directly relevant to the IPS Elements.

- DAU maintains a special topics community for the IPS Elements. This site is excellent for researching Key References, related Communities of Practice (CoP), DAU training courses and ACQuipedia articles. Within the graphic showing the titles of each of the IPS Elements are hyperlinked. The reader clicks on the specific IPS Element title to access the respective research information.

Structure of this Guidebook

Users of this guidebook will find each Integrated Product Support Element and its supporting material sequentially listed by separate chapters. The user may either start by reading a chapter from start to finish or go directly to that section of interest. Each chapter is intended to be a stand-alone body of material.

The table of contents is very detailed to allow for ease of finding topical material by IPS Element. It is deliberately structured into both numbered paragraphs and alphabetically ordered sections. The numerical ordering of paragraphs coincides with Appendix A of the Product Support Manager Guidebook. The alphabetical ordering of sections corresponds to answering the "Who, What, When, Where, Why and How" for planning and management of activities and requirements within each IPS Element. This structure was chosen so that the reader would have a continuing numerical association for each of the IPS Element sub-topics. This numerical association will become more important in the future as Life Cycle Logistics policy continues to mature.

Each chapter is arranged according to the following structure:

- Integrated Product Support Element Objective and Description (the objectives and definitions correspond to the Product Support Manager Guidebook Appendix A)
- Overview
- Why each IPS Element is Important
- PSM Activities (corresponding to the numbering schema of the Product Support Manager Guidebook Appendix A) and Related Sub-Topics
- Major Activities by Acquisition Phase
- Data Item Description (DID) Deliverables
- Proponency
- DoD Policy, Regulations and Statutes
- Communities of Practices and Interest
- Training Resources

Using this Guidebook

The new reader may be dismayed by the number of pages of content within this Guidebook. The intent is not for users to have to read all of the content, but only that which is relevant to the questions or challenges at hand. As you would use an encyclopedia, go to the table of contents, and pick out those topical items of interest and read those carefully. Note: This Guidebook will become Web-based when it is hosted on the DAU website, which will make it easier to search and navigate amongst topics of interest.

The following advice is offered:

- Read the foreword and preface first.
- Skim quickly through each of the chapters to become familiar with their contents. Each IPS Element chapter is consistently organized using the same structure as described in

section 3 above. For example, the topic of "Training Resources" will always be found in Section I and "DoD Policy" will always be found in Section D of each chapter.
- Use the references (many of them hyperlinked) which are located throughout the Guidebook to aid in quickly finding primary or additional information sources.

Deployment of this Guidebook

This Guidebook is located on the Defense Acquisition University (DAU) Acquisition Community Connection (ACC) website. It can also be found using publicly available internet search engines by searching with the keywords: "DAU IPS Elements Guidebook." For ease and speed of navigating this document, the table of contents contains hyperlinks to each Element while the beginning of each chapter contains a hyperlinked mini outline. The complete Guidebook is also downloadable as a .pdf file via the link on the DAU ACC website.

Disclaimers

The following disclaimers are included due to the rapidly changing nature of policy and the need to use only current policy *as it is published* in directives, instructions, directive-type memorandums, and other mandatory guidance.

Things to consider while reading this IPS Element Guidebook:

- This Guidebook only reflects current policy as of the publication of this guidebook as written in directives, instructions, and other written guidance by OSD and its Components.
- Pending policy is not included.
- Supply Chain Management is more than adequately addressed in the Product Support Manager Guidebook, April 2016, and is not duplicated in this IPS Element Guidebook.
- During the development of this Guidebook, the organization of the IPS Elements and their sub-topics was discussed and vetted with leadership throughout the DoD Product Support community to ensure compliance with existing policy. Policy is changing very rapidly, however, and the topics and/or their supporting material may become superseded by future changes.
- Website locations change frequently so hyperlinks may become obsolete.
- Future updates to this Guidebook are not scheduled as of this writing.
- Feedback to DAU on this Guidebook can be provided directly from the DAU ACC site. Please note that feedback is only permitted by Acquisition Community Connection account holders.
- The scope is intended to be comprehensive but not all inclusive. The reader may be aware of additional references not specifically noted in this guidebook and is encouraged to submit proposed changes and additions.

Product Support Management

Objective

Plan and manage cost and performance across the product support value chain, from design through disposal.

Description

Plan, manage, and fund product support across all IPS Elements.

Overview

This Product Support Management Integrated Product Support Element will, through the Product Support Manager, provide continuous product support leadership throughout the weapon system's life cycle, reporting to senior leadership of status of program key metrics and product support activities, and providing senior program subject matter expertise in all areas of life cycle product support.

Product support management is the development and implementation of product support strategies to ensure supportability is considered throughout the system life cycle through the optimization of the key performance outcomes of reliability, availability, maintainability, and reduction of total ownership costs. The scope of product support management planning and execution includes the enterprise level integration of all twelve integrated product support elements throughout the lifecycle commensurate with the roles and responsibilities of the Product Support Manager position created under Public Law 111-84, Section 805.

Why Product Support Management is Important

Per the DoDI 5000.02, Operation of the Adaptive Acquisition Framework, Section 3: Program Management Authorities, under the supervision of PMs, Product Support Managers develop, plan, and implement a comprehensive product support strategy for all integrated product support elements and their material readiness. Product support managers will make use of data-driven decision-making tools with appropriate predictive analysis capabilities to improve systems availability and reduce costs.

The Product Support Manager will need to understand requirements development, all Acquisition Phases and have a good working knowledge of other functional areas for planning and implementation activities, to include contracting, finance, configuration management, outcome-based strategy development, etc. for total life cycle product support of the weapon system being fielded.

Discussion of the PSM Position

"The Secretary of Defense shall require that each major weapon system be supported by a product support manager…" to "maximize value to the Department of Defense by providing the best possible product support outcomes at the lowest operations and support cost." —FY10 NDAA, Section 805.

The three primary laws (or statutes) addressing the Product Support Manager are listed in the Product Support Manager Guidebook:

- Title 10 U.S.C. § 2337 – Life-Cycle Management and Product Support
- PL 110-417 The National Defense Authorization Act for Fiscal Year 2009, Section 815
- PL 113-66 The National Defense Authorization Act for Fiscal Year 2014, Section 803

On October 7, 2009, House-Senate Conference Committee Agreement was reached on the Fiscal Year 2010 National Defense Authorization Act (NDAA), and the next day, the House approved the FY2010 Defense Authorization Conference Report. It was signed into law (P.L. 111-84) by the President on October 28. Section 805 of the FY10 NDAA, entitled "Life-cycle management and product support," among other things, states that "the Secretary of Defense shall require that each major weapon system be supported by a product support manager" (PSM)."

Section 805 also clarifies the role, responsibilities, and definition of the Product Support Integrator (PSI) under Performance Based Life Cycle Support (PBL) arrangements by stating that ''product support integrator means an entity within the Federal Government or outside the Federal Government charged with integrating all sources of product support, both private and public, defined within the scope of a product support arrangement." This is important, both from how DoD plans, develops, fields, and manages product support and sustainment of its major weapon systems, and how Performance Based Life Cycle Product Support (PBL) arrangements are managed and executed in the future.

As described in the Product Support Manager Guidebook, public law specifies that the PSM has eleven identified responsibilities:

1. Develop and implement a comprehensive product support strategy for the weapon system.
2. Use appropriate predictive analysis and modeling tools that can improve material availability and reliability, increase operational availability, and reduce O&S cost.
3. Conduct appropriate cost analyses to validate the product support strategy, including cost-benefit analyses, as outlined in OMB Circular A-94.
4. Ensure achievement of desired product support outcomes through development and implementation of appropriate Product Support Arrangements (PSA).
5. Adjust performance requirements and resource allocations across PSI and PSPs as necessary to optimize implementation of the product support strategy.
6. Periodically review PSAs between the PSIs and PSPs to ensure the arrangements are consistent with the overall product support strategy.
7. Prior to each change in the product support strategy, or every five years, whichever occurs first, revalidate any business-case analysis performed for the strategy.

8. Ensure that the product support strategy maximizes small business participation at the appropriate tiers.
9. Ensure that PSAs for the weapon system describe how such arrangements will ensure efficient procurement, management, and allocation of Government-owned parts inventories in order to prevent unnecessary procurements of such parts.
10. Make a determination regarding the applicability of preservation and storage of unique tooling associated with the production of program specific components; if relevant, include a plan for the preservations, storage, or disposal of all production tooling.
11. Work to identify obsolete electronic parts that are included in the specifications for an acquisition program of the DoD and approve suitable replacements for electronic parts.

The law mandates that:

- The Secretary of Defense issue comprehensive guidance on life-cycle management and development/implementation of product support strategies for major weapon systems;
- Each major weapon system be supported by a product support manager (PSM);
- Each PSM position be performed by a properly qualified member of the armed forces or full-time employee of the Department of Defense.

There are important benefits in the establishment of a PSM, including, but not limited to:

- Focal point for development of the Life Cycle Sustainment Plan (LCSP)
- Increased focus on Desired Performance Outcomes
- Reduces Product Support Costs
- Supports the PM
- Facilitates Life Cycle Management
- Clearly Delineates Inherently Governmental Functions
- Helps Achieve Long-Term Best Value Outcomes
- Establishes Clear Lines of Authority
- Clearly Articulates Roles and Responsibilities
- Standardizes Terminology
- Encourages Development of Appropriately Rigorous, Targeted Training
- Further Integrates Acquisition and Sustainment
- Applicability beyond Major Defense Acquisition Programs (MDAP)
- Better Managed Weapon System Support
- PBL as a Weapon System Product Support Strategy is Enhanced
- Government and Industry Roles Clarified
- PM-PSM Relationship Better Understood
- More Clearly Defined Expectations.

Congressional report language stated the intent is that the PSM shall be a separate and distinct position from the weapon system program manager (PM). In the implementation of this provision, the positions of product support manager, assistant program manager for logistics, deputy program manager for logistics, and system support manager shall be considered synonymous.

The question may arise as to whether the DoD has always had Product Support Managers. Why is this important? The answer is that this legislation clarifies:

- the position statutory authorities and responsibilities;
- the establishment of a Program Manager (PM) “help-mate”;
- PM authority, including in long-term sustainment funding;
- More respect for an integral program management position (front-line);
- The importance of life cycle management;
- The need for long-term sustainment planning & execution, including implementation of outcome based, performance-based life cycle product support (PBL) strategies.

Product Support Manager Activities

1.1. Warfighter and Maintainer Requirements Capture

Requirements are needs that are determined to be obligatory to achieve a desired outcome. Requirements for weapons systems are defined during the Joint Capabilities Integration and Development System (JCIDS) process, implemented during the Defense Acquisition System management process, and resourced through the Planning, Programming, Budgeting and Execution (PPBE) process.

Statutes, Policy and Guidance

DoD requirements determination and processes are governed by documents known as statutes, regulations, policies, and guidebooks.

- Current statutes are found at the website of the U.S. House of Representatives Office of the Law Revision Counsel United States Code.
- Current policy documents can be found at the websites of respective DoD Offices and the White House Services Executive Services Directorate.
- Current guidance is found at the websites of respective DoD Offices and the DAU Online Resources website.

U.S. Statutes

A statute is a legally enforceable law that must be adhered to. It can proscribe or prohibit an activity. Congress has enacted a number of statutes known as United States Code (USC) to ensure availability of a ready and controlled (i.e., government owned) source of technical competence and resources for effective and timely response to a national defense contingency requirement and that there is a balance between the private and the public sector industrial base.

The product support strategy must ensure compliance with all statutory and regulatory requirements. There are additional important references to USC that are identified throughout this Guidebook. These legislative and statutory issues must be considered as an integral and evolving aspect of all Life-Cycle Management decisions.

Examples of statutes relevant to product support management are:

- Title 10 Statute USC Section 2320 (b) (3), requires that, whenever practicable, a contract for supplies or services entered into by a Government agency must contain appropriate provisions relating to Technical Data.
- Title 10 Statute, Sections 2464 and 2466 requires that at least 50 percent depot-level funding in a fiscal year be retained by the Government (military departments or a defense agency), creates the need to acquire the necessary data to perform the depot-level overhauls.

Policy
A policy gives further information as to how a statute must be followed. Policies usually address a specific goal or objective.

Examples of policy documents are:

- DoDD 5000.01, The Defense Acquisition System
- DoDI 5000.02, Operation of the Adaptive Acquisition Framework

Guidance
Guidance documents contain sound practices that typically give instructions on how to implement a specific policy established in DoD directives and DoD instructions. Guidance documents may be issued as manuals or guidebooks. Guidance may also be tailored to fit a specific situation.

Examples of guidance documents are:

- DoD Defense Acquisition Guidebook (DAG)
- DoD Product Support Business Case Analysis Guidebook
- MIL-HDBK-502, Product Support Analysis

Joint Capabilities Integration and Development System (JCIDS) Process
The Joint Capabilities Integration and Development System (JCIDS) is established as the primary means for the Joint Requirements Oversight Council (JROC) to fulfill its statutory responsibilities to the Chairman of the Joint Chiefs of Staff (CJCS). These responsibilities include assessing joint military capabilities, and identifying, approving, and prioritizing gaps in these capabilities, to meet applicable requirements in the National Defense Strategy (NDS).

The new CJCSI 5123.01H Charter of the Joint Requirements Oversight Council (JROC) and Implementation of the Joint Capabilities Integration and Development System (JCIDS) along with a new 2018 Joint Capabilities Integration and Development System (JCIDS) Manual have been issued and are now available on the JCIDS Intellipedia site (CAC required).

Defense Acquisition System (DAS)

- The Defense Acquisition System is the management process that guides all DoD acquisition programs. DoD Directive 5000.01, The Defense Acquisition System, provides the policies and principles that govern the defense acquisition system.
- DoDI 5000.02, Operation of the Adaptive Acquisition Framework, in turn, establishes the management framework that implements these policies and principles.

1.2. Alliance Management

Alliances are mutually beneficial arrangements, and they are important to the DoD. There are many difference types of alliances and usually partnership arrangements are included in the topic of alliances.

Alliances are generally formal, long-term relationships built on shared values and common forward momentum. For example, NATO was formally established by the North Atlantic Treaty in 1949, and its 29 members are allies. Partnerships usually focus on something mutually beneficial during a specific amount of time or for specific circumstances. Within the DoD, government depots and commercial repair facilities often partner under a contract arrangement to provide repair services at higher response time with lower total life cycle costs.

There is a key distinction between partnerships and defense contracts. All partnerships are implemented within the framework and business arrangements established by a contract between the DoD and a private-sector entity (e.g., an original equipment manufacturer [OEM], small business, or other third-party logistics provider [3PL]). Defense contracts specify the work tasks, articles, services, and outcomes to be provided by the private-sector entity. They are generally one-sided in their directive requirements—from the government to the contractor. Partnerships enable a more collaborative relationship in which parties from both public and private sectors are able to leverage and maximize the use of their resources in ways that were not specified in their underlying contracts.

1.2.1. PPP/Third Party Logistics (3PL) Management

Public Private Partnership (PPP)
A good resource for the PSM is the Public Private Partnering for Product Support Guidebook.

Public–private partnership (PPP) describes a government service or private business venture which is funded and operated through a partnership of government and one or more private sector companies. Because funding is involved, PPP's almost always require a formal contract between a public sector authority and a private party, in which the private party provides a public service or project and assumes financial, technical, and operational risk in the project. In some types of PPP, the cost of using the service is borne by the users of the service and not by the taxpayer. The term PPP is used generically and does not define what types of contracts or specific relationships are to be used in this arrangement.

The primary intent of public-private partnerships or the depot maintenance partnership initiative is to enhance depot support to the Warfighter by enabling and empowering the DoD organic depots to develop appropriate partnerships with the commercial sector, while recognizing the legitimate national security need for DoD to retain Core depot maintenance capability.

Partnering is essentially a philosophy that focuses on a cooperative agreement between the following:

- Program Manager;
- System Support Manager;
- Depot Maintenance Manager;
- Private Sector Supplier of Sustainment and Modernization. The Service Secretaries are required to designate Centers of Industrial & Technical Excellence (CITE) and the head of a CITE has authority to enter into partnerships.

The objectives of public-private partnerships are to:

- Maximize the utilization of maintenance depot capability;
- Reduce or eliminate the cost of ownership by the DoD in such area as operations and maintenance;
- Reduce the cost of products and services to the DoD;
- Include the use of public sector facilities and employees to perform work or produce goods for the private sector;
- Private sector use of public sector equipment and facilities to perform work for the public sector; and
- Promote work-sharing arrangements using both public and private sector facilities and/or employees.

There are three basic types of public-private partnerships in use within the defense product support community. Most partnerships are focused on depot maintenance.

- Direct Sale (sales of articles and services)–An arrangement, currently authorized primarily for depot maintenance activities designated as centers of industrial and technical excellence (CITE), arsenals and ammunition plants, and other working capital–funded industrial facilities under specified circumstances, whereby military and commercial entities enter into a business relationship for the sale of depot maintenance articles or services to an outside (non-government) entity, usually a contractor.
- Workshare – A partnership in which a government buying activity, in collaboration with a contractor and an organic product support activity (predominantly depot

maintenance activities to date), determines the best mix of work, capitalizing on each partner’s capabilities.

- Lease – An arrangement that allows a private-sector entity to have access to, and beneficial use of, facilities or equipment that is real or personal government property. Facilities and equipment may be made available for lease, so long as the arrangement does not preclude the government activity from performing its mission.

Third Party Provider/Third Party Logistics
In commerce, a "third-party source" means a supplier (or service provider) who is not directly controlled by either the seller (first party) or the customer/buyer (second party) in a business transaction.

Third-party logistics (abbreviated as **3PL**) is generally the use of third-party businesses (not the customer or primary seller) to outsource elements of the its distribution, warehousing, and fulfillment services.

1.2.2. International Partners

DoD instructions governing early consideration of International Acquisition and Exportability (IA&E), require program management to consider the potential for cooperative development or production, and/or foreign sales or transfers early in the acquisition planning process, and throughout the acquisition life cycle. In the Defense Acquisition Guidebook, see CH 1–4.2.8 and Chapter 1, Supplement 1 International Acquisition and Exportability (IA&E) for details on IA&E actions during the acquisition phases. A top-level summary of IA&E considerations across the acquisition phases and related activities, documentation, and programs are illustrated in Chapter 1, Figure 18. Also see the DAU Presentation, International Acquisition and Exportability (IA&E), 15 Aug 2018.

The DoD Defense Pricing and Contracting website has a resource library for international contracting.

International and Cooperative Programs
An international cooperative program is any acquisition program or technology project that includes participation by one or more foreign nations, through an international agreement, during any phase of a system's life cycle. Cooperative logistics refers to cooperation between the U.S. and allied or friendly nations or international organizations in the logistical support of defense systems and equipment.

Cooperative logistics is part of the acquisition process, but as a substantial part of military operations, much of the implementation process involves Security Assistance processes and procedures.

Security Assistance
Security Assistance is a group of programs, authorized by law, which allows the transfer of military articles and services to friendly foreign Governments. Security Assistance can be the delivery of defense weapon systems to foreign Governments; U.S. Service schools training international students; U.S. Personnel advising other Governments on ways to improve their internal defense capabilities; U.S. Personnel providing guidance and assistance in establishing infrastructures and economic bases to achieve and maintain regional stability; etc.

Per the Defense Acquisition Guidebook, Chapter 1, the U.S. Government's security cooperation efforts include planning and implementation of Security Assistance program transfers of military articles and services to friendly foreign governments and specified international organizations through sales, grants, or leases. The Secretary of State is responsible for continuous supervision and general direction of the Security Assistance program. Within the DoD, Security Assistance efforts are conducted under the oversight of the Under Secretary of Defense for Policy and are administered by the Defense Security Cooperation Agency (DSCA). While Foreign Military Sales (FMS) is the primary mechanism used to implement Security Assistance efforts, it is not the only mechanism. The Security Assistance Management Manual (SAMM) issued by DSCA defines policies and procedures for FMS and Security Assistance programs.

Defense Security Cooperation Agency (DSCA)
DSCA is the central agency that synchronizes global security cooperation programs, funding, and efforts across OSD, Joint Staff, State Department, COCOMS, the services and U.S. Industry. DSCA is responsible for the effective policy, processes, training, and financial management necessary to execute security cooperation within the DoD. DSCA mission areas include: Foreign Military Sales, Foreign Military Financing, International Military Education and Training, Humanitarian Assistance, Disaster Relief & Mine Action, and Regional Centers.

The Department of Defense established DSCA as a separate agency to direct, administer, and supervise security assistance programs. DSCA receives policy direction, as well as staff supervision, from the Assistant Secretary of Defense for International Security Affairs, which in turn is directed and supervised by the Under Secretary of Defense for Policy.

Cooperative Logistics Supply Support Arrangement (CLSSA)
Cooperative Logistics Supply Support Arrangements (CLSSA) are FMS agreements for the furnishing of secondary items from the U.S. Logistics system to a country in support of specific major end items/systems. DoD considers the CLSSA to be one of the most effective means to replenish the in-country stocks of spares and repair parts that were initially furnished with end items of equipment. FMS CLSSA agreements set out terms under which DoD provides supply support for a common weapon system to a foreign government or international organization on a basis equal to that provided to U.S. Forces. Availability of such support is of paramount importance in promoting interoperability as well as in marketing U.S. Manufactured weapon systems. Department of Defense manual DoDM 5105.38 provides guidance for CLSSAs.

1.2.3. Foreign Military Sales (FMS)

FMS is a non-appropriated program through which eligible foreign governments purchase defense articles, services, and training from the U.S. Government.

The Foreign Military Sales (FMS) Program is that part of Security Assistance authorized by the Arms Export Control Act (AECA) and conducted using formal contracts or agreements between the United States Government (USG) and an authorized foreign purchaser. These contracts, called Letters of Offer and Acceptance (LOA), are signed by both the USG and the purchasing Government or international organization; and provide for the sale of defense articles and/or defense services (to include training) usually from Department of Defense (DoD) stocks or through purchase under DoD-managed contracts. As with all Security Assistance, the FMS program supports United States (U.S.) foreign policy and national security.

Regulations for foreign acquisition is covered under the Defense Federal Acquisition Regulation, Part 225 – Foreign Acquisition, found on the DoD Defense Pricing and Contracting website.

International Traffic in Arms Regulations (ITAR)
International Traffic in Arms Regulations (ITAR) is a set of United States government regulations that control the export and import of defense-related articles and services on the United States Munitions List. These regulations implement the provisions of the Arms Export Control Act and are described in Title 22 (Foreign Relations), Chapter I (Department of State), and sub-chapter M of the Code of Federal Regulations.

ITAR regulations dictate that information and material pertaining to defense and military related technologies may only be shared with "US Persons" unless approval from the Department of State is received. By definition, a "US Person" can be a US citizen; a permanent legal resident (green-card holder), or a corporation, business, organization, or group that is incorporated in the United States under US law.

1.3. Contract Development and Management

From a sustainment perspective, contracts are structured and managed to balance three major objectives throughout the life cycle of the system: delivering sustained materiel readiness; minimizing the requirement for logistics support through technology insertion and refreshment; and continuously improving the cost-effectiveness of logistics products and services. Defense Acquisition University has 9 communities of practice dedicated to the area of Contracting as listed below:

- ACE For Services
- Acquisition Law
- Commercial Off the Shelf Products and Commercial Services
- Contingency Contracting
- Contract Cost, Price & Finance

- Contracting
- Contracting Officers Representative
- Enterprise Software Initiative (ESI)
- Interagency Acquisition Support

The DoD Defense Pricing and Contracting website has a resource library on contracting.

Performance Specifications
Information on performance specifications is found in the DoD Assist Database, MIL-STD-961, Defense and Program-Unique Specifications Format and Content.

Performance specifications translate operational requirements into more technical language that tells the manufacturer: 1) what the government will consider an acceptable product, and 2) how the government will determine if the product is acceptable.

Performance specifications communicate the user's requirements to the manufacturer. They translate operational requirements into more technical language that tells the manufacturer: 1) what we will consider an acceptable product, and 2) how we will determine if the product is acceptable. To the extent that any specification does these two things, it is good. The problem arises when we use specifications to tell the manufacturer how to make the product.

The following are examples of performance specifications:
Example #1: The circuit breaker shall not trip when subjected to the class 1, type A, shock test specified in MIL-S-901. Purpose: States required results.
Example #2: The detector shall not contain foreign matter—such as dust, dirt, fingerprints, or moisture—that can be detected by visual examination. Purpose: Provides criteria for verifying compliance. (Assuming that foreign matter affects detector performance)
Example #3: The equipment shall withstand, without damage, temperatures ranging from -46°C to +71°C. Purpose: Defines operational environment.

Request for Proposal (RFP)
A Request for Proposal (RFP) is a solicitation used in negotiated acquisition to communicate government requirements to prospective contractors and to solicit proposals. Federal Government RFP format and composition is mandated by the Federal Acquisition Regulation (FAR). The DoD Defense Pricing and Contracting website provides links to all the Defense Acquisition Regulations.

Independent Government Cost Estimate
Section 101 of Public Law 111-23, "Weapon Systems Acquisition Reform Act of 2009," May 22, 2009, requires the Director, Cost Assessment and Program Evaluation (DCAPE) to conduct independent cost estimates (ICE) on Major Defense Acquisition Programs (MDAP) for which the USD(AT&L) is the MDA, and also, in certain circumstances, for Major Automated Information Systems (MAIS) programs. The statute also requires DCAPE to review DoD Component cost

estimates and cost analyses conducted in connection with Major Defense Acquisition Programs (MDAPS). Additionally, DCAPE is required to provide policies and procedures for the conduct of all DoD cost estimates (and issues guidance relating to the full consideration of life-cycle management and sustainability costs).

More information is found in the ACQuipedia article, Independent Cost Estimate (ICE) and a guidebook on the DoD DPAP website.

Contract Deliverables

A contract deliverable is anything that can be physically delivered but may include non-manufactured things such as meeting minutes or reports. Data deliverables are reflected in the contract's Contract Data Requirements List (CDRL) and described via a Data Item Description (DID).

A DID is a completed document that defines the data required of a contractor. The document specifically defines the data content, format, and intended use. Deliverables and reporting requirements are tailored to each acquisition. DID's are found on the DoD Assist Database. Also see the section below in this chapter titled "B. Data Item Description (DID) Deliverables."

The Contract Data Requirements List (CDRL) is a list of authorized data requirements for a specific procurement that forms part of a contract. It is comprised of either a single DD Form 1423, or a series of DD Forms 1423 containing data requirements and delivery information. The CDRL is the standard format for identifying potential data requirements in a solicitation, and deliverable data requirements in a contract. More information on CDRL's is found in MIL-HDBK-245, Handbook for Preparation of Statement of Work (SOW) on the DoD Assist Database.

Examples of reports and other deliverables frequently seen in product support contracts are below:

- Technical progress reports—technical monitoring tools that provide summaries of technical information and progress on a contract;
- Invention reports—disclosure of inventions conceived or first reduced to practice through work under a contract;
- Federal financial reports—business monitoring tools that provide financial status of a contract; necessary for monitoring, avoiding, or anticipating cost overruns and enabling contracting officer's technical representatives to match costs incurred with technical progress;
- Data—deliverables identified in a contract that can include data files, computer programs, source codes, and any written documentation;
- Summary of salient results or outcomes—summary of results achieved during performance of a contract;
- Final report—includes specific work performed and results obtained for an entire contract period;

- Special reports—reports or analyses as required by a statement of work or a contracting officer's technical representative. These may include tables, text, graphs, and diagrams presented at meetings or professional conferences, and other special reports concerning study findings;
- Study status reports—site-specific performance reports including accrual and retention of study participants, timeliness of data submission, and adherence to protocol specifications;
- SOPs—standard operating procedures for actions relevant to contract performance, quality assurance, and quality control plans;
- Training resources —training materials used, developed, or maintained under a contract.

Contract Incentives

Incentives are a method of motivating the contractor to achieve the desired behavior in terms of measurable performance outcomes. Contract incentives include award fee, incentive fee, award term, and cost sharing. More information is found on the DAU website in the Product Support Manager Guidebook, Appendix E.6 and the Defense Acquisition Guidebook, Chapter 1.

Sustainment contracts should produce measurable performance outcomes that cumulatively contribute to the sustainment of system KPP/KSAs, to their threshold or objective levels. To motivate the contractor to achieve the desired behavior, appropriate contract incentives (including award fee, incentive fee, award term, and cost sharing) need to be developed to promote and facilitate contractor performance.

Incentives are unique to every contract and should be tied to metrics tailored to reflect the DoD Component's specific definitions and reporting processes. Award and incentive contracts should include tailored cost reporting to enable appropriate contract management and to facilitate future cost estimating and price analysis.

Earned Value Management System (EVMS)

An Earned Value Management System (EVMS) supports program management by integrating the program work scope with cost and schedule elements for optimum planning and control. EVM policy applies to contracts with industry and to intra-government activities. More information on EVMS is found on the DAU Tools Catalog website in the Defense Acquisition Guidebook, Chapter 1.

EVMS is used throughout the life cycle subject to certain thresholds. Upon award of contract, the EVMS is used by the contractor to plan and control contract work. The Government relies on the contractor’s system and should not impose duplicative systems. Contractors maintain and improve the system, coordinating changes with the customer. Refer to appropriate DFARS clauses for further guidance.

Business Transparency
On December 8, 2009, The Office of Management and Budget issued the Open Government Directive (M-10-06) which described the principles of transparency, participation, and collaboration as "the cornerstone of an open government." In keeping with these principles, the Open Government Plan details an approach for sharing data more openly, engaging with the public more proactively and collaborating with all citizens.

Quality
Applying best practice may not be enough to manage and mitigate process-based risks that may start a chain of events leading to undesirable outcomes. Program Managers can stress the importance of effective quality management to industry. Delivery of systems that prevent or avoid problems are the goal. Program Managers can also use advanced quality management systems (such as ISO 9000, Quality Management; AS 9100, Quality Systems – Aerospace: Model for Quality Assurance in Design, Development, Production, Installation and Servicing; and the Malcolm Baldrich Quality Award criteria) to develop their quality strategy and approach. MIL-STD-1916, DoD Preferred Methods for Acceptance of Product, provides standardized acceptance sampling systems, which are consistent with the contract requirements for submission of all conforming products or services. These sampling systems allow PMs to influence continuous improvement through corrective action while still allowing a maximum degree of flexibility to contractors. International Quality Standard ISO 21247, Combined Accept-Zero Sampling Systems and Process Control Procedures for Product Acceptance, is an acceptable alternative to MIL-STD-1916. Also see the Defense Acquisition Guidebook, Chapter 1 found on the DAU Tools Catalog website.

1.3.1. Develop and Maintain a PSA with the Warfighter

Product Support Arrangements (PSA)
A PSA is a contract, task order, or any other type of contractual arrangement, or any type of agreement or non-contractual arrangement with or within the Federal government such as a Memorandum of Agreement, (MOA), Memorandum of Understanding (MOU), Service Level Agreement (SLA) or Commercial Services Agreement (CSA) for the performance of sustainment or product support required for major weapon systems, subsystems, or components. The Product Support Arrangement assigns and delineates the roles, responsibilities, resourcing, and reciprocal aspects of product support business relationships. More information is found on the DAU Tools Catalog in the Defense Acquisition Guidebook, Chapter 4 and the Product Support Manager Guidebook.

Memorandums of Agreement (MOA)
A memorandum of agreement (MOA) or cooperative agreement is a document written between parties to cooperatively work together on an agreed upon project or meet an agreed objective. The purpose of an MOA is to have a written understanding of the agreement between parties. In an MOA, there is a reciprocal relationship in which the actions of both parties are dependent on actions by the other party. An example is an MOA between the Program Manager and the Warfighter about the desired outcomes and the associated metrics

for use in measuring the accomplishment of those outcomes. More information is found on the Executive Service Directorate DoD Issuances website, DoDI 4000.10, Support Agreements.

Memorandums of Understanding (MOU)
A memorandum of understanding (MOU) is a document describing a bilateral or multilateral agreement between parties. It expresses a convergence of will between the parties, indicating an intended common line of action. It is often used in cases where parties either do not imply a legal commitment or in situations where the parties cannot create a legally enforceable agreement. In an MOU, there is no dependency on the other party, but recognition of their separate roles and responsibilities is required; example: an organic and commercial repair line is established in which one party accomplishes repair on one of the Shop Replaceable Units (SRU) on the end item while the other party accomplishes repair on another SRU. The MOU documents the understanding that both parties are working on the same end item but have no dependency on each other beyond the understanding. More information is found on the Executive Service Directorate DoD Issuances website, DoDI 4000.10, Support Agreements.

Service Level Agreements (SLA)
A service level agreement is a part of a service contract where the level of service is formally defined. In practice, the term SLA is sometimes used to refer to the contracted delivery time (of the service) or performance. As an example, internet service providers will commonly include service level agreements within the terms of their contracts with customers to define the level(s) of service being sold in plain language terms. In this case the SLA will typically have a technical definition and performance metrics in terms of mean time between failures (MTBF), mean time to repair or mean time to recovery (MTTR); various data rates or similar measurable outcomes. Service level agreements are often a component of the Commercial Services Agreement (CSA). More information is found on the DoD Enterprise Software Initiative (ESI) website and the Defense Acquisition Guidebook, Chapter 4 Life Cycle Sustainment.

Commercial Services Agreements (CSA)
CSAs are agreements used to implement a Direct Sales Public-Private Partnership, in which the organic government agency (e.g., the depot) acts as a subcontractor to a commercial entity (i.e., a contractor) and authorizes the sale of goods or services from the government entity to the contractor. CSA's are legal and binding contracts. More information is found in DoDI 5000.74, Acquisition of Services and SD-2, DoD Acquisitions – Buying Commercial Items and Nondevelopmental Items.

1.3.2. Develop and Maintain Performance Based Agreements (PSA) with the Product Support Integrator (PSI)

Performance Based Agreements (PBA)
Performance Based Agreements are one of the key components of an effective product support strategy. They establish the negotiated performance baseline and corresponding support necessary to achieve that performance, whether provided by commercial or organic support providers. The Program Manager, utilizing the performance objectives required by the

Warfighter, negotiates the required level of support to achieve the desired performance at a cost consistent with available support funding. Once the performance, support, and cost are accepted by the stakeholders, the PM enters into a performance-based agreement with the user. The agreement specifies the level of operational support and performance required. The PM then enters into performance-based agreements with the support providers, specifying the performance parameters that will meet the requirements of the Warfighter. For more information, see the Product Support Manager's Guidebook and the Performance Based Logistics Guidebook.

1.4. Supportability Test and Evaluation

Supportability Test and Evaluation (ST&E) is a test methodology, in which criteria and tools for evaluating, analyzing, and reporting how well the twelve Integrated Product Support (IPS) Elements are applied to articles under test. ST&E can influence support design through application of IPS Elements and should occur as early as possible in the acquisition life cycle. Supportability Test and Evaluation also focuses on assessing a weapon system/subsystem's performance and suitability through direct observation of human machine interface activities. In other words, answers the question, does the product design make sense and provides for ease of maintenance and support? The primary objectives of Supportability Test and Evaluation are to inform development of an affordable design and a performance-based product support strategy predicated on best value.

According to DAU CLL 003, Supportability Test and Evaluation, logistics test and evaluation is divided into two broad categories, developmental test and evaluation (DT&E) and Initial Operational Test and Evaluation (IOT&E). In developmental testing, the major emphasis is on design and reliability, maintainability and supportability are the key focus areas. Subcategories of DT&E and IOT&E includes LOG T&E, Live Fire T&E, Initial Operational Test and Evaluation, and Follow-On Test and Evaluation. Typically, DT is performed by personnel working under the direction of the program office although the government has facilities and test squadrons performing this mission. DT answers the question, "Did we build it right?" In other words does the final product meet the design criteria as outlined in the plans, drawings, and specifications? In contrast to the question asked by DT&E: "Did we build it right?" OT&E asks: "Did we build the right thing?" In other words, did what we build meet the operational requirements of the Warfighter? Whereas DT&E compares the finished product to the design specifications and drawings, OT&E compares the final product to the requirements as stated in the Capabilities Development Document.

Maintainability Demonstration (M-Demo) or Logistics Demonstration (LOG-DEMO)
A maintainability demonstration (M-Demo) is a joint contractor and procuring activity effort to determine whether specific maintainability contractual requirements have been achieved. The M-Demo would be implemented to verify by demonstration the actual maintainability characteristics of a system, against the maintainability requirements or objectives.

A logistics demonstration (LOG-Demo) is a part of developmental test and evaluation (DT&E) used to evaluate the system under test's interface with the Integrated Product Support (IPS) Elements (product support package) and ensure the user unit has the logistical capability to achieve initial operational capability (IOC). The logistics demonstration (frequently referred to a LOG Demo) can be a singular, comprehensive event evaluating all 12 IPS Elements or a series of individual tests (incremental) evaluating maintenance tasks deemed critical to the system's operation. A logistics demonstration includes the nondestructive disassembly and reassembly of a production representative system using its related peculiar test, measurement, and diagnostic equipment (TMDE); tools; training devices; technical publications; and support equipment.

According to DAU CLL 003, Supportability Test and Evaluation, there are great variations in Service application of these terms. Often LOG Demos and M Demos are conducted concurrently and the demarcation between the two is not apparent. When the technician is using the technical publications, tools, support equipment, training or any other IPS Element in an evaluation scenario, that is the LOG Demo part of the evolution. Reliability and maintainability are products of the system's design and it helps to understand that no addition of Integrated Product Support Elements (e.g., spare parts, training, tools, support equipment) can improve reliability or maintainability.

Maintainability is verified through maintainability demonstrations where evaluators assume a "perfect world" (e.g., perfect tools/test equipment/publications/parts availability) and, technically, are only concerned with the time required to restore the system to operational status. Technically, the purpose of an M-Demo is NOT to evaluate real-world conditions but only to verify that the design of the system is sufficient to meet the mean-time-to-repair (MTTR) metric. Real-world conditions resulting from lack of one or more IPS Elements are the purview of the LOG Demo not the M-Demo.

Product Support in the Test & Evaluation Master Plan (TEMP)

The TEMP documents the overall structure and objectives of the Test and Evaluation (T&E) program. It provides a framework within which to generate detailed T&E plans and documents schedule and resource implications associated with the T&E program. The TEMP identifies the necessary Developmental Test and Evaluation (DT&E), Initial Operational Test and Evaluation (IOT&E), and Live Fire Test and Evaluation (LFT&E) activities. It relates program schedule, test management strategy and structure, and required resources to Critical Operational Issues (COI), Critical Technical Parameters (CTP), objectives and thresholds documented in the Capability Development Document (CDD), evaluation criteria, and milestone decision points. For multi-Service or joint programs, a single integrated TEMP is required. Component-unique content requirements, particularly evaluation criteria associated with COIs, can be addressed in a Component-prepared annex to the basic TEMP.

Within the TEMP, the program manager is required to identify the Key Performance Parameters (KPP) and Key System Attributes (KSA) for the system and for each listed parameter, providing the threshold and objective values from the CDD.

Supportability analyses are also included in the TEMP. Per [MIL-HDBK 502, Product Support Analysis], supportability test, evaluation, and verification is the process by which a system or components are compared against requirements and specifications through testing. The results are evaluated to assess progress of design, performance, supportability, etc. This process is used to assess achievement of support parameters specified; identify reasons for deviations from projections; and recommend changes to correct deficiencies and improve system readiness.

See DoDI 5000.89, Test and Evaluation and the Defense Acquisition Guidebook (DAG), Chapter 8, Test and Evaluation, include more detailed discussions of the TEMP.

Developmental Test and Evaluation (DT&E)
Developmental testing and evaluation provides feedback to the Program Manager on the progress of the design process and on the product's compliance with contractual requirements. DT&E activities also evaluate the ability of the system to provide effective combat capability, including its ability to meet its validated and derived capability requirements, including the verification of the ability of the system to achieve KPPs and KSAs, and that initial system production and deployment and IOT&E can be supported. The effort requires completion of DT&E activities consistent with the TEMP. Successful completion of adequate testing with production or deployment representative prototype test articles will normally be the primary basis for entering LRIP or Limited Deployment. See DoDI 5000.89, Test and Evaluation and the Defense Acquisition Guidebook (DAG), Chapter 8, Test and Evaluation, include more detailed discussions of DT&E requirements.

IOT&E
The primary purpose of Initial Operational Test and Evaluation (IOT&E) is to determine a system's operational effectiveness and operational suitability. IOT&E can also be used to support system certification requirements and training requirements as long as the primary purpose is accomplished. See DoDI 5000.89, Test and Evaluation and the Defense Acquisition Guidebook (DAG), Chapter 8, Test and Evaluation, include more detailed discussions. Also see the DAU ACQuipedia article for IOT&E.

OT&E
Per the DAU Glossary, Initial Operational Test and Evaluation (IOT&E) is the field test, under realistic conditions, of any item (or key component) of weapons, equipment, or munitions for the purpose of determining the effectiveness and suitability of the weapons, equipment, or munitions for use in combat by typical military users, and the evaluation of the results of such tests. See DoDI 5000.89, Test and Evaluation and the Defense Acquisition Guidebook (DAG), Chapter 8, Test and Evaluation, include more detailed discussions.

Prototyping
A prototype is an original or model on which a later system/item is formed or based. Early prototypes may be built and evaluated during the Technology Development Phase, or later in

the Engineering and Manufacturing Development phase, or are the result of a Joint Capability Technology Demonstration (JCTD) or Advanced Technology Demonstration (ATD), with testing prior to Milestone C decision. Selected prototyping may continue after Milestone C, as required, to identify and resolve specific design or manufacturing risks, or in support of Evolutionary Acquisition (EA).

Prototyping is an engineering technique employed for several reasons: to reduce risk, inform requirements and encourage competition. For example, the primary objective for competitive prototyping (CP) is acquiring more innovative solutions at better value by ensuring competition. CP are addressed in statute for MDAPs (see P.L. 114-92 (SEC. 822 para (c))). Other prototypes should be considered if they materially reduce engineering and manufacturing development risk at an acceptable cost.

The DoD's Office for Prototyping and Software has the role to enable the rapid and affordable introduction of new capabilities. The capabilities may respond to an emerging threat, a mission capability gap, or may enhance interoperability or service life of existing systems. Through its three program offices, EC&P has the flexibility to respond quickly and affordably to a broad range of capability challenges.

In an effort to streamline rapid prototyping and fielding, Under Secretary of Defense for Acquisition and Sustainment Ellen Lord released a memo April 16 providing interim guidance on one of the most foundational changes to Defense acquisition in years – Middle Tier Acquisition**.** This new acquisition approach, which was authorized in the FY2016 National Defense Authorization Act, is an attempt to get "middle tier" capabilities into the field as quickly as possible—in under 5 years compared to large-scale acquisition programs that sometimes take longer than a decade for research and prototyping. Middle Tier Acquisition does this by streamlining the testing and deployment of prototypes or upgrading existing systems with already proven technology. Under this new acquisition authority, designated programs are not subject to the more traditional Joint Capabilities Integration Development System or DoDD 5000.01, except as provided in the implementation guidance. DoD Services are providing Middle Tier Acquisition proven practices and guidance to their acquisition workforces.

Acceptance Testing
Acceptance testing is a test conducted to determine if the requirements of a specification or contract are met. It may involve chemical tests, physical tests, or performance tests. Acceptance testing generally involves running a suite of tests on the completed system. The test environment is usually designed to be identical, or as close as possible, to the anticipated user's environment, including extremes of such. These test cases must each be accompanied by test case input data or a formal description of the operational activities (or both) to be performed and a formal description of the expected results. MIL-STD-1916, DoD Preferred Methods for Acceptance of Product, provides DoD preferred methods for acceptance of products. The purpose of this standard is to encourage defense contractors and other commercial organizations supplying goods and services to the U.S. Government to submit efficient and effective process control (prevention) procedures in place of prescribed sampling

requirements. The goal is to support the movement away from an AQL-based inspection (detection) strategy to implementation of an effective prevention-based strategy including a comprehensive quality system, continuous improvement, and a partnership with the Government.

A Production Reliability Acceptance Test (PRAT) is intended to simulate in-service use of the delivered item or production lot. Because it must provide a basis for determining contractual compliance and because it applies to the items actually delivered to operational forces, PRAT must be independent of the supplier if at all possible. PRAT may require expensive test facilities, so 100 percent sampling is not recommended.

1.5. Development and Maintenance of Sustainment BCAs

The Product Support Business Case Analysis (BCA) is a structured methodology and document that aids decision making by identifying and comparing alternatives by examining the mission and business impacts (both financial and non-financial), risks, and sensitivities. Product Support BCAs may be somewhat different from other decision support analyses through their emphasis of the enterprise-wide perspective of stakeholders and decision makers and assessment of the holistic effects impacted by the decision. Other names for a BCA are Economic Analysis, Cost-Benefit Analysis, and Benefit-Cost Analysis. Broadly speaking, a BCA is any documented, objective, value analysis exploring costs, benefits, and risks. The Product Support BCA concludes with a recommendation and associated specific actions and an implementation plan to achieve stated organizational objectives and desired outcomes.

The Product Support BCA does not replace the judgment of a decision maker. Rather, it provides an analytic, standardized, and objective foundation upon which credible decisions can be made. The Product Support BCA should be a comprehensive, fair, and accurate comparison when evaluating multiple alternatives. It should take into account broad Department wide impacts and context throughout the analysis. The PSM prepares a Product Support BCA for major product support decisions, especially those that result in new or changed resource requirements. The Product Support BCA helps leadership with significant investment and strategic decisions across all applications of Product Support.

1.6. Logistics Trade Studies

Trade studies are systematic, interdisciplinary examinations of the factors affecting system costs. These studies are accomplished by analyzing multiple system concepts and approaches to find the most acceptable ways to attain necessary performance while balancing essential requirements, such as cost or operational availability that must be satisfied for the system to be successful. For example, the objective of a cost performance trade study is not to minimize the cost of the system, but to achieve a specified level of cost reduction at a maximized level of performance.

The PM uses trade studies and analyses to compare alternative sustainment strategies. Then, the PM establishes a baseline sustainment strategy based on the legacy system, analogous systems, existing component/sub-component level repair, and Warfighter and DoD Component preferences. This strategy includes an outline of product support, levels of repair, manpower, schedule, etc. The sustainment strategy is articulated in a draft Life Cycle Sustainment Plan (LCSP)/Product Support Strategy. More information on trade studies is found in the Defense Acquisition Guidebook, Chapters 3 and 4 and DAU LOG 211, Supportability Analysis, Lesson 11.

1.7. Product Support Performance Management

In life cycle management, the PM, with responsibility delegated to the PSM for product support activities, is responsible for the development and documentation of an Acquisition Strategy to guide program execution from program initiation through re-procurement of systems, subsystems, components, spares, and services beyond the initial production contract award, post-production support, and through retirement or disposal. PMs pursue two primary support objectives. First, the weapon system must be designed to deliver the required warfighting capability and be affordable. Second, the product support solution must be efficient and effective, and it must reduce the demand for product support while meeting Warfighter requirements. See the PSM Guidebook, April 2016.

1.7.1. Manage Balanced Performance Metrics

The objective of the product support strategy is to achieve cost-effective Warfighter operational readiness outcomes. Achieving these outcomes depends upon optimizing the IPS Elements that comprise the support strategy. The PSM should determine the appropriate performance metrics for the IPS Elements that in aggregate achieve the top-level Warfighter operational outcomes and reduce Operating & Support (O&S) cost. These performance metrics ensure achievement of the outcomes required for the objective weapon system, subsystem, and components. See the PSM Guidebook, April 2016 for detailed discussion on managing balanced performance metrics.

It is important to understand the differences between related "O&S" terms:

- Operation & Maintenance (O&M) is an appropriation (Ref: DoD FMR 7000.14R). Funds current operations of force and for maintenance of equipment the Armed Services need to operate the force (Includes expenses such as maintenance services, civilian salaries, travel, minor construction projects, operating military forces, training, education, depot maintenance, stock funds, and base operations support).
- Operating & Support (O&S) is a life cycle cost category (Ref: DoD 5000.4-M). Life cycle costs are the sum of four major cost categories: (1) research & development costs, (2) investment costs (3), Operating & Support (O&S) costs associated with use of a system, (4) disposal costs, occurring after initiation of system phase-out or retirement. O&S costs include all personnel, equipment, supplies, software, services, including contract support, associated with operating, modifying, maintaining, supplying, training, and

supporting a defense acquisition program in the DoD inventory. According to Para C3.3.6, this includes costs directly and indirectly attributable to the specific defense program, i.e., costs that would not occur if the program did not exist, such as mission personnel, unit level consumption, fuel and energy resources, intermediate level maintenance, depot maintenance, contractor support, sustaining support, and indirect support. See the CAIG Operating And Support Cost-Estimating Guide for additional information.

- Operations & Support (O&S) is a life cycle phase (Ref: DoDI 5000.02). Purpose is to execute a support program that meets materiel readiness and operational support performance requirements and sustains the system in the most cost-effective manner over its total life cycle. Planning for this phase shall begin prior to program initiation and shall be documented in the Life Cycle Sustainment Plan (LCSP)/Product Support Strategy. Operations and Support has two major efforts, Life-Cycle Sustainment and Disposal.

1.7.2. Sustainment Metrics Reporting

The Sustainment quad chart provides sustainment information in a standardized format that PMs use to report status at programmatic reviews. The quad chart helps the PM present the program's sustainment strategy, schedule, performance metrics, and cost during decision and in-progress reviews with milestone decision authorities. Reporting begins at program initiation and continues through each subsequent milestone and production decision, and at other reviews when directed. The chart is the PM's platform to demonstrate successes or communicate issues. It highlights and promotes innovative sustainment strategies, improved readiness outcomes, and reductions on O&S Costs. Completion of the quad chart is also an opportunity to capture sustainment issues and strategy and ensure the sustainment metrics and costs are affordable. See the PSM Guidebook, April 2016, Appendix C for more information.

1.8. Product Support Budgeting and Funding

The budgeting and funding of life cycle costs for product support strategy development and implementation occur with program initiation and at each subsequent acquisition milestone. O&S cost estimates play a major role in budgeting and funding many different types of product support analyses and reviews during sustainment.

The PMs input at Milestone A focuses on funding requirements necessary to mature critical technology and reduce risks for the logistics and sustainment capabilities that comprise the materiel solution. Funding for important logistics and sustainment-related studies and analyses following Milestone A should support updates to the AoA and market research, as well as the Cost as an Independent Variable, Supportability, and Technology Risk Reduction assessments. Other funding considerations include those needed to establish the Supportability Integrated Product Team and the Integrated Logistics Support Management Program, as well as funds needed to initiate a Product Support BCA. For further discussion, see the Defense Acquisition Guidebook, Chapter 4 Life Cycle Sustainment.

Operating and Support (O&S) costs constitute a significant portion of lifecycle cost for Department of Defense (DoD) systems. Program Managers (PM) and Product Support Managers (PSM) need to structure and conduct O&S cost analysis to inform early life cycle decisions, to effect reliability trades, and to identify Should Cost initiatives with the greatest impact on future costs. As the system design matures, the PSM focus is on planning required to implement the product support strategy to ensure achievement of desired product outcomes during sustainment. The PM and PSM need to provide support to meet operational and suitability requirements while minimizing O&S costs. O&S costs are impacted by Affordability caps and other best practice initiatives that are focused on driving efficiency into the programs while maintaining or improving overall cost.

The DoD O&S Cost Management Guidebook provides a method for mapping product support elements to cost elements in order to focus early life cycle analysis on the highest cost drivers and to help programs assess sustainment impact resulting from funding changes. It provides methods for analyzing available data and identifying cost driving elements to reduce O&S costs across the life cycle. The tools enable better communication of O&S cost assumptions, comparisons, and risks to support acquisition decisions and program reviews.

The DoD Operating and Support Cost-Estimating Guide is focused on O&S cost estimates and analyses for major defense acquisition programs (MDAP) subject to OSD oversight in the defense acquisition process. This guide was prepared by the Office of the Secretary of Defense (OSD) Director of Cost Assessment and Program Evaluation (CAPE) for use by the DoD Components (i.e., military departments and defense agencies) in developing estimates of system operating and support (O&S) costs.

Funding the Product Support Strategy must take into consideration the:

- requirement capabilities as determined by the Joint Capabilities Integration and Development System (JCIDS),
- acquisition and supportability of the products as determined by the Defense Acquisition system
- fiscal constraints of the Planning, Programming, Budget, and Execution (PPBE) Process These considerations result in the Logistics Funding Profile (LFP)—the portion of the program budget necessary to execute the acquisition logistics plan.

The PPBE Process

The Planning, Programming, Budgeting and Execution (PPBE) Process is the primary Resource Allocation Process (RAP) of DoD. It is an annual cyclical process to determine Department funding requirements and to allocate resources to satisfy those requirements. It is one of three major decision support systems for defense acquisition along with Joint Capabilities Integration and Development System (JCIDS) and the Defense Acquisition System. It is a formal, systematic structure for making decisions on policy, strategy, and the development of forces and capabilities to accomplish anticipated missions.

Working Capital Fund (WCF)
The Defense WCF became effective in FY 1992 (authority of Title 10, USC, Section 2208 ("Working Capital Funds"). WFCs are designated to allow DoD corporate structures the ability to minimize risk when executing maintenance and supply functions. Also, WFCs exist to: encourage cross-servicing between DoD Services/Components/Agencies and their operating agencies or partners; provide WCF activity managers direct financial authority and flexibility to purchase and utilize personnel, materials, and services more effectively; establish a more effective process for managing the cost of goods and services for DoD entities; and allow for contracts between WCF activities and DoD entities requiring the end products/services.

WFCs are not the same as DoD funds appropriated by Congress (RDT&E, Procurement, O&M, MILPERS, and MILCON). However, similar to a commercial business, the intent of WFCs is to allow for investments in the near term with a pricing structure that will allow the activity to recoup its investment costs from future year activities and collections.

1.8.1. Budget Execution

Budget Execution represents activities associated with the legal and managerial uses of budgetary resources to achieve results that comply with the enacted Budget and Administration policy. This presentation covers process and authorities that define execution practices in the following four areas:

- Reprogramming and Transfer Actions
- Emergencies and Extraordinary Expenses, including section 6301 (Feed and Forage) Authority and Unfunded Contract Authority
- Working Capital Fund Execution Issues
- Military Construction Execution Issues

There is a good tutorial found at the DoD Comptrollers website on Budget Execution.

As described in the Defense Acquisition Guidebook, Chapter 1 Program Management, the final activity in the PPBE process is the Execution Review, which occurs concurrently with the Program and Budget reviews. The purpose of the Program Review is to prioritize the programs that best meet military strategy needs, whereas the purpose of the Budget Review is to decide how much to spend on each of these programs. The purpose of the Execution Review, therefore, is to assess what is received for the money spent (e.g., actual performance versus planned performance). Performance metrics are developed and used to measure program achievements and attainment of performance goals. These metrics are analyzed to determine whether resources have been appropriately allocated. The decisions associated with all phases of the PPBE process are reflected in the Future Years Defense Program (FYDP).

1.8.2. Budget Management

The DoD budgeting process is based on the annual budget preparation cycle managed by the DCAPE and the Under Secretary of Defense (Comptroller) for the Deputy Secretary of Defense. This process produces a Future Years Defense Program (FYDP) that covers 5 years of spending. While individual program decisions fall under the DAE or designated MDA, DoD budget decisions are made separately at the Secretary or Deputy Secretary level, with the advice of the DAE and others. Within the DoD Components, MDAs will advise the Component budget authorities to ensure that acquisition programs are adequately funded and that program plans are consistent with programmed funding levels.

The Office of the Under Secretary of Defense (Comptroller) include the Program/Budget (PB) organization that is responsible for managing the review, formulation, presentation, and execution of the budget for the Department of Defense. In doing so, the PB organization works to achieve the utmost economy and efficiency in the operations of the Department through sound business judgment and effective fiscal planning and control. The PB organization has responsibility to:

- Oversee the Planning, Programming, Budgeting and Execution (PPBE) process for the Department of Defense.
- Manage a comprehensive, efficient budget formulation process that delivers timely and accurate budgets which reflect the goals of the Administration and Secretary of Defense.
- Provide analyses, products, and presentations to defend the Defense Department's budget.
- Support all budget-related activities needed for overseas contingency operations and other emergent operations such as those supporting overseas humanitarian efforts.
- Review and monitor the execution of the Department's enacted budget.
- Provide sound, accurate, and timely budget analysis and advice to the Department's senior leadership.
- Develop policy guidance on budgetary matters.

Based on the processes and reviews discussed previously, it is important that Program Managers recognize funding realism in terms of resources required to execute the program strategy—including personnel, funding, and facilities—that ought to be carefully planned, budgeted, and executed by the program. Further, it is well to recognize that the cycle for establishing and gaining funding is quite different and separate from the cycle for planning and executing an acquisition program.

1.8.3. Mid-Year Review Justification

The mid-year review occurs midway through the fiscal year (March-April) to examine total spending policies, including budget execution, emergent requirements, and program deficiencies. This is the comptroller's time to discuss why projects and programs need. additional funding, if any. If funds are made available through Congressional action, the major claimant may review some of the unfunded requirements. The comptroller must present the facts and be prepared to back the justifications.

1.9. TOC Management

Total Ownership Cost (TOC) and Life Cycle Cost (LCC)

Historically, for a defense acquisition program, Life cycle cost consists of research and development costs, investment costs, operating and support costs, and disposal costs over the entire life cycle. These costs include not only the direct costs of the acquisition program but also indirect costs that would be logically attributed to the program. In this way, all costs that are logically attributed to the program are included, regardless of funding source or management control.

The concept of Total Ownership Cost (TOC) is related but broader in scope. Total Ownership Cost includes the elements of lifecycle cost as well as other infrastructure or business process costs not normally attributed to the program.

See "Life Cycle Costs (LCC) and Total Ownership Costs (TOC) - A Study in Contrasts," Blog, Bill Kobren, March 03, 2014.

Each of the program's major stakeholders (Congress, program office, contractors, and DoD decision-makers) prefers to view life cycle costs grouped in a way that reflects its particular perspective. The three major ways of grouping and viewing program LCC are:

1. By funding appropriation: DoD receives appropriations from Congress falling into five major categories: Research, Development, Test and Evaluation (RDT&E); Procurement; Operations and Maintenance (O&M); Military Construction (MILCON); and Military Personnel (MILPERS). Program life-cycle costs are broken out along these lines to develop internal budgets and submit budget requests to Congress.
2. By Work Breakdown Structure (WBS): A program WBS provides a framework for program and technical planning, cost estimating, resource allocations, performance measurements, and status reporting. The WBS should define the total system to be developed or produced; display the total system as a product-oriented family tree composed of hardware, software, services, data, and facilities; and relate the elements of work to each other and to the end product. Major acquisition programs shall tailor a program WBS in accordance with the guidance in MIL-STD-881C. Cost breakouts by WBS elements are useful to the program office and contractors in managing the program.
3. By life-cycle cost categories: Cost Assessment and Program Evaluation (CAPE) Operating and Support Cost-Estimating Guide, 2020, defines the cost categories.

Life Cycle Cost Estimating (LCCE)

A Program Office Estimate (POE) is a life cycle cost estimate (LCCE) developed by the PMO or by a government cost estimating organization on behalf of the PMO. Each DoD Component will establish policy to determine how its POEs are developed and what role the POE plays in the establishment of a CCP (Component Cost Position).

All Department of Defense (DoD) Military Departments and Defense Agencies (DoD Components) prepare LCCEs in support of their acquisition programs. A LCCE attempts to identify and to properly phase, or spread, all the costs of an acquisition program, from its initiation through disposal of the resulting system at the end of its useful life.

LCCEs for DoD systems serve two primary purposes:

1. They are used at acquisition program milestone and decision reviews to assess whether the system’s cost is affordable, or consistent with the DoD Component’s and DoD’s overall long-range investment and force structure plans.
2. LCCEs form the basis for budget requests to Congress. LCCEs are prepared in terms of base-year dollars (also known as constant dollars) for a selected base year (usually the year of program initiation or last major milestone review). Thereafter, the estimate escalated to then-year dollars for inflation and outlay patterns and used as the basis for input to the programming and budgeting phases of the Planning, Programming, Budgeting and Execution process (PPBE).

DoDI 5000.73, Cost Analysis Guidance and Procedures mandates that the POE, along with other program LCCEs such as the CCP and CCE (Component Cost Estimate) be presented to OSD Cost Assessment and Program Evaluation (CAPE) prior to milestones where OSD CAPE are required to create and Independent Cost Estimate (ICE).

1.10. Planning Management

Per the Defense Acquisition Guidebook, Chapter 1 Program Management, planning an acquisition requires an understanding of the external and internal environments: the three DoD decision support systems and the organization, staffing, and operation of a Program Management Office (PMO).

The external environment, DoD decision support systems consists of the Joint Capabilities Integration and Development System (JCIDS); Planning, Programming, Budgeting, and Execution (PPBE); and the Defense Acquisition System (DAS). In combination the three systems provide an integrated approach to strategic planning, identification of needs for military capabilities, program and budget development, and systems acquisition. Effective PMs achieve synchronization among requirements, budgeting, and execution by maintaining a keen awareness of the status of their program relative to each of the decision support systems.

An overview of the interaction and relationships among the three DoD decision support systems is presented in CH 1–3.2. “Big A.” For detailed discussions on each of the three DoD decision support systems, refer to CH 1-3.2.1 (JCIDS), CH 1–3.2.2 (PPBE), and CH 1-3.2.3 (DAS).

The internal environment is the program office, with supporting organizations that function as an Integrated Product Team (IPT) for the duration of the program. As the program is executed, the Leads for various disciplines such as Systems Engineering (SE), Test and Evaluation (T&E), Sustainment, Financial Management, etc., develop and implement specific plans for their areas of responsibility. They also actively participate in the development of an event based PMO IMP. The PMO IMP includes detailed criteria for events at a level of detail to effectively manage the program from prior to initiation to fielding and life-cycle support. That is not to say that at initiation all events can or should be planned to an execution level of detail with specified accomplishments and criteria. A PMO IMS is developed from the IMP so that both a top-down and bottoms-up approach are in place to manage program development and execution.

Integrated Product and Process Development (IPPD)

Per the Defense Acquisition Guidebook (DAG), Chapter 1 Program Management, defense acquisition works best when all of DoD works together. Cooperation and empowerment are essential.

Integrated Product and Process Development (IPPD) is the management technique used in DoD to simultaneously integrate all essential acquisition activities using multidisciplinary teams to optimize design, manufacturing, and supportability processes. One key tenet of program management is the use of multidisciplinary teamwork through IPTs. The DAG further explains IPPD Key Tenets and Pitfalls.

Integrated Master Schedule (IMS)

According to the DoD Integrated Master Plan and Integrated Master Schedule Preparation and Use Guide, the IMS is an integrated, networked schedule containing all the detailed discrete work packages and planning packages (or lower level tasks or activities) necessary to support the events, accomplishments and criteria of the Integrated Master Plan.

Sustainment Maturity Levels

According to the DoD Product Support Manager’s (PSM) Guidebook, Sustainment Maturity Levels (SML) are a life cycle sustainment management tool used to assess the program’s progress in implementing the product support strategy, including the design and the resultant Product Support Package to achieve the sustainment metrics. SMLs are also a method that may be used by a Product Support Manager (PSM) to help identify and think through the maturity level the support plan should achieve for each milestone and the extent to which a program’s product support implementation efforts are “likely to result in the timely delivery of a level of capability to the Warfighter.” The SML concept addresses the full range of support options, from traditional organic based to full commercial based product support without prescribing a specific solution. In addition, the SML approach can be applied across major sub-systems to provide a common, consistent, repeatable means of articulating and understanding the Product Support Package maturity.

Risk Management

Per the Defense Acquisition Guidebook, Chapter 3, the most important decisions to control risk are made early in a program life cycle. During the early phases, the program works with the requirements community to help shape the product concept and requirements. PMs and teams should understand the capabilities under development and perform a detailed analysis to identify the key risks. Where necessary, prioritizing requirements and making trade-offs should be accomplished to meet affordability objectives. Once the concept and requirements are in place, the team determines the basic program structure, the acquisition strategy and which acquisition phase to enter, based on the type and level of key risks.

Defense programs encounter risks and issues that should be anticipated and addressed on a continuing basis. Risk and issue management are closely related and use similar processes. Opportunity management is complementary to risk management and helps achieve should-cost objectives. Risks, Issues and Opportunities may be in areas including, but not limited to, technology, integration, quality, manufacturing, logistics, requirements, software, test, and reliability. See the DoD Directive 5000.01, The Defense Acquisition System and other DoD Issuances for specific policy on risk management.

1.10.1. IPT Management

Per the Defense Acquisition Guidebook (DAG), Chapter 1 Program Management, Program oversight and IPPD processes are implemented through Integrated Product Team (IPT) members who represent technical, business, and support functions. The following guiding principles improve the productivity of any IPT:

- Chartering, launch, and initiation. To get the team off to a good start, prepare a charter documenting the mission, timeframe, and membership of the IPT; train participants in IPT principles and the role of each team member; and prepare a Plan of Actions and Milestones (POA&M).
- Goal alignment. Team leaders ensure that the goals and objectives of each team member are consistent with the goals of the project. Effective feedback mechanisms can be put in place to facilitate this.
- Open discussions with no secrets. Due to the unique design of IPTs in which each member has expertise in a specific area, free and open communication among all members is essential.
- Empowered, qualified team members. Team members have the authority to represent their superiors in the decision-making process. They remain in close communication with their bosses to ensure their advice is sound and not subject to change later, barring unforeseen circumstances.

- Dedicated/Committed, Proactive Participation. Because team success hinges on participation by members with institutional knowledge of functional areas, IPTs are organized so that all key stakeholders can contribute effectively. In many cases, this means minimizing membership to enhance communication and trust.
- Issues Raised and Resolved Early. All issues are raised openly and discussed at the earliest possible opportunity, and solved through team consensus and discussion, not isolated conversations "offline."

1.10.2. ILA Management

An Independent Logistics Assessment (ILA), also referred to as a Logistics Assessment (LA), is an analysis of a program's supportability planning. Preferably, it is conducted by an independent and impartial team of Subject Matter Experts (SME) not directly associated with the program being assessed. An ILA is not a compliance audit, but an effective and valid assessment of the program office's product support strategy, as well as an assessment of how this strategy leads to successfully operating a system at an affordable cost. (DoD Logistics Assessment Guidebook).

1.10.3. LSCP/Product Support Strategy Development and Management

The Life Cycle Sustainment Plan (LCSP)/Product Support Strategy documents the Program Manager and Product Support Manager's plan for formulating, implementing, and executing the sustainment strategy. The LCSP/Product Support Strategy describes the approach and resources necessary to develop and integrate sustainment requirements into the system's design, development, testing, deployment, and sustainment phases.

The Defense Acquisition Guidebook (DAG), and the DoD Life Cycle Sustainment Plan (LCSP) Outline each contain extensive information on the requirements for the LCSP/Product Support Strategy.

Note that the LCSP is incorporated into policy addressing the Product Support Strategy for a program. Users are encouraged to review DoD Directive 5000.01, The Defense Acquisition System, and DoDI 5000.02, Operation of the Adaptive Acquisition Framework, plus other policy located on the DoD AAF website.

1.10.4. Milestone Gate Review Management

The topic of milestone gate reviews is addressed in detail within the DoD AAF framework, depending on which pathway or set of pathways a specific program is adopting. Users are encouraged to review DoD Directive 5000.01, The Defense Acquisition System, and DoDI 5000.02, Operation of the Adaptive Acquisition Framework, plus other policy located on the DoD AAF website.

Program Technical Reviews

Per the Defense Acquisition Guidebook, Chapter 3, for DoD weapon systems development, a properly tailored series of technical reviews and audits provide key points throughout the life cycle to evaluate significant achievements and assess technical maturity and risk. The Program Manager (PM) and Systems Engineer work to properly align the technical reviews to support knowledge-based milestone decisions that streamline the acquisition life cycle and save precious taxpayer dollars. Technical reviews and audits allow the PM and Systems Engineer to jointly define and control the program's technical effort by establishing the success criteria for each review and audit. A well-defined program facilitates effective monitoring and control through increasingly mature points.

Technology Maturity and Technology Readiness
Acquisition milestones and systems engineering technical reviews and audits serve as key points throughout the life cycle to evaluate significant achievements and assess technical maturity and risk. The Defense Acquisition Guidebook, Chapter 3 Systems Engineering provides more information.

Department experience (e.g., Government Accountability Office (GAO) Report 12-400SP) has found that successful programs use knowledge-based product development practices that include steps to gather knowledge to confirm the program's technologies are mature, their designs are stable, and their production processes are in control. Successful materiel developers ensure a high level of knowledge is achieved at key junctures in development.

1.11. Portfolio Transfer Planning and Transfer Execution

Portfolio transfer is the process by which the management authorities and responsibilities for Air Force weapon systems and acquisition programs are formally transferred between AFMC product centers and logistics centers. Each DoD Component has specific regulations regarding how a program/system transitions from the acquisition authority to the sustainment authority. Users should check with their respective organizations for appropriate regulations.

Technology Transfer
Technology Transfer is the transfer or licensing of technology developed in Federal Laboratories to domestic partners, including industry, state and local governments, and academia. Key mechanism for the transfer are Cooperative Research and Development Agreements (CRADA), Patent License Agreements, Educational Partnership Agreements, and DoD-wide Partnership Intermediaries, in particular, TechLink and TechMatch.

Title 10 USC, section 2515 established the Office of Technology Transition within the Office of the Secretary of Defense. The purpose being to "ensure, to the maximum extent practicable, that technology developed for national security purposes is integrated into the private sector of the United States in order to enhance national technology and industrial base..." Each of the Military Services, Defense Agencies, and Office of the Secretary of Defense (OSD) maintain technology transfer websites to inform the public and make available general information on this program. These websites provide information on technology transfer opportunities, training, success stories, and mechanisms and agreement examples to facilitate joint research and development efforts and transfer technology to the private sector. These websites are:

- DUSD(AS&C) Technology Transfer Office
- Army Research Laboratory
- ONR Science & Technology Office of Transition (Code 03T)
- Air Force Office of Technology Transition (T2)
- Missile Defense Agency
- National Security Agency Domestic Technology Transfer Program
- United States Joint Forces Command

1.12. Logistics Policy Implementation

Logistics policy is contained at the highest levels of DoD policy and guidance. Users are encouraged to review DoD Directive 5000.01, The Defense Acquisition System, and DoDI 5000.02, Operation of the Adaptive Acquisition Framework, plus other policy located on the DoD AAF website.

Product Support in Manufacturing
Product support considerations that occur during manufacturing focus on ensuring all the integrated product support elements are being considered and where there may be integration with the manufacturing process. Examples include suppliers who should have long term arrangements to continue past manufacturing into sustainment, infrastructure which can be re-used for maintenance and supply functions; repair parts production lines to integrate and manage supply and demand as the system transitions into fielding and operations while manufacturing of new systems is still occurring; quality control; etc., The PM should consider RFP requirements that promote standard and capable manufacturing processes that could be used or repurposed to support depot activities and promote structured, consistent processes for software development and sustainment activities based on standard maturity models.

The Defense Acquisition Guidebook (DAG), Chapter 4 Life Cycle Sustainment, Table 6: Key Sustainment Questions at Full Rate Production (FRP) Decision Review provides a listing of key product support considerations related to manufacturing.

As part of the program's Production Readiness Review (PRR), the PM assesses the readiness of production processes and facilities to ramp to volume and meet the system's end item and sustainment demands. The PM assesses how the proposed production methods may affect sustainment and identifies the sustainment risks associated with increased levels of production rate (LRIP and FRP). Any sustainment risks should inform the product support package design and the program's planning for production and deployment. See the Defense Acquisition Guidebook (DAG).

Postproduction Support Plan

A post product support plan identifies the IPS Elements which are critical to postproduction support planning, detailed analysis including examination of all items for possible parts supportability problems such as obsolescence and other resource implications and problem correction. Postproduction Support (PPS) includes the management and support activities necessary to ensure continued attainment of readiness and supportability objectives with economical logistics support, after cessation of production for the acquisition or modification of a major system or equipment. Post production support planning is contained within the Life-Cycle Sustainment Plan (LCSP)/Product Support Strategy.

Deployment and Fielding Planning

Post-production support planning is contained within the Life-Cycle Sustainment Plan (LCSP)/Product Support Strategy.

As part of the System Verification Review, the PM should assess the collective results of system verifications to determine the extent to which sustainment requirements have been successfully verified and, more importantly, determine sustainment performance shortfalls. The PM should ensure that all system verification and validation information is reflected in the Product Support Package. Deployment risks and impacts should be fully defined, and appropriate mitigation actions included in the program's plan and budget. See the Defense Acquisition Guidebook (DAG), Chapter 4 Life Cycle Sustainment, CH 3 Section 3.3.6 and DAU LOG 211, Supportability Analysis, Lesson 14, for additional information on System Verification Review.

Implementing KPP and KSAs

The strategy and detailed planning to implement the program's Sustainment KPP and KSAs is contained within the Life Cycle Sustainment Plan (LCSP)/Product Support Strategy.

Before Milestone A, the DoD Component's requirements developer formulates a draft Capability Development Document (CDD), informed by the Initial Capabilities Document (ICD) and the Analysis of Alternatives (AoA) . This document contains all requirements for the system. The mandatory Sustainment KPP requirement is broken involves three attributes that enable affordable logistics performance: the Availability KPP (which includes the Materiel Availability and Operational Availability KPPs), the Reliability and the Maintainability Key System Attributes (KSA), and the O&S Cost KSA.

Sustainment metrics are developed and measured together, as well as in concert with the other system KPP and KSAs. An unachievable value in any metric can have a ripple effect on the other sustainment or system performance metrics and may drive up development and O&S Costs. The LCL/PSM and the Chief Engineer collaborate on establishing and refining the sustainment metrics. Additionally, the sustainment metrics provide the linkage to integrate the product support elements. See the Defense Acquisition Guidebook (DAG), Chapter 4 Life Cycle Sustainment.

The Product Support Package
The product support package is the collection of product support elements required to field and maintain the readiness and operational capability of weapon systems, subsystems, and components. Development of the product support package during this phase starts with designing for supportability and technology trade-offs. The goal is affordable and technologically feasible design thresholds that satisfy Warfighter requirements.

These design decisions will influence the support package, such as determining whether two- or three-level maintenance is appropriate, the range and depth of required provisioning, the need for unique support equipment, and technical manuals and training required to support the system.

Manpower, facilities, information systems, and the rest of the product support elements are also impacted by design and business decisions. The Life-Cycle Sustainment Plan (LCSP)/Product Support Strategy documents the product support package development status. See the Defense Acquisition Guidebook (DAG), Chapter 4 Life Cycle Sustainment.

Product Support Checklists and Assessments
Checklists and assessment for the evaluating a product's product support status are found in multiple documents:

- Life Cycle Sustainment Plan (LCSP) Outline Guidance
- PSM Guidebook
- Logistics Assessment (LA) Guidebook (ILA Guidebook)
- DoD Service Regulations (Users should check with their respective organizations) – level of repair analysis, manpower and training assessments.

System Disposal
Disposal, as described in DoDM 4160.21 Defense Materiel Disposition: Disposal Guidance and Procedures, is the process of reutilizing, transferring, donating, selling, destroying, or other ultimate disposition of real property.

The objectives of the Defense Materiel Disposition Program are to:
a. Provide standardized disposition management guidance for DoD excess property and FEPP (including scrap) and HP, by using efficient internal and external processes. The expected outcome includes protecting national security interests, minimizing environmental mishaps, satisfying valid needs by extended use of property, permitting authorized donations, obtaining optimum monetary return to the U.S. Government, and minimizing abandonment or destruction(A/D) of property.

b. Migrate from legacy transactions with 80 record position formats applicable to military standard system procedures (e.g., Defense Logistics Manual (DLM) 4000.25-1 (Reference (p)) and DLM 4000.25-2 (Reference (q)) to variable length DLMS transactions as described in DLM 4000.25 (Reference (r)) (American National Standards Institute Accredited Standards Committee (ANSI ASC) X12 or equivalent Extensible Markup Language (XML) schema)) to track items throughout the supply chain life cycle. Implementation must be consistent with DoDI 8320.02 (Reference (s)).
c. Ensure cost-effective disposal of precious metals bearing scrap and end items for the replenishment of valuable resources through the DoD PMRP.
d. Ensure personal property and related subcomponents are not declared excess and disposed of prior to determining the need for economic recovery.
e. Encourage Military Departments and Defense Agencies to: (1) Comply with the spirit and intent of Executive Order 12862. (2) Set results-oriented goals, such as delivering customer value that results in improvement of overall Military Department performance. 3) Serve the taxpayer's interests by ensuring tax money is used wisely and by being responsive and reliable in all dealings with the public.

Disposal of repair parts is addressed in the Supply Support IPS Element chapter.

Disposal of technical data is addressed in the Technical Data IPS Element chapter.

DLA Disposition Services (formerly DRMO)
DLA Disposition Services disposes of excess property received from the military services. That property is first offered for reutilization within the Department of Defense (DoD), transfer to other federal agencies, or donation to state and local governments and other qualified organizations. In the past four years more than $2.2 billion worth of property was reused each year. Every dollar's worth of property reutilized is a tax dollar saved.

DLA Disposition Services also supports disaster relief at home, and humanitarian assistance and foreign military sales programs.

- DLA Disposition Services manages the DoD surplus property sales program. Excess property that is not reutilized, transferred, or donated may be sold to the public. The property, no longer needed by the government, is only sold if it is appropriate and safe for sale to the general public.
- Keeping the environment in mind. DLA Disposition Services manages the disposal of hazardous property for DoD activities, maximizing the use of each item and minimizing environmental risks and costs through monitored compliant disposal.
- A Resource Recovery and Recycling Program conserves natural resources, reduces waste products and returns revenue to the military services. The Precious Metals Recovery Program significantly reduces the need for DoD to purchase metals such as gold, silver, and platinum family metals.

- Demilitarization. Certain property is demilitarized (i.e., rendered useless for its originally intended purpose). Surplus property with inherent military characteristics must undergo "demil." Offensive and defensive weapons and associated material are demilitarized prior to sale or as a condition of sale. There is a risk that DoD personal property could be diverted into the hands of enemies of the United States as shown in Figure 1. To mitigate this risk, it is necessary to perform DEMIL on items being transferred out of DoD control except when permitted pursuant to specific legal authority.
- Support for the U.S. military. DLA Disposition Services supports America's military wherever they are called to serve. Current contingency missions see DLA Disposition Services civilians serving alongside combat forces in Afghanistan. They are part of the worldwide presence within DoD, with people serving in 16 foreign countries, two U.S. territories (Guam and Puerto Rico) and 41 states.

Recycling
All installations, worldwide, shall have recycling programs as required by Executive Order 12780. Pursuant to Public Law 97-214 (10 USC 2577), and DoDI 4715.4, Pollution Prevention. Each installation and facility not on a military installation, worldwide, shall have, or be associated with, a Qualified Recycling Program (QRP) to service all tenant activities.

Issues Related to Return and Reintegration
Each DoD Component has designated reclamation organizations to ensure tests and inspections are performed prior to reintegration into the supply chain for all parts planned for reuse.

Deactivation and Stand Down of Operational Units
Deactivation of military units is the inactivation, redeployment to another operational area or the relocation within a major command. The deactivation process is often unique to the command and host installation.

Security and Destruction of Classified Items
The destruction of classified material should occur when that material is no longer required, including media, memory, and equipment. The DoDI 5220.22, National Industrial Security Program (NISP), addresses DoD policy:

- The Secretary of Defense, designated as the Executive Agent for the NISP by Reference(d), may prescribe such specific requirements, restrictions, and other safeguards as considered necessary to protect classified information that may be disclosed, or has been disclosed, to current, prospective, or former contractors, licensees, or grantees of U.S. agencies.
- The Secretary of Defense is authorized to enter into agreements with any other Executive Branch department or agency to provide industrial security services required for safeguarding classified information disclosed to industry by these departments or

agencies. Such departments and agencies, together with the DoD Components, are hereafter referred to collectively as Government Contracting Activities (GCA).

- The DoD shall set forth policies, practices, and procedures for the GCAs to follow for the effective protection of classified information provided to industry, including foreign government information that the U.S. Government is obligated to protect in the interest of national security.

Archiving and Record Retention of Historical Data
Historical data may be destroyed or sent to archiving and record retention repositories such as the Naval Historical Center, the National Archives, or a federal records center. This topic is discussed in more detail in the Technical Data IPS Element Chapter.

Benefiting Historical Collections
The loaning, giving, or exchange of documents, historical artifacts, and condemned or obsolete combat materiel to benefit the Department of Defense's historical collection and associated educational programs is available under 10 U.S.C. 2572.

1.13. Configuration Management

Configuration Management Planning and Management
The Defense Acquisition Guidebook (DAG), Chapter 3 describes configuration management. The Configuration Management process establishes and maintains the consistency of a system's functional, performance and physical attributes with its requirements, design and operational information and allows technical insight into all levels of the system design throughout the system's life cycle. Effective configuration management supports the establishment and maintenance of the functional, allocated and product baseline. Establishing rigorous configuration control enables the successful development, test, production, delivery, and sustainment of the needed capability to the end user.

The DoD-adopted standard EIA-649-1, Configuration Management Requirements for Defense Contracts implements the principles outlined in ANSI/EIA-649B for use by defense organizations and industry partners during all phases of the acquisition life cycle. It makes provisions for innovative implementation and tailoring of specific configuration management processes to be used by system suppliers, developers, integrators, maintainers, and sustainers.

SAE EIA-649B, Configuration Management Standard, has been adopted by the Department as the Industry standard intended for use when establishing, performing, or evaluating CM processes. The Standard consolidates content and terminology contained in the GEIA-Handbook-649, Configuration Management Handbook and MIL-Handbook-61, Configuration Management Guidebook, and provides the principles evoked within SAE EIA-649-1 Configuration Management Requirements for Defense Contracts.

Data Item Descriptions (DID) to support the industry standards were approved on April 2015 and uploaded into the DLA ASSIST database. The DIDs are identified and hyperlinked within the references section of this article. Additionally, DD Forms have been approved and posted on the DTIC DoD Forms Management Program website.

Given the Department's adoption of industry standards, all Configuration Management related Military Standards have been cancelled. MIL-HDBK-61, Configuration Management Guidance is currently in effect; its content has been incorporated into GEIA-Handbook-649, Configuration Management Handbook.

1.13.1. Configuration Identification and Baseline Maintenance
Configuration identification is the process for establishing levels or boundaries for managing as independent entities, typically if there is a performance specification or detailed specification associated the product is identified as a configuration item. This process ensures a unique identifier is provided in which functional, performance, and design attributes can be assigned allowing for management of relationships between these attributes, the documentation that represents these attributes, and other configuration items.

The following baselines are critical to executing Configuration Management:

- Functional Baseline: Describes the system’s performance (functional, interoperability and interface characteristics) and the verification required to demonstrate the achievement of those specified characteristics. It is directly traceable to the operational requirements contained in the Initial Capabilities Document (ICD).
- Allocated Baseline: Describes the functional and interface characteristics for all system elements (allocated and derived from the higher-level product structure hierarchy) and the verification required to demonstrate achievement of those specified characteristics. The allocated baseline for each lower-level system element (hardware and software) is usually established and put under configuration control at the system element Preliminary Design Review (PDR).
- Product Baseline: Describes the detailed design for production, fielding/deployment and operations and support. The product baseline prescribes all necessary physical (form, fit and function) characteristics and selected functional characteristics designated for production acceptance testing and production test requirements. It is traceable to the system performance requirements contained in the CDD.

1.13.2. Configuration Control
Configuration control is a systematic process that ensures that changes to released configuration documentation are properly identified, documented, evaluated for impact, approved by an appropriate level of authority, incorporated, and verified.

Configuration Control Board (CCB)
A configuration control board is composed of technical and administrative representatives who recommend approval or disapproval of proposed engineering changes to, and proposed deviations from, current approved configuration documentation.

1.13.3. Configuration Status Accounting

The configuration management activity concerning capture and storage of, and access to, configuration information needed to manage products and product information effectively.

1.13.4. Configuration Auditing

Configuration Verification and Audit includes 1) configuration verification of the initial configuration of a CI, and the incorporation of approved engineering changes, to assure that the CI meets its required performance and documented configuration requirements; 2) validation that a development program has achieved its performance requirements and configuration documentation, or the system/CI being audited is consistent with the product meeting the requirements. Audits include the Functional Configuration Audit (FCA) and Physical Configuration Audit (PCA).

1.14. Performance-Based Life-Cycle Product Support (PBL)

The DAU ACQuipedia library contains the following recommended articles focusing on PBL:

- Performance Based Logistics (PBL) Contract Lengths
- Performance Based Logistics (PBL) Contracting Strategies
- Performance Based Logistics (PBL) Implementation
- Performance Based Logistics (PBL) Management
- Performance Based Logistics (PBL) Metrics - Overview
- Performance Based Logistics (PBL) Metrics – Techniques & Tools for Optimizing Operating & Support (O&S) Cost & System Readiness
- Performance Based Logistics (PBL) Metrics - Thresholds vs. Objectives
- Performance Based Logistics (PBL) Overview

Good Reference: The Integrated DAU Product Support Tools and Resources library provides eight tools for the PSM to include:

- **Product Support Strategy Development Tool**
  The Product Support Strategy Development Tool supports DoD Product Support Managers (PSM) and Life Cycle Logistics workforce members in developing affordable and executable product support strategies, while expanding on and reinforcing DoD product support guidance contained in both the DoD Product Support Manager's Guidebook and the DoD Performance Based Logistics Guidebook.
- **Product Support Implementation Roadmap**
  This tool assists in building a best value product support package in support of the Warfighter. The tool provides detailed activity and output listings across the lifecycle

and by IPS Element. It provides information via a "List View," which is a compact list of Product Support activities and outputs required, as well as a "Timeline View" showing activities and outputs over the total lifecycle.

- **Product Support Business Model (PSBM)**
  This tool on the DAU Acquisition Tools website defines the hierarchical framework in which the planning, development, implementation, management, and execution of product support for a weapon system component, subsystem, or system platform will be accomplished over the life cycle. The PSBM describes the methodology by which DoD intends to ensure achievement of optimized product support through balancing maximum weapon system availability with the most affordable and predictable total ownership cost. Also see the section below further describing the PSBM process.
- **Milestone Documentation Identification (MDID) Tool**
  The Milestone Document Identification tool (MDID) helps defense acquisition workforce members identify and filter through statutory and regulatory document requirements by phase, milestone, Acquisition Category (ACAT), Life Cycle Event, Source, Key Word as identified in the various tables.
- **Acquisition Requirements Roadmap Tool (ARRT) Suite**
  ARRT is a powerful job aid designed to help defense acquisition workforce members improve tradecraft in service acquisitions. Features include supporting development of performance-based service requirements following a proven process, creating a draft Performance Work Statement (PWS), Quality Assurance Surveillance Plan (QASP), and Performance Requirements Summary (PRS), develop contract source selection factors, monitor and track contractor performance based on your PWS, and develop an Independent Government Cost Estimate.
- **US Army Materiel Command LDAC Tools Suite**
  A suite of decision support software tools to assist acquisition Program and Product Support Managers conduct supportability analyses, develop key program management documentation, develop their logistics management information data base, conduct engineering life cycle costing, perform Level of Repair Analysis (LORA), conduct sustainment/supportability analysis, and employ the results of these analyses to reduce project cost, schedule, increase performance, and minimize risk.
- **Performance Based Logistics (PBL) Maturity Assessment Tool**
  Assists with an analysis of a program's PBL maturity and provides an assessment of how this strategy may lead to a successful PBL program. Assessment can be conducted during any program phase, but when executed early in the program, the design and contracting approaches may be positively influenced to enable effective PBL product support arrangements.

Product Support Strategies

Product support strategies describe the supportability planning, analyses, and trade-offs used to determine the optimum product support concept for a materiel system and to identify the appropriate metrics for continuous readiness and affordability improvements throughout the product life cycle. The product support strategy evolves in detail, so that by Milestone C, it defines how the program will address the support and fielding requirements necessary, reflected in the 12 Integrated Product Support (IPS) Elements which make up the product support package, and the Warfighter's needs to meet readiness and performance objectives, lower total ownership cost, reduce risks, and avoid harm to the environment and human health. The product support strategy should address how the program manager and other responsible organizations will maintain oversight of the fielded system. It should also explain the contracting approach for product support throughout the system life cycle.

Per the Product Support Manager Guidebook, product support strategies can take many forms at many levels, leveraging the capabilities of a variety of government and industry Product Support Providers (PSP). They can be established and implemented at the system, subsystem, or component levels; they can more heavily leverage the industry capabilities of the commercial sector, organic Government capabilities, or an integrated best-value mix of commercial and organic sector competencies, capabilities, and expertise.

Interim Contractor Support

Interim support requirements refer to temporary contractor support in lieu of a permanent support solution (organic or commercial) for a predetermined time that allows a DoD Component to deliberately plan and program for investment in required support resources (spares, technical data, support equipment, training equipment, etc.), while a permanent support capability is put in place (i.e., the selection/establishment of an organic depot). Interim contractor support is usually required for support of prototypes and early test and production assets during development and initial fielding. The PM first identifies those support activities that are required prior to fielding the permanent support solution and then develops a plan for implementing the interim support solution and transitioning to the permanent support solution.

Performance Based Life Cycle Product Support (PBL)

Performance Based Life Cycle Product Support (also referred to as Performance Based Logistics or PBL) is a performance-based product support strategy for the development and implementation of an integrated, affordable, product support package designed to optimize system readiness and meet the Warfighter's requirements in terms of performance outcomes for a weapon system through long-term product support arrangements with clear lines of authority and responsibility.

A PBL arrangement is not synonymous with Contractor Logistics Support (CLS). CLS signifies the "who" of providing support, not the "how" of the business model. CLS is support provided by a contractor, whether the arrangement is structured around Warfighter outcomes with associated incentives or not. PBL arrangements, on the other hand, are tied to Warfighter outcomes and integrate the various product support activities (e.g., supply support, sustaining engineering, maintenance, etc.) of the supply chain with appropriate incentives and metrics. In addition, PBL focuses on combining best practices of both Government and industry.

Transactional Based Product Support
A transactional based strategy is characterized by a defined scope and payment for that scope based on a discrete event happening. The business model will usually reflect increasing revenues or costs directly related to the volume of events or transactions which occur. Incentivization to achieve success typically serve to increase the number of transactions per some pre-defined unit of measure, i.e., Deliveries per day, new orders per cycle, number of repair actions per service, etc.

Hybrid Mix
The hybrid product support strategy is a best value blend of a PBL outcome-based product support strategy and a traditional transactional based product support strategy which reflects the fact that PBL product support rarely applies to the entire system or all the IPS elements. Those sub-systems and components that do not fall under PBL product support default to transactional based product support. The hybrid product support strategy is defined further as the best value mix of government and industry product support providers to implement an affordable product support strategy based on their capabilities, capacity, and cost to perform the twelve IPS elements.

The 12 Step Product Support Strategy Process Model
The 12-Step Approach to PBL follows the 12-Step Product Support Strategy Process Model found in the PSM Guidebook **and** the PBL Guidebook**.** The 12-Step model is a repeatable process that facilitates the successful accomplishment of these activities. The model should not be seen as rigid, but instead as flexible to support the unique needs of individual programs. The steps may be performed in a different order, or they may be repeated or deleted depending on the life cycle phase and program requirements.

Product Support Business Model
The Product Support Business Model (PSBM) was developed to assist the PM and PSM, who must be tightly aligned, with the numerous supportability considerations and trade-offs that take place during the development and fielding of a weapon system. The PSBM defines the hierarchical framework and methodology through which the planning, development, implementation, management, and execution of product support for a weapon system component, subsystem, or platform will be accomplished over the life cycle. The model seeks to balance weapon system availability with the most affordable and predictable total ownership cost. Performance-based product support is a mechanism for accomplishing this task in a manner that shares performance risk between the Government and commercial product support provider(s). A properly designed PBL arrangement will align the provider’s and Government’s goals through the proper application of incentives.

Role of the Program Manager (PM)

The DoD Directive 5000.01, The Defense Acquisition System, and DoDI 5000.02, Operation of the Adaptive Acquisition Framework designate a PM as the individual with responsibility for, and authority, to accomplish program objectives.

The role of the program manager is to direct the development, production, and initial deployment (as a minimum) of a new defense system. This must be done within limits of cost, schedule, and performance, as approved by the program manager's acquisition executive. The program manager's role, then, is to be the agent of the military service or defense agency in the defense acquisition system to ensure the Warfighter’s modernization requirements are met efficiently and effectively in the shortest possible time.

The Product Support Manager (PSM)
As the PM’s key leader for sustainment planning, the Product Support Manager (PSM) has primary responsibility for implementing many of the actions, processes, and procedures included in this chapter. The PSM provides subject matter expertise to the PM for product support, from concept through disposal. The responsibilities of the PSM are defined in 10 USC 2337, although the PSM roles and responsibilities in the post-production O&S phase vary by DoD Component. *See* the PSM Guidebook and the PBL Guidebook for detailed discussion. Also see DoD Directive 5000.01, The Defense Acquisition System, and DoDI 5000.02, Operation of the Adaptive Acquisition Framework.

The Product Support Integrator (PSI)
The Product Support Integrator (PSI) is an entity from government or industry performing as a formally bound agent charged with integrating all sources of support, public and private, defined within the scope of the product support arrangements (e.g., contract, Memorandum of Agreement (MOA), Memorandum of Understanding (MOU), Service Level Agreement [SLA]) to achieve the documented outcomes. The Product Support Manager (PSM) designates the Product Support Integrator(s) who will be delegated the responsibility to integrate the product support providers to deliver the specified outcomes assigned consistent with the scope of their delegated responsibility. The PSI has considerable flexibility and latitude in how the necessary support is provided, so long as the outcomes are accomplished. *See* the PSM Guidebook and the PBL Guidebook for detailed discussion.

The Product Support Provider (PSP)
The term “product support provider” means an entity that provides product support functions. The term includes an entity within the Department of Defense, an entity within the private sector, or a partnership between such entities. (Source: 10 U.S.C 2337). The Product Support Providers are assigned responsibilities to perform and accomplish the functions represented by the Integrated Product Support (IPS) elements or work packages within a Work Breakdown Structure (WBS) which, per the DoD Product Support Business Case Analysis (BCA) process and consistent with statute and policy, comprise the range of best value or statutorily assigned workloads that achieve the Warfighter support outcomes. This can be done at the component, subsystem, system, program, or enterprise level. *See* the PSM Guidebook and the PBL Guidebook for detailed discussion.

Contingency Logistics Considerations
The Department of Defense (DoD) provides the military forces needed to deter war and to protect the security of the US. To support this mission, the combatant commanders' (CCDR) plans are supported by posturing forward-deployed forces at Contingency Locations (CL) throughout their Areas of Responsibility (AOR). Contingency basing is the life cycle process of planning, establishing, constructing, operating, managing, transferring, and transitioning or closing a non-enduring location (EL) supporting a CCDR's requirements. See Joint Publication 4-04, Contingency Basing.

The Defense Logistics Agency (DLA) Joint Contingency Acquisition Support Office (JCASO) website provides additional resources and references. As a joint strategic enabling capability for the Department of Defense, JCASO helps joint force commanders ensure they have pre-planned, organizational approaches to executing Operational Contract Support (OCS) and associated expenditures during contingencies in which organic military solutions are not feasible or timely. JCASO's sustained engagement with combatant commands staffs during conflicts, humanitarian assistance operations, and exercises, enhances DoD's best practices initiatives, reduces the demand for boots on the ground, and is responsive when theater crises arise. When requested, JCASO's mission support teams and joint OCS planners support combatant commands' planning, exercises, training, and deployments.

Joint Logistics
Per the Joint Publication 4-0, Joint Logistics, joint logistics is the coordinated use, synchronization, and often sharing of two or more combatant commands or Military Departments' logistics resources to support the joint force.

1.15. Continuous Process Improvement
Continuous Process Improvement (CPI) is an integrated system of improvement that focuses on doing the right things, right. It is also an enterprise-wide "way of thinking" for achieving lower cost, shorter lead times, and higher quality. As a way of thinking, CPI is relevant to any process, regardless of complexity or relative importance. CPI provides an ongoing focus on enhancing the satisfaction of the Warfighter's needs. CPI can seek "incremental" improvement over time or "breakthrough" improvement all at once. Delivery (customer valued) processes are constantly evaluated and improved in the light of their efficiency, effectiveness, and flexibility. Primary reference is DoDI 5010.43, Implementation and Management of the DoD-Wide Continuous Process Improvement/Lean Six Sigma (CPI/LSS) Program. See also DAU CLE 015 Continuous Process Improvement Familiarization, Lesson 1.

A. Product Support Management Major Activities by Acquisition Phase

Activities of the Product Support Management IPS Element
Each activity of the Product Support Management IPS Element, as listed in the PSM Guidebook Appendix A, is under the responsibility of the Program Manager, the Product Support Manager,

and the lead stakeholder from other areas as applicable, i.e., configuration management, engineering, environment, manufacturing, etc. Relevant Proponency DoD offices are listed in this chapter below in Section C, Proponency.

The Stakeholders

Per the PSM Guidebook, although the PM is the life-cycle systems manager, the PSM is responsible to the PM for the life-cycle product support management. Effective product support strategies require the participation and consensus of all stakeholders in developing the optimum sustainment strategy. The IPT team, led by the PSM, may consist of Government and private-sector functional experts, and should include all appropriate stakeholders including Warfighter representatives. However, it is vital that members work across organizational boundaries. Teambuilding to achieve a system orientation focused on integrating support across the IPS Elements to achieve Warfighter required performance is critical.

In addition to assisting the PM/PSM in developing, refining, and implementing the product support strategy, the Product Support Management IPT also ensure consideration, throughout support strategy design and development, of all factors and criteria necessary to achieve a best value strategy that leverages the best capabilities of the public and private sectors to meet Warfighter performance, readiness, and availability requirements at the lowest LCC.

The Contractor Organizations

Per the PSM Guidebook, contracts are implemented between the DoD and industry, they specify the requirements, parameters of support, deliverables, pricing, incentives, risk mitigation clauses, and the terms and conditions of performance. The PSM Guidebook provides additional information on the many roles that the contractor organization may perform to include: Product Support Integrator (PSI), Product Support Provider (PSP), partner in a Public Private Partnership arrangement, and various support roles specific to one or more of the Integrated Product Support Elements.

Input to the Life-Cycle Sustainment Plan (LCSP)/Product Support Strategy.

Detailed guidance on development of the Life Cycle Sustainment Plan (LCSP)/Product Support Strategy states that "The purpose of this annotated outline is to improve sustainment planning for Department of Defense (DoD) weapon systems. This may be achieved when programs make design decisions that achieve operational performance requirements and reduce demand for sustainment. "

While information from the Product Support Management activities will impact many areas of the LCSP, the below LCSP sections specifically address PS Management:

- 2 Product Support Performance
- 3 Product Support Strategy
- 4 Program Review Issues and Corrective Actions
- 6 Integrated Schedule
- 7 Cost and Funding

- 8 Management

As Product Support Management activities continue through the life cycle, their impacts will both directly and indirectly impact the system's KPP, KSA and Additional Performance Attribute (APA) (i.e., Mean Downtime and Logistics Footprint) parameters.

When Is Product Support Management Delivered and Managed in the Lifecycle?
There are multiple references the reader should carefully review when determining when the various products and services within the Product Support Management IPS Element are delivered and managed in the system lifecycle:

- DoD Directive 5000.01, The Defense Acquisition System
- DoDI 5000.02, Operation of the Adaptive Acquisition Framework
- Relevant policy found at the DoD AAF Website
- Life-Cycle Sustainment Plan Outline Guidance
- Defense Acquisition Guidebook (DAG)
- Product Support Implementation Roadmap

Per the Defense Acquisition Guidebook (DAG), Chapter 4, Life Cycle Sustainment, while weapon system sustainment does not actually begin until the first production units are fielded, sustainment planning begins at the earliest stages of the defense acquisition system. Successful post-fielding sustainment performance depends on critical thinking during requirements development and solution analysis. Readers are referred to the DAG, CH 4–2.2 Life Cycle Sustainment Overview, Figure 1, Overview of Life Cycle Sustainment Activities, which shows the major sustainment planning activities within the defense acquisition system program structure.

The activities within the Product Support Management IPS Element are best visualized in the DoD Product Support Implementation Roadmap Tool. This tool allows the User to check the box highlighting information specifically linked to the Product Support Management Integrated Product Support Element.

Once the Design Interface IPS Element box is checked, the timeline expands to show the detailed activities and respective outputs for each activity by phase, as show in a partial illustration in Figure 1-1 below.

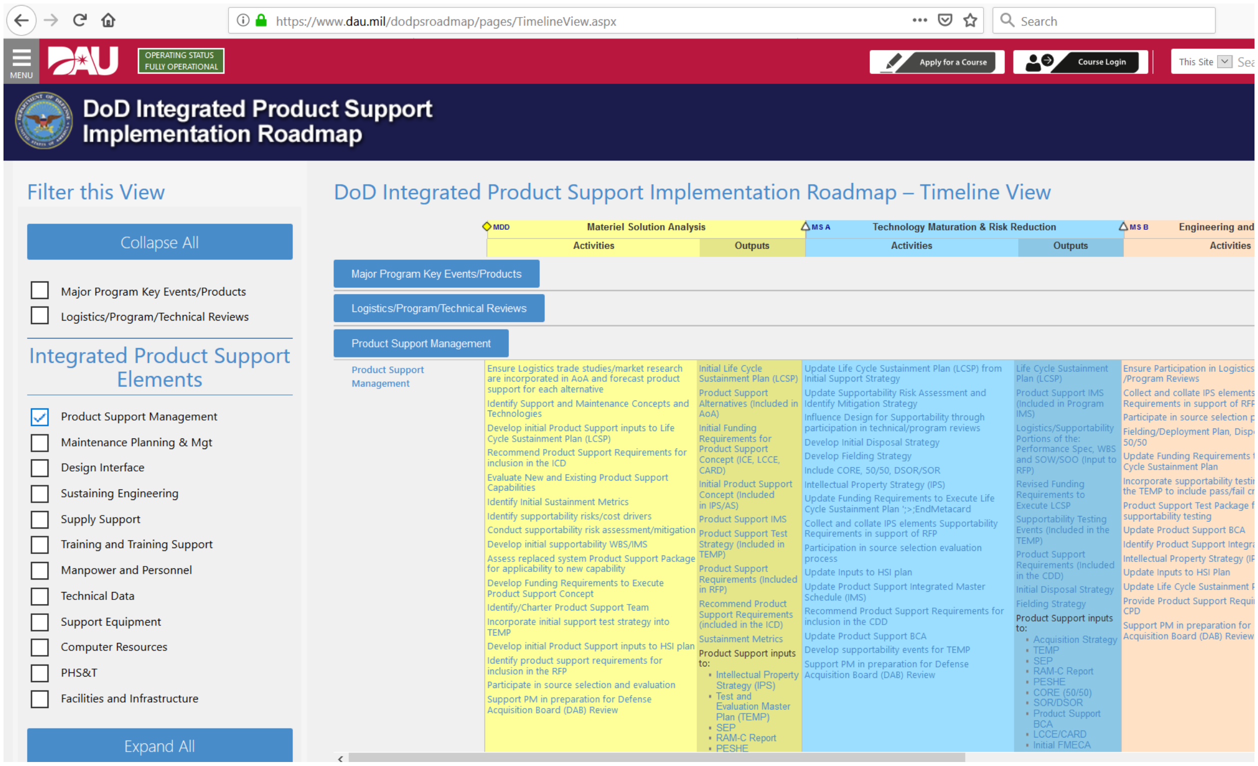


Figure 1-1, Screenshot of the DoD Integrated Product Support Implementation Roadmap Timeline View Homepage with the Product Support Management IPS Element box checked. Notice the Product Support Management activities and respective outputs are visible for each life cycle acquisition phase.

Activities and outputs are then hyperlinked to a pop-up window that displays specific data related to that respective activity as shown in the screenshot below in Figure 1-2. The specific data is in-turn hyperlinked to allow the user to subsequently search for detailed information regarding any specific activity.

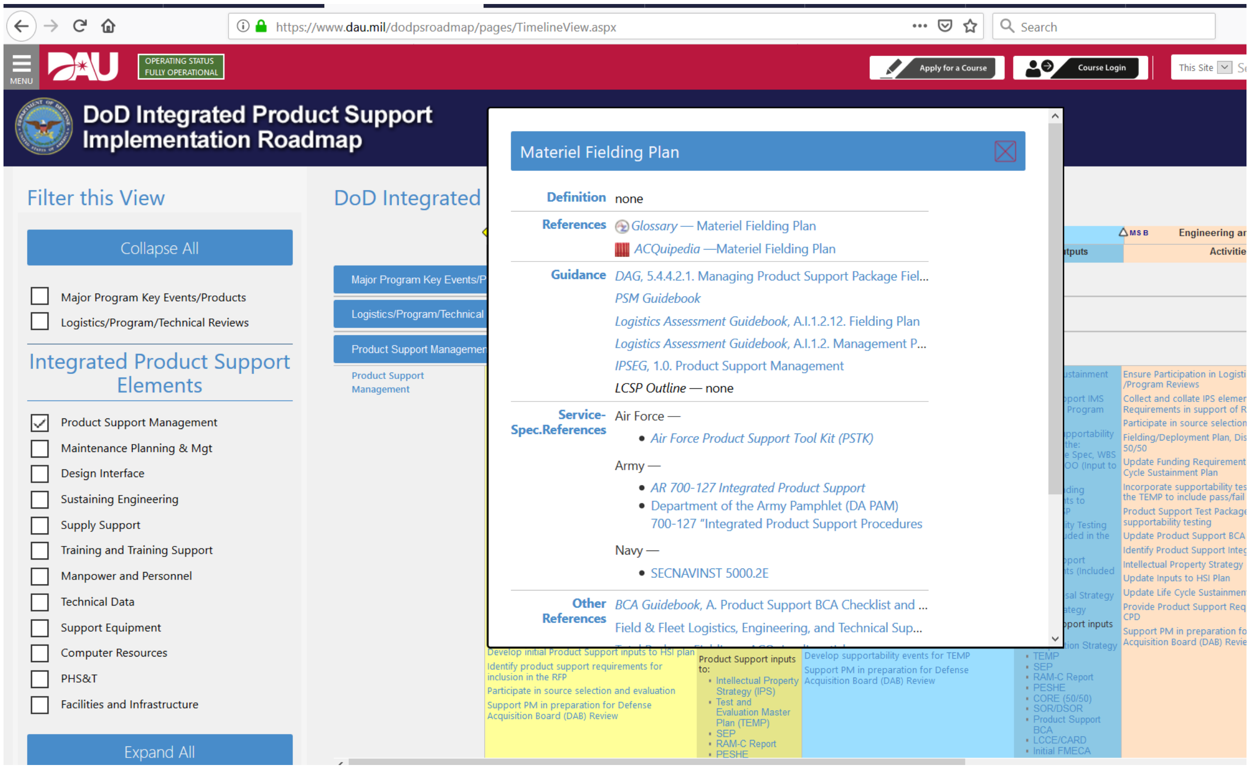


Figure 1-2, Screenshot of the DoD Integrated Product Support Implementation Roadmap Timeline View Homepage with the Product Support Management IPS Element box checked. The User then clicked on the outcome "Life Cycle Sustainment Plan (LCSP)" from the listing of activities and outcomes for Product Support Management. This data card provides further information for the User to search for further detailed information.

B. Data Item Description (DID) Deliverables

A Data Item Description (DID) is a completed document, typically identified in a Contract Data Requirements List (CDRL), that defines the data required of a contractor. The document specifically defines the data content, format, and intended use of the data. DIDs are found on the DLA Assist Database.

Helpful Search Hint: All DID's start with the letters "DI-." Once your search results are shown, click on the column header "Document ID" to sort by alphabetical order. The "DI-" items will be easier to find. You can also insert "DI-" into the Document ID field. For the Status field, be sure to use the "Active" category from the drop-down list.

The below DIDs are a representative listing and is not inclusive of all Product Support Management related DIDs.

- DI-CMAN-80639, Engineering Change Proposal (ECP)
- DI-CMAN-80789, Quality Assurance Provisions
- DI-CMAN-80858, Contractor's Configuration Management Plan
- DI-FNCL-80912, Performance and Cost Report

- DI-FNCL-81116, Man-hour Estimate, Technical Cost Proposals
- DI-FNCL-80165, Cost Breakdown Structure Summary Report
- DI-FNCL-81565, Cost Data Summary Report
- DI-ILSS-80095, Integrated Logistics Support Plan
- DI-ILSS-80525, Logistic Support Status Report
- DI-MGMT-80227, Contractor's Progress, Status and Management Report
- DI-MGMT-80920, List of Items Delivered During the Term of a Contract
- DI-MGMT-81255, Production Status Report
- DI-MGMT-81238, Contract Field Service Report
- DI-MGMT-81334, Contract Work Breakdown Structure
- DI-MGMT-81543, Government Owned Material (GOM) Status Report
- DI-MGMT-81580, Contractor's Standard Operating Procedures
- DI-MGMT-81642, Small Business Sub-Contractor Report
- DI-MGMT-81650, Integrated Master Schedule (IMS) (Replaces DI-MISC-81183)
- DI-MGMT-81808, Contractor's Risk Management Plan
- DI-MGMT-81809, Risk Management Status Report
- DI-MISC-81258, Value Engineering Program Plan
- DI-MISC-81259, Value Engineering Study Proposal
- DI-MISC-81364, Security Requirements List
- DI-MNTY-81603, Maintainability/Testability Demonstration Test Report
- DI-MNTY-81604, Maintainability/Testability Demonstration Test Plan
- DI-NDTI-80566, Test Plan
- DI-NDTI-80603, Test Procedure
- DI-NDTI-80809, Test/Inspection Report
- DI-NDTI-81284, Test and Evaluation Program Plan (TEPP)
- DI-NDTI-81585, Reliability Test Plan
- DI-QCIC-80553, Acceptance Test Plan
- DI-QCIC-80736, Quality Deficiency Report
- DI-QCIC-81379, Quality System Plan
- DI-QCIC-81722, Quality Program Plan (QPP)
- DI-QCIC-81794 Quality Assurance Program Plan
- DI-SESS-81704, Test Plans/Test Procedures

C. Proponency

Please note that DoD organizational changes may result in changes to Office designations and Proponency responsibilities that may not match the content in this Guidebook.

At the OSD level, the following offices may serve as proponents for issues related to Product Support Management:

Life Cycle Product Support
The mission of the OSD proponent for life cycle product support, the Deputy Assistant Secretary of Defense for Product Support (DASD Product Support), is to:
-Provide DoD decision makers with comprehensive, timely, relevant, and actionable assessments that direct long-term, affordable product support.
-Provide the DoD enterprise with policy, processes, guidance, and tools that drive effective product support planning and execution at best value.
-Lead the cultural transformation necessary to deliver optimal life cycle product support.

Test and Evaluation
It is DoD policy that the Deputy Assistant Secretary of Defense for Developmental Test and Evaluation (DASD(DT&E)) shall be the focal point for all policy, practice, procedures, and acquisition workforce issues relating to developmental test and evaluation (DT&E) within the DoD.

The Director, Operational Test & Evaluation (DOT&E) is the principal staff assistant and senior advisor to the Secretary of Defense on operational test and evaluation (OT&E) in the Department of Defense (DoD). DOT&E is responsible for issuing DoD OT&E policy and procedures; reviewing and analyzing the results of OT&E conducted for each major DoD acquisition program; providing independent assessments to SecDef, the Under Secretary of Defense for Acquisition and Sustainment (USD(A&S)), and Congress; making budgetary and financial recommendations to the SecDef regarding OT&E; and overseeing major DoD acquisition programs to ensure OT&E is adequate to confirm operational effectiveness and suitability of the defense system in combat use.

See DoDI 5000.89, Test and Evaluation and DoDD 5141.02, Director of Operational Test and Evaluation (DOT&E) plus other relevant issuance at the DoD Issuances website.

Pricing and Contracting
The mission of Defense Pricing and Contracting (DPC) is to enable the Components to effectively deliver goods and services that meet the needs of the warfighter, while ensuring a business deal that is in the best interests of the tax payer by overseeing and implementing business enterprise initiatives related to pricing, formulating and overseeing complex, DoD-wide pricing policies and strategies supporting the procurement of major defense system programs, major automated information systems and service acquisitions for the Department; and providing innovative policy, guidance, and oversight while being good stewards of the taxpayers' money.

Configuration Management (CM)
Per the Defense Acquisition Guidebook, Chapter 3, Systems Engineering, the Systems Engineer ensures Configuration Management planning is complete and should document details and

activities in the program's Systems Engineering Plan (SEP) and the supporting Configuration Management Plan (CMP) (as appropriate).

In addition, the DoD-adopted commercial standard EIA649C, Configuration Management Standard, implements the principles outlined in ANSI/EIA-649B for use by defense organizations and industry partners during all phases of the acquisition life cycle.

Continuous Process Improvement

The Deputy Chief Management Officer (DCMO) partners across the U.S. Department of Defense (DoD) to improve the cross-cutting management of the Department's enterprise business operations and systems on behalf of the Secretary and Deputy Secretary of Defense.

Continuous process improvement is recognized as a Materiel Readiness enabler by the Office of the Deputy Assistant Secretary of Defense for Sustainment.

D. U.S. Government Statute, Regulations, DoD Policy and Guidance

The policy and guidance listed in this guidebook are suggested as a core set of DoD-level references. Readers should check with their respective organizations for additional policy and guidance specific to their program and product support requirements.

Please note that due to the high rate of change occurring in policy and guidance, the letter designations found as part of a reference will be removed in this guide. Readers are encouraged to check the DoD reference source on a frequent basis to ensure they are using the current reference version.

Access to U.S. Government laws/statutes are found at http://uscode.house.gov/browse.xhtml.

- 10 U.S.C. 2337. Life-Cycle Management and Product Support paragraph b(1)

There are additional handbooks, manuals and other reference sources located below in the **Best Practices** section of this chapter.

E. Communities of Practice and Interest

The topic of design interface covers such a vast scope of equipment that there is no one community of practice. Typically, design interface communities focus on the supportability of a type of system, for example, ships and aircraft, or of a type of DoD mission.

The Preface of this IPS Elements Guidebook provides a listing of "golden references," many of which provide libraries, research portals and other resources for finding additional information on specific topics of design interface.

Many OSD offices (listed under the Proponency section above) maintain a comprehensive website with links to DoD partner organizations, policy, and guidance, plus many other resources. Readers are encouraged to check the relevant proponent website for additional information. Readers should check with their respective organizations for the communities of practice that focus on the area of product support management most relevant to their interests.

The DAU community hub is a website that consolidates the links to approximately 50 communities of practice related to DoD acquisition practices. Many of these communities are important to the Product Support Management IPS Element.

Best Practices Sources

- DoD Performance Based Logistics Community of Practice (PBL CoP)
- DoD Weapon Systems Acquisition Reform Product Support Assessment
- Integrated Product Support Element Guidebook
- Product Support (IPS) Implementation Roadmap
- Life Cycle Sustainment Plan (LCSP) Outline
- LOG CoP Integrated Product Support (IPS) Element site
- Logistics Assessment Guidebook
- MIL-HDBK-61A Configuration Management
- MIL-HDBK-245 Handbook for Preparation of a SOW
- Performance Based Logistics Guidebook
- Product Support Analytical Tools Database
- Product Support Business Case Analysis (BCA) Guidebook
- Product Support Manager (PSM) Guidebook
- Product Support Toolkit
- SAE GEIA-HDBK-649 Implementation Guide for Configuration Management
- SAE GEIA-STD-649B Configuration Management
- GAO Best Practices and Leading Practices in Acquisition Management

GAO work has shown that four interrelated elements promote an efficient and accountable acquisition environment and process: 1) Organizational Alignment and Leadership, 2) Policies and Processes, 3) Human Capital's Acquisition Workforce and 4) Knowledge and Information Management. This website contains Key Reports and Related GAO links to relevant reports describing best practices in acquisition management.

F. Training Resources

DAU Courseware

A complete list of DAU training resources can be found at the DAU iCatalog. Courses are classified as Training Courses (Regular [certification and assignment specific] training courses), Continuous Learning, and Targeted Training (Alternate means to meet training requirements).

The below list of DAU courses are relevant to the Product Support Management IPS Element:

- LOG 101 Acquisition Logistics Fundamentals
- LOG 102 Fundamentals of System Sustainment Management
- LOG 103 Reliability, Availability, and Maintainability (RAM)
- LOG 200 Product Support Strategy Development, Part A
- LOG 201 Product Support Strategy Development, Part B
- LOG 204 Configuration Management
- LOG 206 Intermediate Systems Sustainment Management
- LOG 211 Supportability Analysis
- LOG 215 Technical Data Management
- LOG 235 Performance-Based Logistics
- LOG 340 Life Cycle Product Support
- LOG 350 Enterprise Life Cycle Logistics Management
- LOG 465 Executive Product Support Manager's Course
- CLE 068 Intellectual Property and Data Rights
- CLE 074 Cybersecurity Throughout DoD Acquisition
- CLL 001 Life Cycle Management and Sustainment Metrics
- CLL 002 DLA Support to the PM
- CLL 005 Developing a Life Cycle Sustainment Plan (LCSP)
- CLL 006 Public-Private Partnerships
- CLL 008 Designing for Supportability in DoD Systems
- CLL 011 Performance Based Logistics
- CLL 012 Supportability Analysis
- CLL 015 Business Case Analysis (BCA)
- CLL 020 Independent Logistics Assessment
- CLL 031 PBL Contracting Strategies
- CLL 032 Preventing Counterfeit Parts from Entering the DoD System
- CLL 033 Logistician's Responsibilities During Major Technical Reviews
- CLL 037 DoD Supply Chain Fundamentals
- CLL 038 Provisioning and Cataloging
- CLL 043 Green Logistics Planning for Sustainment
- CLL 045 Designing for Transportability
- CLL 047 The Twelve Integrated Product Support Elements
- CLL 051 System Retirement, Materiel Disposition, Reclamation, Demilitarization and Disposal
- CLL 057 Level of Repair Analysis (LORA) Fundamentals
- CLL 058 Level of Repair Analysis (LORA) Implementation
- CLL 062 DoD Counterfeit Prevention Awareness
- CLL 120 Shelf Life

- CLM 013 Work Breakdown Structure (WBS)
- CLM 014 IPT Management and Leadership
- CLM 016 Cost Estimating
- CLM 017 Risk Management
- CLM 024 Contracting Overview
- CLM 031 Improved Statement of Work (SOW)
- CLM 071 Introduction to Data Management
- CLM 072 Data Management Strategy Development
- CLM 073 Data Management Planning System
- CLM 074 Technical Data and Computer Software Rights
- CLM 075 Data Acquisition
- CLM 076 Data Markings
- CLM 077 Data Management Protection and Storage
- CLM 200 Item Unique Identification
- CLM 201 Serialized Item Management
- CLV 016 Introduction to the Earned Value Management System (EVMS)

DAU ACQuipedia Articles
ACQuipedia serves as an online encyclopedia of common defense acquisition topics. Each topic is identified as an article. Each article contains a definition, a brief narrative that provides context, and includes links to the most pertinent policy, guidance, tools, practices, and training which further augment understanding and expand depth.

ACQuipedia was developed as a collaborative project to create content around Defense Acquisition-related topics. Articles (topics) will be maintained as a collaborative effort of subject matter experts across the Defense Acquisition University (DAU). Future growth may expand the collaboration of subject matter experts beyond DAU.

ACQuipedia provides the acquisition workforce with quick access to information in a succinct and digestible format. Article content aggregates the most relevant references and learning assets to narrowly focus users and quickly provide high value information.
The DAU ACQuipedia homepage provides a listing of linked ACQuipedia articles relevant to Product Support Management. The reader is encouraged to visit the homepage to see additional articles.

- Acquisition Strategy (AS)
- Administrative Delay Time
- Affordability Analysis
- Berry Amendment
- Best Value Product Support Arrangements
- Configuration Management (CM)

- Services Acquisition
- Small Business
- Source Selection
- Specifications and Standards
- Statement of Work - Performance Work Statement - Statement of Objectives
- Subcontracting
- Supportability Testing (Logistics Test & Evaluation)
- Sustainability
- Sustainment Key Performance Parameter (KPP)
- Sustainment Maturity Levels (SML)
- System Performance Specification
- Systems Engineering Plan (SEP)
- Technical Baselines
- Technical Performance Measurement (TPM)
- Test & Evaluation Master Plan (TEMP)
- Total Package Fielding
- Types of Funds
- USAF Product Support Tool Kit (PTSK)
- Work Breakdown Structure (WBS)
- Work Package (WP)

Design Interface

Objective

Participate in the systems engineering process to impact the design from its inception throughout the lifecycle, facilitating supportability to maximize the availability, effectiveness, and capability of the system at the lowest TOC.

Description

Design interface is the integration of the quantitative design characteristics of systems engineering (reliability, maintainability, etc.) with the functional Integrated Product Support Elements (i.e., Integrated Product Support Elements). Design interface reflects the driving relationship of system design parameters to product support resource requirements. These design parameters are expressed in operational terms rather than as inherent values and specifically relate to system requirements. Thus, product support requirements are derived to ensure the system meets its availability goals and design costs and support costs of the system are effectively balanced. The basic items that need to be considered as part of design interface include:

- Reliability
- Availability
- Maintainability
- Supportability
- Suitability
- Integrated Product Support (IPS) Elements
- Affordability
- Configuration Management
- Safety requirements
- Environmental and HAZMAT requirements
- Human Systems Integration
- Calibration
- Anti-Tamper
- Habitability
- Disposal
- Legal requirements

Overview

Design interface is intended to be a set of activities to control and manage design choices that impact supportability. The special test equipment example presented in section 2.1.1 could be controlled by limiting the introduction of new test equipment or limiting the design of the test equipment to fit within the existing support infrastructure training, facilities, supply support, etc., for test equipment. The inclusion of product support objectives into the management of design will greatly increase the probability that product support objectives are met in suitable and effective ways.

Why Design Interface is Important

The activities of design interface begin during requirements definition of the system and continue throughout the system's life cycle. In each stage of the acquisition process, Life Cycle Logisticians will work as part of the PSM IPT with design and systems engineering, cost analysis, test and evaluation, quality control and many other program areas to ensure every aspect of the system is focused on meeting the required product support objectives.

To use an example in the area of corrosion, corrosion-related costs as a percentage of total maintenance costs for DoD is determined to be 23 percent. This includes both infrastructure and facilities (15.1 percent) and weapon systems and equipment costs (24.0 percent). That means the corrosion cost for infrastructure and facilities is $1.768 billion, and the corrosion cost for weapon systems and equipment is $20.732 billion. Of the total cost of corrosion for DoD of $22.5 billion, $20.925 billion is derived from the maintenance records from the services' various databases, and $1.575 billion is outside normal reporting. Source: DoD Corrosion Policy and Oversight Office

Design interface is therefore a "leading activity" that impacts all the product support elements because a well performed design interface is one that minimizes the logistics footprint, maximizes reliability, ensures that maintainability is user friendly and effective, and addresses the long-term issues related to obsolescence management, technology refreshment, modifications and upgrades, and overall usage under all operating conditions.

The success of design interface is completely dependent upon the entire program leadership recognizing that supportability goals must be achieved. A forward-looking culture needs to be encouraged throughout the program that the end products must be as easy to use and maintain as possible.

Product Support Manager Activities

2.1. Standardization and Interoperability

Standardization

The Defense Acquisition Guidebook (DAG) Chapter 3, section CH 3–4.3.21 Standardization, supports the achievement of commonality and interoperability of parts and processes with United States forces and our allies, promotes safety, provides for life-cycle sustainment, and allows for rapid, cost-effective technology insertion through use of standard interfaces and open systems. Standardization is an enabling tool to provide the warfighter with systems and equipment that are interoperable, reliable, sustainable, and affordable. Standardization plays a key role in defining systems engineering (SE) best practices and processes.

The Program Manager (PM) balances the decision to use standardized agreements, practices, products, parts, processes, interfaces and methods with required capabilities, operational environment, technology feasibility and growth and cost-effectiveness.

DoDM 4120.24, Enclosure 4, Defense Standardization Program (DSP) Procedures, provides policies on standardization considerations, how to document standardization decisions, and a discussion of the tailoring of standardization documents. It also provides references to key resources for the standardization process.

Interoperability
Interoperability is the requirement that the program's system interact with other systems through transport of information, energy, or matter.

For example, an air-launched missile is required to be interoperable with its delivery platform(s). Information is exchanged. A mechanical interface secures the missile until launch and so on. Usually, interoperability involves external interfaces (see DAG CH 3–4.1.8. Interface Management Process) and is essential for the creation of a systems of systems. Every system is required to be certified interoperable before it is fielded. The Joint Interoperability Test Command (JITC) is responsible for this certification. The DAG provides additional references.

2.2. Engineering Data Analysis
Engineering data is generally considered as technical data which provides definitive identification of dimensional, material, mechanical, electrical, functional and/or other characteristics that depict the physical characteristics, location, and function of the item. It includes specifications, standards, drawings, photographs, descriptions, assembly and general arrangement drawings, schematic diagrams, wiring, cabling diagrams, and similar data needed to indicate the location and functions of the item. DAU iCatalog, LOG 215, Technical Data Management.

Engineering analysis, in general, involves the application of scientific analytic principles and processes to reveal the properties and state of a system, device or mechanism under study.

Examples of engineering analysis:
- R&M Allocations – R&M allocations assist with the analysis of reliability and maintainability goals for systems with decomposition of those goals down to individual subsystems.
- R&M Block Diagrams – The R&M block diagrams and math models are graphical representations prepared to reflect equipment configurations and the inter-relationships of reliability and maintainability parameters.
- R&M Predictions – The R&M predictions provide an evaluation of a proposed design or for comparison of alternative designs through predictions of the rate at which an item is

expected to fail. A reliability prediction is usually based on an established model for electronic and mechanical components.

- Failure Definition and Scoring Criteria (FDSC) – Failure definitions and scoring criteria are used as guidelines for classifying incidents during system or subsystem testing.
- Failure Modes, Effects & Criticality Analysis (FMECA) – Analysis is performed to assess the severity of the effects of component/subsystem failures on system performance.
- Maintainability and Built-In Test (BIT) – Assessment of the quantitative and qualitative maintainability and built-In test characteristics of the design.
- Reliability Growth Testing at the System and Subsystem Level – Reliability testing of development systems to identify failure modes, which if uncorrected could cause the equipment to exhibit unacceptable levels of reliability performance during operational usage.
- Failure Reporting, Analysis, and Corrective Action System (FRACAS) – Engineering activity during development, production, and sustainment to provide management visibility and control for R&M improvement of hardware and associated software by timely and disciplined utilization of failure data to generate and implement effective corrective actions to prevent failure recurrence.

Design for Suitability

Suitability refers to whether the required intelligence data, information, infrastructure, or resources are, or are expected to be, appropriate to support the capability. Manual for the Operation of the Joint Capabilities Integration and Development System (JCIDS), 31 August 2018.

Suitability is the measure of an item's ability to be supported in its intended operational environment. Measures of suitability typically relate to readiness or operational availability, and hence reliability, maintainability, and the item’s support structure. Suitability measures will be reflected in Warfighter requirements, key performance parameters, key sustainment attributes, or other subordinate metrics. In designing for suitability, the PSM or Life Cycle Logistician (LCL) works as part of the systems engineering team early in the acquisition cycle to model and forecast the impact which the design of the system will have on these suitability measures.

Reliability

Reliability is a measure of the probability that the system will perform without failure over a specific interval, under specified conditions. Reliability shall be sufficient to support the warfighting capability requirements, within expected operating environments. Considerations of reliability must support both availability metrics and be reflected in the O&S Cost attribute. Operation of the Joint Capabilities Integration and Development System (JCIDS), 31 August 2018.

Mission Reliability
Mission reliability is the measure of the ability of an item to perform its required function for the duration of a specified mission profile, defined as the probability that the system will not fail to complete the mission, considering all possible redundant modes of operation.

Logistics Reliability
Logistics reliability is the measure of the ability of an item to operate without placing a demand on the logistics support structure for repair or adjustment, including all failures to the system and maintenance demand as a result of system operations. Logistics Reliability is a fundamental component of an O&S cost as well as Materiel Availability.

Reliability Block Diagrams
Reliability block diagrams are prepared to show interdependencies among all elements. (subsystems, equipment, etc.) or functional groups of the item for item success in each service use event. The purpose of the reliability block diagram is to show by concise visual shorthand. the various series-parallel block combinations (paths) that result in item success. A complete understanding of the item's mission definition, and service use profile is required to produce the reliability diagram. MIL-HDBK-338, Electronic Reliability Design Handbook.

Impact of FMECA on Design
A procedure for analyzing each potential failure mode in a product to determine the results or effects thereof on the product. When the analysis is extended to classify each potential failure mode according to its severity and probability of occurrence, it is called a Failure Mode, Effects, and Criticality Analysis (FMECA). MIL-HDBK-338, Electronic Reliability Design Handbook.

The Failure Modes & Effects Analysis (FMEA) and Failure Modes, Effects & Criticality Analysis (FMECA) is a reliability evaluation/design technique which examines potential failure modes within a system and its equipment, in order to determine the effects on equipment and system performance. Each mode is classified according to impact on mission success and safety to personnel and equipment. It should be noted that the FMECA is composed of three separate analyses, the Failure Mode and Effects Analysis (FMEA), the Criticality Analysis (CA) and Risk Priority Analysis (RPA), and Critical Item Analysis (CIA) and Failure Compensation Analysis (FCA).

Fault Tree Analysis
A Fault Tree Analysis (FTA) analyzes high-level failures and identifies all lower-level (sub-system) failures that cause it. Generally, the undesired event constitutes the highest level (top) event in a fault tree diagram and represents a complete or catastrophic failure of the system.

Availability
Availability is a general term that refers to whether the intelligence data, information, infrastructure, or resources are, or are expected to be, available throughout the capability solution's projected lifecycle. Additional information is found in the Manual for the Operation of the Joint Capabilities Integration and Development System (JCIDS), 31 August 2018.

Materiel Availability KPP
Materiel Availability is the measure of the percentage of the total inventory of a system operationally capable, based on materiel condition, of performing an assigned mission. This can be expressed mathematically as the number of operationally available end items/total population. The total system population includes all operational systems necessary to support the Operational Context of the CDD including operational systems for training (vice mock-ups, partial systems, and simulators), systems for attrition reserve and prepositioning, and systems temporarily in a non-operational materiel condition, such as planned depot maintenance. Materiel Availability requirement links directly with investment decisions, as the total quantity purchased is informed by the sustainment strategy and how many systems will be in available status to support CONOPS and OPLANS.

Materiel Availability also covers the timeframe from placement into operational service through the planned end of service life. Materiel Availability takes into account all calendar time that a system is in the inventory, including “out-of-reporting” status. For single or small-quantity systems, Materiel Availability can represent available time (i.e., up time, when the system is in operational status) as a percentage of total calendar time. Additional information is found in the Manual for the Operation of the Joint Capabilities Integration and Development System (JCIDS), 31 August 2018.

Operational Availability KPP
Operational Availability is the measure of the percentage of time that a system or group of systems within a unit are operationally capable of performing an assigned mission and can be expressed as (uptime/ (uptime + downtime)). Operational Availability is usually specified for a given scenario or type of unit, e.g., combat group wartime scenario, peacetime training unit, etc. It is normally based on a steady-state situation, usually expressed in terms of annual usage. Determining the optimum value for Operational Availability requires a comprehensive analysis of the system and its planned CONOPS and/or OMS/MP, including the planned operating environment, operating tempo, reliability and maintenance concepts, and supply chain solutions. Additional information is found in the Manual for the Operation of the Joint Capabilities Integration and Development System (JCIDS), 31 August 2018.

Maintainability
In reliability, one is concerned with designing an item to last as long as possible without failure; in maintainability, the emphasis is on designing an item so that a failure can be repaired as quickly as possible. The combination of high reliability and high maintainability results in high system availability. Maintainability, then, is a measure of the ease and rapidity with which a system or equipment can be restored to operational status following a failure. It is a function of the equipment design and installation, personnel availability in the required skill levels, adequacy of maintenance procedures and test equipment, and the physical environment under which maintenance is performed. MIL-HDBK-338, Electronic Reliability Design Handbook.

Maintainability KSA
The measure of the ability of the system to be brought back to a readiness status and state of normal function. Additional information is found in the Manual for the Operation of the Joint Capabilities Integration and Development System (JCIDS), 31 August 2018.

Transportability
Transportability is the inherent capability of an item or system to be moved effectively and efficiently by required transportation assets and modes. DoDI 4540.07, Operation of the DoD Engineering for Transportability and Deployability Program.

MIL-STD-1366, Interface Standard for Transportability Criteria, provides for the inclusion of transportability and deployability requirements in the design of end items of equipment obtained through the materiel acquisition process for the military services.

Trade Studies for Design Interface
During TMRR, the threshold and objective values should drive exploration of technologies and risk reduction activities. It is likely the performance attribute threshold and objective values may change during this phase.

During EMD, tradeoffs are made between the threshold and objective values to optimize performance given the available technology for the increment and the competing demands introduced by combining subsystems into the overall system. A deeper analysis of cost-capability trade-offs at and around threshold and objective values may be beneficial to decision makers, by exploring incremental return on investment where certain performance attributes might be insensitive to small deviation at great advantage in lifecycle cost, performance, schedule, and quantity reviews.

After the Critical Design Review (CDR), these tradeoff decisions are essentially completed, and a more precise determination of acceptable performance can be stated in an update to the CDD if required. Manual for the Operation of the Joint Capabilities Integration and Development System (JCIDS), 31 August 2018.

Additional information on trade studies is found in the Sustaining Engineering IPS Element chapter in this Guidebook.

2.3. Net-Centric Capability Management
The DoD Net-Centric Services Strategy (NCSS) goals include making data assets visible, accessible, and understandable. This strategy establishes services as the preferred means by which data producers and capability providers can make their data assets and capabilities available across the DoD and beyond. It also establishes services as the preferred means by which consumers can access and use these data assets and capabilities.

Net-Ready Key Performance Parameter (KPP)

Net-ready (NR) attributes determine specific criteria for interoperability, and operationally effective end-to-end information exchanges which are traceable to their associated operational context, and are measurable, testable, and support efficient and effective T&E.

1. The NR KPP identifies operational, net-centric requirements in terms of threshold and objective values for Measures of Effectiveness (MOE), which includes Measures of Performance (MOP) and Measures of Suitability (MOS). The NR KPP covers all communication, computing, and EM spectrum requirements involving information elements among producer, sender, receiver, and consumer. Information elements include the information, product, and service exchanges. These exchanges enable successful completion of the warfighter mission or joint business processes.
2. The NR KPP includes three attributes derived through a three-step process of mission analysis, information analysis, and systems engineering. These attributes are then documented in solution architectures developed according to the current DoDAF standard in reference DoD CIO, August 2010, "DoD Architecture Framework (DoDAF), Version 2.02."
3. Attribute 1: Supports military operations.
4. Attribute 2: Is entered and managed on the network.
5. Attribute 3: Effectively exchanges information. Source: JCIDS Manual, Page D-E-1, Content Guide for the Net-Ready KPP.

2.4. RAM Design

Reliability, Availability, and Maintainability (RAM) are three terms important to system design as described in the Defense Acquisition Guidebook (DAG) Chapter 4, Life Cycle Sustainment.

Reliability measures the probability that a system will perform without failure over a specified interval under specified conditions.

Availability defines the number of end items available for operational use as a share of the total number of end items in the inventory. Availability is central to determining the number of end items needed to fulfill the required number of operational units at any given time.

Maintainability metrics, including Mean Downtime and Mean Time to Repair, provide the foundation of the Availability KPP outcome. Maintainability metrics allow the requirements developer to understand how long it takes to restore available status. Including maintainability in a requirements document helps improve logistics readiness.

Reliability and Maintainability Engineering

The purpose of Reliability and Maintainability (R&M) Engineering is to influence system design in order to increase mission capability and availability and decrease logistics burden and cost over a system's life cycle. R&M engineering supports designing a system that will operate reliably and can be maintained in the sustainment phase of acquisition. Properly planned, R&M

engineering reduces cost and schedule risks by preventing or identifying R&M deficiencies early in development. This early action results in increased acquisition efficiency and higher success rates during operational testing and the development process.

R&M parameters (e.g., mission and logistics reliability, corrective maintenance, built-in test) are important characteristics used in measuring the operational suitability and effectiveness of Department of Defense (DoD) weapon systems. R&M parameters also relate to other system parameters, primarily those that characterize the system performance, readiness, logistics supportability, and total ownership cost. The R&M parameters and particular levels of performance support other system parameters essential to the success of the mission.

RAM-C Rationale Report

The Reliability, Availability, Maintainability and Cost (RAM-C) Rationale Report documents the quantitative basis for the three elements of the Sustainment Key Performance Parameter (KPP) as well as the tradeoffs made with respect to system performance. The RAM-C Report is applicable to Major Defense Acquisition Programs.

A preliminary RAM-C Report is required in support of the Milestone (MS) A decision. It is attached to the Systems Engineering Plan (SEP) at Milestone (MS) A, and updated in support of the Development Request for Proposal (RFP) Release Decision Point, MS B, and MS C.
The DoD provides guidance and a training brief for development of the RAM-C Rationale Report.

2.5. Producibility

The Defense Acquisition Guidebook (DAG) Chapter 3, section CH3-4.3.18, Producibility, Quality and Manufacturing Readiness, states that producibility is a design accomplishment for the relative ease of manufacturing. Like manufacturing and other key system design functions, producibility is integral to delivering capability to the warfighter effectively and efficiently. Producible designs are lower risk, more cost-effective and repeatable, which enhances product reliability and supportability. Producibility should be assessed at both a product and enterprise (i.e., organizational, prime contractor facility) level. The Program Manager (PM) should implement producibility engineering and planning efforts early and should continuously assess the integrated processes and resources needed to successfully achieve producibility.

2.6. Supportability/Sustainability

Supportability and sustainability do not have the same definitions. The DAU ACQuipedia contains excellent articles and references on Supportability Design Objectives and Sustainability.

Supportability

MIL-HDBK-502, Product Support Analysis, Activity 8, Supportability and Supportability Related Design Factors (paragraph 5.3.6) is conducted “to establish quantitative operations and support characteristics of alternative design and operational concepts; and support related design objectives, goals and thresholds, and constraints for inclusion in requirement, decision, and program documents and specifications."

Sustainability
'Sustainability' and 'sustainable' mean to create and maintain conditions, under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic, and other requirements of present and future generations of Americans. (Executive Order 13423 and Executive Order 13514).

2.7. Deployability Management

Deployability management, also referred to as the fielding process, addresses both system (hardware) deployment and personnel deployment. During a system's acquisition cycle, it is the point at which a program or increment of capability is reviewed for entrance into the Production and Deployment (P&D) Phase or for Limited Deployment. Users are encouraged to review DoD Directive 5000.01, The Defense Acquisition System, DoDI 5000.02, Operation of the Adaptive Acquisition Framework, other policy located on the DoD AAF website, and the Defense Acquisition Guidebook for more information on system deployment.

The Materiel Fielding Plan (MFP) serves as the program's single standalone document containing the detailed plans, actions and responsibilities of the fielding, gaining and supporting commands to successfully field and deploy a materiel system with an objective of a fully manned, trained, and supported system. The MFP will also address any system or materiel being replaced and outlines how it will be transferred or retrograded. Much of the data in the MFP originates in other source documents and program documents. In addition, the MFP relies on information in the Life Cycle Sustainment Plan (LCSP)/Product Support Strategy, the Capability Development Document (CDD), and the Basis of Issue Plan (BOIP).

MIL-STD-1366E, Interface Standard for Transportability Criteria, provides for the inclusion of transportability and deployability requirements in the design of end items of equipment obtained through the materiel acquisition process for the military services.

DoDD 4510.11, DoD Transportation Engineering, and DoDI 4540.07, Operation of the DoD Engineering for Transportability and Deployability Program, implement a coordinated engineering transportability and deployability program between the DoD Components.

For more information on personnel deployment, visit the website for the Office of the Under Secretary for Personnel and Readiness. Related articles in the DAU ACQuipedia include Total Package Fielding and System Fielding and Site Activation and Provisioning. Readers are encouraged to contact their respective organizations for more information on system deployment and personnel deployment topics.

2.8. Human Systems Integration (HSI)

The Defense Acquisition Guidebook (DAG) CH 5-3.3, Human Systems Integration References, provides Table 1, Human Systems Integration Related Policy and Direction.

Systems engineering (SE) addresses the three major elements of each system: hardware, software and human. SE integrates human capability considerations with the other specialty engineering disciplines to achieve total system performance requirements by factoring into the system design the capabilities and limitations of the human operators, maintainers, and users. Throughout the acquisition life cycle, the Systems Engineer should apply Human Systems Integration (HSI) design criteria, principles and practices described in MIL-STD-1472 (Human Engineering) and MIL-STD-46855 (Human Engineering Requirements for Military Systems, Equipment and Facilities).

Human Systems Integration Strategy, Risk and Risk Mitigation

The Defense Acquisition Guidebook (DAG) CH 5–4.1 Human Systems Integration Strategy, Risk and Risk Mitigation states that Acquisition Systems designs have historically been overly complex; difficult to train, learn to use and operate, and maintain. Designs should enable mission/program success by being easier to train, operate, and maintain. Systems should also be safe and efficient, cost-effective, and less likely to require redesign. Inputs from the HSI domains (manpower, personnel, training, environment, safety and occupational health, human factors engineering, personnel survivability, and habitability) should be used to determine and address performance impacts to all aspects of the system (hardware, software, and human).

Manpower as an HSI Component

The number of military, civilian, and contractor personnel required and available to operate, maintain, sustain, and provide training for systems.

The Defense Acquisition Guidebook (DAG) CH 5-2.1 Manpower Planning and Human Systems Integration states that manpower is typically the highest cost driver in the development and sustainment of acquisition programs and can account for 67-70 percent of the program budget. When Manpower Planning is engaged along with HSI, PMs have the tools to effectively manage systems and to ensure that the human element of the system is included in the pros, cons, and risks of using a program.

Manpower is discussed in the Manpower and Personnel IPS Element Chapter of this Guidebook.

2.8.1. Human Factors Engineering

The integration of human characteristics into system definition, design, development, and evaluation to optimize human machine performance under operational conditions.

Human Factors Engineering as an HSI Component

The Defense Acquisition Guidebook (DAG) Chapter 5 states that Human Factors Engineering (HFE) plays an important role in each phase of the acquisition cycle, to include requirements of development, system definition, design, development, evaluation and system support for reliability and maintainability in the field. To realize the potential of HFE contributions, HFE must be incorporated into the design process at the earliest stages of the acquisition process.

2.8.2. Personnel

The cognitive and physical capabilities required to train, operate, maintain, and sustain materiel and information systems.

Personnel Considerations in Human Systems Integration

The Defense Acquisition Guidebook (DAG) Chapter 5 states that personnel factors are those human aptitudes (i.e., cognitive, physical, and sensory capabilities), knowledge, skills, abilities, and experience levels that are needed to properly perform job tasks. Personnel factors are used to develop the military occupational specialties (or equivalent DoD Component personnel system classifications) and civilian job series of system operators, maintainers, trainers, and support personnel. Personnel officials contribute to the Defense acquisition process by ensuring that the PM pursues engineering designs that minimize personnel requirements and keep the human aptitudes necessary for operation and maintenance of the equipment at levels consistent with what will be available in the user population at the time the system is fielded.

Personnel is further discussion in the Manpower and Personnel IPS Element Chapter of this Guidebook.

2.8.3. Habitability

The consideration of the characteristics of systems focused on satisfying personnel needs that are dependent upon physical environment, such as berthing and hygiene.

Habitability as an HSI Component

The Defense Acquisition Guidebook (DAG) Chapter 5 states that habitability factors are those living and working conditions necessary to sustain the morale, safety, health, and comfort of the user population. They directly contribute to personnel effectiveness and mission accomplishment, and often preclude recruitment and retention problems. Examples include lighting, space, ventilation, and sanitation; noise and temperature control (i.e., heating and air conditioning); religious, medical, and food services availability; and berthing, bathing, and personal hygiene.

2.8.4. Training

Training gives users, operators, maintainers, leaders, and support personnel the opportunity to acquire, gain, or enhance knowledge and skills while concurrently developing their cognitive, physical, sensory, team dynamics, and adaptive abilities to conduct joint operations and achieve maximized and fiscally sustainable system life cycles. The training of people as a component of material solutions delivers the intended capability to improve or fill capability gaps.

Training as an HSI Component

The Defense Acquisition Guidebook (DAG) Chapter 5, section CH 5–4.2.3 Training**,** states that the Human Systems Integration (HSI) Training Domain assists PMs throughout the acquired system’s life cycle by focusing attention on the human interface with the acquired system, and by integrating and inserting manpower, personnel, training, human factors engineering, environment, safety, occupational health, habitability and survivability as Systems Engineered elements into the Defense Acquisition process.

The Systems Engineered practice of continuous application of human-centered methods and tools ensures maximum operational and training effectiveness of the newly acquired system throughout its life cycle. Systems Engineering in DoD Acquisition provides perspectives on the use of systems engineered/developed training approaches to translate user-defined capabilities into engineering specifications and outlines the role of the PM in integrated system design activities.

Training is further discussion in the Training and Training Systems IPS Element Chapter of this Guidebook.

2.8.5. Safety and Occupational Health Plan Development and Management
The DoDI 6055.01, DoD Safety and Occupational Health (SOH) Program, states that the DoD goal is the elimination of on- and off-duty mishaps and related deaths, injuries, occupational illnesses, and lost mission capability and resources.

DENIX
The DoD Environment, Safety & Occupational Health Network and Information Exchange (DENIX) is a collaborative cloud platform used to share and report Department of Defense (DoD) specific environment, safety & occupational health (ESOH) information with the public and DoD communities. Supporting the general public; federal, state, tribal and local governments; international organizations; and the DoD, DENIX is the primary resource for DoD ESOH-related news, activities, initiatives, reports, training, and policies. More than 50 organizations call DENIX home, giving Subject Matter Experts a universal platform to communicate authoritative information and resources to the DoD ESOH community and stakeholders.

2.9. Environmental Management
The DoD Office of the Assistance Secretary of Defense for Environment is committed to implementing environmental practices to facilitate and improve the capabilities of our forces while safeguarding the long-term sustainability of our Nation's priceless resources. By acting as a responsible environmental steward, the Department can more effectively manage and sustain training, testing, and operational lands to achieve mission readiness. The DoD benefits immensely from the thoughtful leadership, innovation, and hard work of our personnel in protecting human health and preserving our Nation's natural and cultural resources while executing our national defense mission.

See also DENIX in para. 2.8.5 above.

SERDP and ESTCP
SERDP and ESTCP harness the latest science and technology to develop and demonstrate innovative, cost-effective, and sustainable solutions to meet DoD's environmental challenges.

The Strategic Environmental Research and Development Program (SERDP) is DoD's environmental science and technology program, planned and executed in partnership with DOE and EPA, with participation by numerous other federal and non-federal organizations. SERDP invests across a broad spectrum of basic and applied research, as well as advanced development.

Environmental Security Technology Certification Program (ESTCP) is DoD's environmental technology demonstration and validation program. The Program was established in 1995 to promote the transfer of innovative technologies that have successfully established proof of concept to field or production use. ESTCP demonstrations collect cost and performance data to overcome the barriers to employ an innovative technology because of concerns regarding technical or programmatic risk, the so-called "Valley of Death."

2.10. Warfighter/Machine/Software/Interface/Usability Management

The DoD ACQuipedia article on Interface Management provides additional links to DoD guidance and references.

Interfaces include external interfaces between systems (Systems of Systems) or products, and internal interfaces between both Configuration Items (CI) that comprise a system or product and internal interfaces of components within the CI. Interfacing items may require parallel design/development or may be existing items. Physical items may be electrical, electronic, mechanical, hydraulic, pneumatic, or mechanical.

Performance requirements may be requirements for operating range, frequency, transmission rate, or capacity. Software/data interfaces may be interoperability, language, development/test standards and facilities.

A product's interfaces, including systems, equipment, software, and data are identified and documented in product configuration information so that their integrity may be maintained through a disciplined configuration management change process that addresses the construct of "Form, Fit, Function, Interface (F3I)." A product's interface attributes are the functional and physical characteristics that exist at the common boundary with co-functioning or physically attaching products.

Analyzing interfaces categorizes their context and environment so that the appropriate definition and management of each interface can be determined. Interface analysis involves identification of the interface type and relationship, as expressed in the following:

- Is the interface at the system, Configuration Item (CI), assembly or part level?
- Is there a contractual relationship such as a contract or purchase order between the parties to the interface?
- Is the same customer responsible for both interfacing items or are different customers involved?

2.11. Survivability and Vulnerability Management

The Defense Acquisition Guidebook (DAG) CH 3–4.3.23 Survivability and Susceptibility, states that survivability is the capability of a system and its crew to avoid or withstand a hostile environment without suffering an abortive impairment of its ability to accomplish its designated mission. Susceptibility is the degree to which a device, piece of equipment or weapon system is open to effective attack as a result of one or more inherent weaknesses. Manmade and natural environmental conditions described in MIL-STD-810 (Environmental Engineering Considerations and Laboratory Tests) (e.g., sand, vibration, shock, immersion, fog, etc.), electromagnetic environment described in MIL-STD-461 (Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment) and MIL-STD-464 (Electromagnetic Environmental Effects Requirements for Systems), and cyber environment should also be considered in system design.

2.12. Affordability

Users are encouraged to review DoD Directive 5000.01, The Defense Acquisition System, DoDI 5000.02, Operation of the Adaptive Acquisition Framework, DoDI 5000.84 Analysis of Alternatives, plus other policy located on the DoD AAF website and DoD Issuances website for policy addressing the fundamental concepts and approaches for developing and applying affordability constraints to acquisition programs as part of life-cycle investment analysis, decision making, and management.

Affordability analysis is a DoD Component leadership responsibility that should involve the programming, resource planning, requirements, intelligence, and acquisition communities. The purpose of this analysis is to avoid starting or continuing programs which future budgets cannot support, in terms of either procurement or sustainment. Components will derive procurement and sustainment constraints early in the program planning process to prioritize capability requirements and conduct cost tradeoffs throughout the program's life cycle.

2.13. Modularity and Open Systems Architecture (MOSA)

The Department of Defense's (DoD) Modular Open Systems Approach (MOSA) is to design systems with highly cohesive, loosely coupled, and severable modules that can be competed separately and acquired from independent vendors. This approach allows the Department to acquire warfighting capabilities, including systems, subsystems, software components, and services, with more flexibility and competition. MOSA implies the use of modular open systems architecture, a structure in which system interfaces share common, widely accepted standards, with which conformance can be verified.

2.14. Corrosion Control and Prevention

The DoD Corrosion Prevention and Control Planning Guidebook for Military Systems and Equipment was created to assist DoD and contractor program offices, Program Managers, and Integrated Product Teams (IPT) in effectively managing corrosion during the entire acquisition process, including sustainment. The many tools and best practices in the guidebook can assist in reducing ownership costs and increasing system availability through improved CPC planning, and execution. The content of this guidebook was developed from broad and in-depth military and industry experience regarding the protection of systems/equipment from corrosion and its effects.

The DoD ACQuipedia article on Corrosion Control and Prevention provides additional links to DoD guidance and references.

The DoD acquires, operates, and maintains a vast array of physical assets, ranging from aircraft, ships, ground combat vehicles, and material, as well as wharves, buildings, and other infrastructure. These assets are subject to degradation due to corrosion, with specific effects in the following areas:

- Safety—A number of systems/equipment and Facilities and Infrastructure (F&I) mishaps have been attributed to the effects of corrosion. For example, corrosion-related structural cracking has resulted in catastrophic failure and corroded electrical contacts have contributed to mishaps.
- Availability—Systems and equipment are routinely unavailable due to corrosion deficiencies.
- Financial—Approximately 25% of all systems/equipment and facility maintenance is attributable to corrosion, costing DoD more than $20 billion annually.

General DoD policy states that trade-off decisions during acquisition involving cost, useful service life, and effectiveness shall address corrosion prevention and mitigation and that corrosion prevention and control (CPC) programs and preservation techniques must be implemented throughout the life cycle of all military equipment and infrastructure. DoD operates an overarching CPC IPT to implement strategies, determine objectives, and develop and execute plans, procedures, and roadmaps to reduce the overall impact of corrosion on DoD assets. This aggressive approach is a result of Public Law 107-314 Sec 1067 [codified in 10 U.S.C. 2228], titled “Prevention and mitigation of corrosion of military infrastructure and equipment” which implemented annual reporting by Services and DoD.

2.15. Non-destructive Inspection

Nondestructive testing evaluates the soundness of parts to specific accept/reject criteria through various nondestructive testing (NDT) methods. These test methods allow technicians to examine the part for discontinuities without destroying it. Each DoD Service oversees non-destructive inspection for its equipment. Readers are encouraged to contact their respective organizations for points of contact.

Examples of Non-destructive inspection/testing methods include:

Eddy Current is used to detect discontinuities in parts that are conductors of electricity. An eddy current is the circulating electrical current induced in a conductor by an alternating magnetic field. When eddy currents encounter an obstacle, such as a crack, the surrounding currents become distorted. This change is detected on a meter or other type of display.

Magnetic Particle is used for detecting discontinuities in ferromagnetic parts. The part is magnetized by using an electrical current that induces a magnetic field in the part. A discontinuity, which crosses the magnetic field, creates north and south poles on either side of the defect area. When magnetic particles are applied to the part, the poles attract the particles and an indication of the discontinuity is formed.

Penetrant is used to detect discontinuities, i.e., cracks, pits, etc., open to the surface on parts made of nonporous materials. This method depends on the ability of the penetrant to enter into a surface discontinuity in the material to which it is applied.

Ultrasonic Testing uses ultrasonic vibrations to detect internal defects, delamination, disbonds, and discontinuities. Ultrasonic Testing (or UT) can be used on most materials and can locate small defects deep into the structure. UT uses a piezoelectric transducer to convert electrical signals to ultrasonic (mechanical) vibrations. A single transducer is used for pulse-echo testing, two transducers can be used for through-transmission or pitch-catch, and multiple transducers can be placed in an array like those used in medical ultrasound. Depending on the "launch" angle, the sound wave can travel straight down into a part, at an angle, or on the part surface.

Testability

In accordance with the DoD Test & Evaluation Management Guide, the Chief Developmental Tester and subject matter experts from the T&E Working level Integrated Product Team (WIPT) must participate in early requirements development forums as soon as a new program is considered. The objective is not to write requirements for users but to help the users articulate better requirements as clearly as possible and ensure that the requirements can be tested (i.e., the requirements are testable). Developmental Test & Evaluation (DT&E) personnel can provide advice about the technical feasibility of proposed new requirements, making the system more affordable and more technologically achievable. Operational testers can help ensure that the system (1) can meet mission requirements, (2) clearly conveys the users' needs, and (3) can be determined to be operationally effective and suitable with a high degree of confidence.

2.16. Hazardous Material Management

HAZMAT includes materials that are toxic, corrosive, and reactive. In addition, some materials are unacceptable from an ESOH perspective and are banned (e.g., Chlorofluorocarbons and Halons). Additionally, some chemicals or materials either lack human health standards or have an evolving science and regulatory status with potential to significantly impact the DoD mission – in DoD, these chemicals and materials are referred to as Emerging Contaminants (EC). There is no single list that identifies all the hazardous and environmentally unacceptable materials. The DAU Community of Practices (CoP) for Environment, Safety and Occupational Health (ESOH) section on Hazardous Materials Management contains detailed information, DoD guidance and references.

2.17. Energy Management
Operational Energy
The 2018 National Defense Strategy outlines a security environment characterized by strategic competition and a "lethal and disruptive battlefield, combined across domains, and conducted at increasing speed and reach," where even the "homeland is no longer a sanctuary." These multi-domain risks are challenging the assured delivery of energy to the Joint forces. While operational energy is an essential component of our warfighting capability, longer operating distances, remote and austere geography, and anti-access/area denial threats are challenging the Department's ability to assure the delivery of fuel. As the ability to deliver energy is placed at risk, so too is the Department's ability to deploy and sustain forces around the globe.

Installation Energy
DoD's installation energy strategy is designed to ensure mission assurance for the warfighter, reduce energy costs, and improve the energy resilience of our fixed installations. This includes:

- Reducing the demand for installation energy and water through conservation and efficiency
- Expanding the supply distributed (on-site) energy for mission assurance.
- Improving the energy grid and storage resilience of our installations
- Leveraging advanced technology for energy resource efficiencies and increased security
- Improving the cybersecurity of mission critical facility related control systems.

A. Design Interface Major Activities by Acquisition Phase

Activities of the Design Interface IPS Element
Each activity of the Design Interface IPS Element, as listed in the PSM Guidebook Appendix A, is under the responsibility of the Program Manager, the Product Support Manager, and the lead stakeholder from other areas as applicable, i.e., configuration management, engineering, environment, manufacturing, etc. Relevant Proponency DoD offices are listed in this chapter below in Section C, Proponency.

Input to the LCSP/Product Support Strategy.
Detailed guidance on development of the Life Cycle Sustainment Plan (LCSP)/Product Support Strategy states that "The purpose of this annotated outline is to improve sustainment planning for Department of Defense (DoD) weapon systems. This may be achieved when programs make design decisions that achieve operational performance requirements and reduce demand for sustainment."

While information from Design Interface activities will impact many areas of the LCSP/Product Support Strategy, the below LCSP sections specifically address Design Interface:
3.1 Sustainment Strategy Considerations
5 Influencing Design and Sustainment
9.1 Design Interface (with 5 subsections)

9.2 Product Support Element Determination

As Design Interface activities continue through the life cycle, their impacts will both directly and indirectly impact the system's KPP, KSA and APA parameters. The PSM and LCL should start participating early in the system lifecycle for greatest impact.

When Is Design Interface Delivered and Managed in the Lifecycle?
The activities within the Design Interface IPS Element are best visualized in the DoD Product Support Implementation Roadmap Too. This tool, as illustrated below in Figure 2-1 allows the User to check the box highlighting information specifically linked to the Design Interface Integrated Product Support Element.

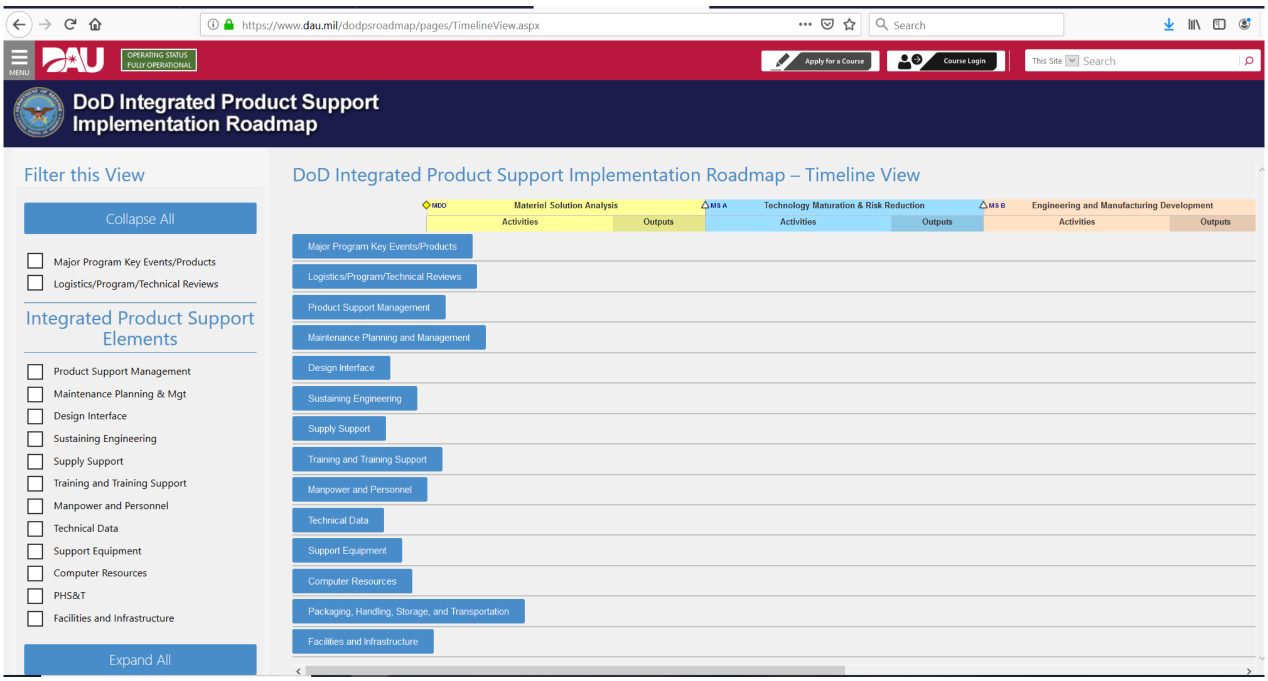


Figure 2-1, Screenshot of the DoD Integrated Product Support Implementation Roadmap Timeline View Homepage.

Once the Design Interface IPS Element box is checked, the timeline expands to show the detailed activities and respective outputs for each activity by phase, as show in a partial illustration in Figure 2-2 below.

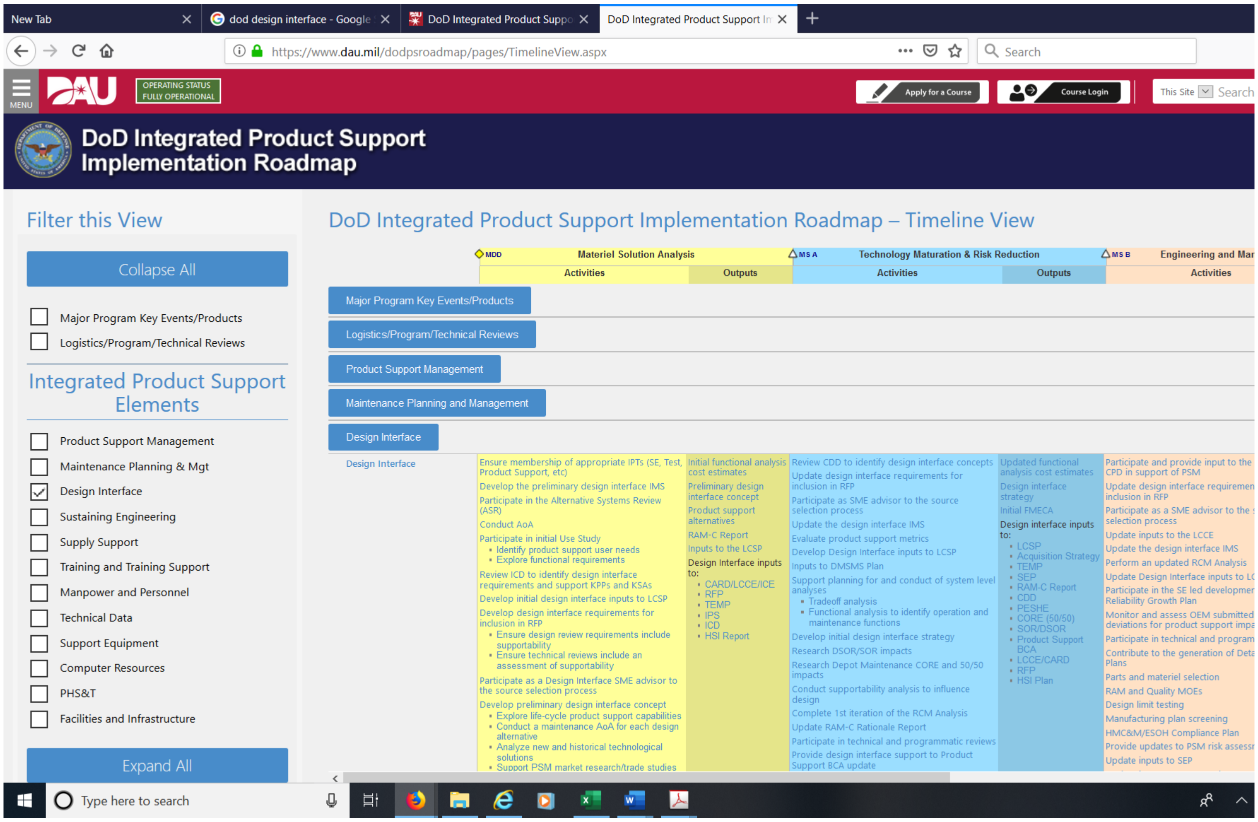


Figure 2-2, Screenshot of the DoD Integrated Product Support Implementation Roadmap Timeline View Homepage with the Design Interface IPS Element box checked. Notice the Design Interface activities and respective outputs are visible for each life cycle acquisition phase.

Each activity and output is then hyperlinked to a pop-up window that displays specific data related to that respective activity as shown in the screenshot below in Figure 2-3. The specific data is in-turn hyperlinked to allow the user to subsequently search for detailed information regarding any specific activity.

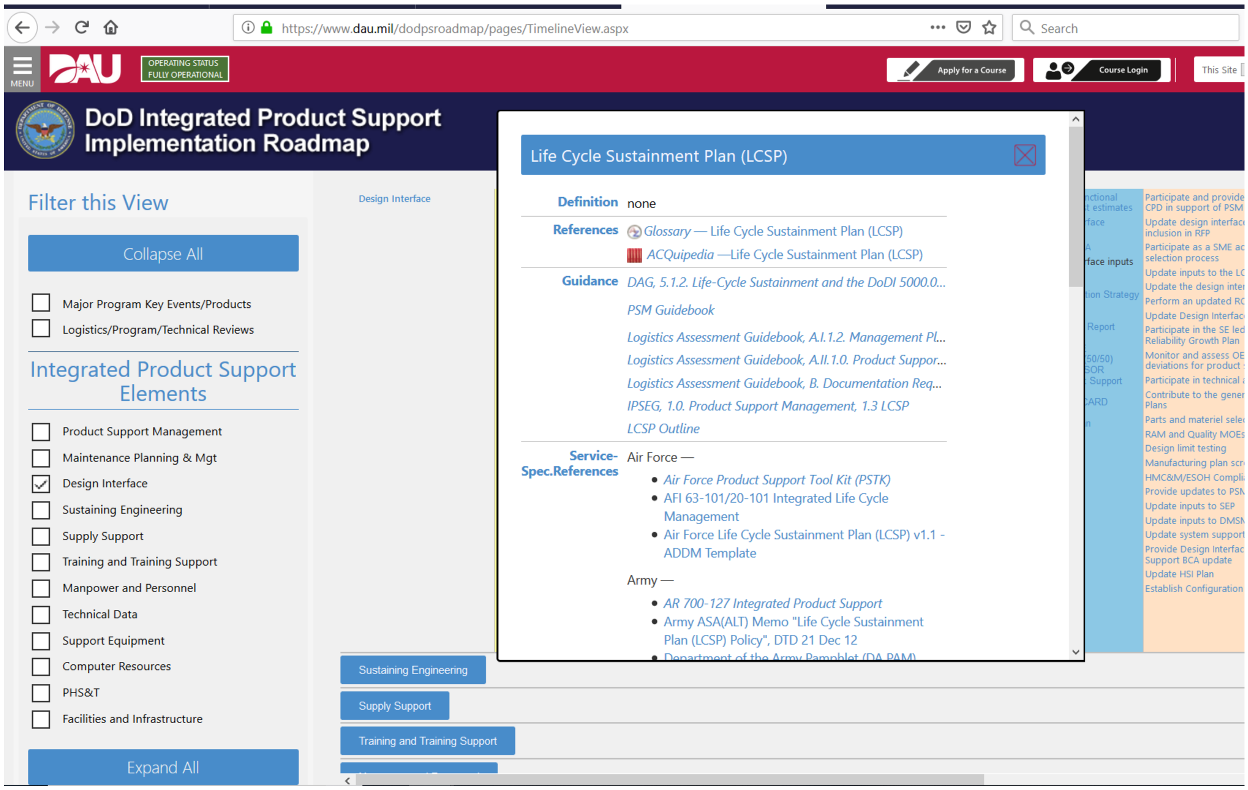


Figure 2-3, Screenshot of the DoD Integrated Product Support Implementation Roadmap Timeline View Homepage with the Design Interface IPS Element box checked. The User then clicked on the outcome “Life Cycle Sustainment Plan (LCSP)” from the listing of activities and outcomes for Design Interface. This data card provides further information for the User to search for further detailed information.

B. Data Item Description (DID) Deliverables

A Data Item Description (DID) is a completed document, typically identified in a Contract Data Requirements List (CDRL), that defines the data required of a contractor. The document specifically defines the data content, format, and intended use of the data. DIDs are found on the DLA Assist Database.

Helpful Search Hint: All DID’s start with the letters “DI-.” Once your search results are shown, click on the column header “Document ID” to sort by alphabetical order. The “DI-“ items will be easier to find. The below DIDs are a representative listing and is not inclusive of all Design Interface related DIDs.

- DI-ENVR-81375, Environmental Health and Safety Plan
- DI-ENVR-81378, Environmental Operation and Maintenance (O&M) Plan
- DI-ENVR-81663, Environmental Stress Screening Report
- DI-HFAC-81743, Human Systems Integration Program Plan
- DI-ILSS-80111, Reliability-Centered Maintenance Analysis Data
- DI-ILSS-81164, LSA-058, Reliability and Maintainability Analysis

- DI-MISC-80370, Safety Engineering Analysis Report
- DI-PSSS-80980B, Reliability -Centered Maintenance (RCM) Failure Modes and Effects Analysis (FMEA) Report
- DI-PSSS-81829, Reliability-Centered Maintenance (RCM) Corrective Maintenance (CM) Development Report
- DI-PSSS-82114, Reliability-Centered Maintenance (RCM) Analysis Report
- DI-RELI-81500, Survivability Cost Effectiveness Trade-off Studies Report
- DI-SAFT-80101, System Safety Hazard Analysis Report
- DI-SAFT-80106, Health Hazard Assessment Report (HHAR)
- DI-SAFT-80184, Radiation Hazard Control Procedures (RHCP)
- DI-SAFT-80402, Operating Procedures for Hazardous Materials
- DI-SAFT-81125, Hazard Assessment Test Report
- DI-SESS-81496, Reliability and Maintainability (R&M) Block Diagrams and Mathematical Models Report
- DI-SESS-81497, Reliability and Maintainability Predictions Report
- DI-SESS-81585, Reliability and Maintainability Test Plan
- DI-SESS-81613 (R&M) Program Plan
- DI-SESS-81628, Reliability Test Report
- DI-SESS-81629, Reliability Test Procedure
- DI-SESS-81968, Reliability and Maintainability (R&M) Allocation Report

C. Proponency

Please note that DoD organizational changes may result in changes to Office designations and Proponency responsibilities that may not match the content in this Guidebook.

The Design Interface Element has many topical areas. The below listing identifies the DoD Proponent Office for most of the topical areas as they related to the Design Interface Element - but this list should not be considered as complete or all-inclusive. The reader is encouraged to check the Defense Acquisition Guidebook, DAU ACQuipedia library and other reference sources for more information on specific topics.

At the OSD level, the following offices serve as the primary proponents for issues related to Design Interface:

- For Advanced Capabilities: Directorate of Defense Research and Engineering for Advanced Capabilities
- For Sustainment: Office of the Assistant Secretary of Defense for Sustainment

Affordability

Affordability as related to the Design Interface IPS Element considers both the analysis of cost as well as the tools for cost analysis. Affordability is addressed in all chapters of the Defense Acquisition Guidebook - please see Chapter 2, Analysis of Alternatives, Cost Estimating and Reporting, Chapter 3, Systems Engineering and Chapter 4, Life Cycle Sustainment. Proponency responsibilities are with the Director (Cost Assessment and Program Evaluation), the Office of the Assistant Secretary of Defense for Sustainment, and Directorate of Defense Research and Engineering for Advanced Capabilities.

Corrosion

The Office of Corrosion Policy and Oversight is responsible for addressing the needs and meeting the goals of the DoD's Corrosion Prevention and Mitigation Program. The Corrosion Office develops Corrosion Prevention and Control (CPC) strategies for the DoD and oversees their implementation through the CPC Integrated Product Team (IPT).

Deployability

The Under Secretary for Personnel and Readiness is the principal staff assistant and advisor to the Secretary and Deputy Secretary of Defense for Total Force Management as it relates to readiness; National Guard and Reserve component affairs; health affairs; training; and personnel requirements and management, including equal opportunity, morale, welfare, recreation, and quality of life matters.

Transportation Policy is responsible for establishing policies and providing guidance to DoD Components for efficient and effective use of DoD and commercial transportation resources. Transportation Policy is organized under the Office of the Deputy Assistant Secretary of Defense for Sustainment (Logistics).

Energy Management

The mission of the Office of the Deputy Assistant Secretary of Defense for Energy, ODASD(ENR) is to enhance military capability, readiness, and resilience for the warfighter, while mitigating risk and cost in the supply and use of energy in operations and training.

Hazardous Material Management

The Hazardous Materials Information Resource System (HMIRS) is the central repository for information on hazardous materials used by the Department of Defense (DoD). The DoDI 6050.05 provides instruction for the United States (U.S.) Government and civil agencies to maintain product hazard information on hazardous materials that are procured and to maintain the documents indefinitely.

Human Systems Integration (HSI)

The DoDD 5000.01, The Defense Acquisition System, states that human systems integration planning will begin in the early stages of the program life cycle. The goal will be to optimize total system performance and total ownership costs, while ensuring that the system is designed, operated, and maintained consistent with mission requirements. See also the Defense Acquisition Guidebook (DAG) Chapter 6.

Human Systems Integration, with accompanying references, is listed as an initiative on the DoD DDR&R, Advanced Capability website.

The Human Performance Training and Biosystems Directorate (HPT&B) Directorate was established within the Office of the Assistant Secretary of Defense for Research and Engineering, ASD (R&E), and is charged with the responsibility to provide technical leadership, management oversight, and the development of policy guidance for science and technology. The HPT&B portfolio covers a diverse range of research and academic disciplines.

Modularity and Open Systems

The DoDD 5000.01 (The Defense Acquisition System) highlights consideration of the Modular Open Systems Approach (MOSA) by all programs: Joint concepts, standardization, and integrated architectures will be used to the maximum extent possible to characterize the exchange of data, information, materiel, and services to and from systems, units, and platforms to assure all systems effectively and securely interoperate with other U.S. forces and coalition partner systems.

MOSA, with accompanying references, is listed as an initiative on the DoD DDR&E, Advanced Capabilities website.

Net-Centric

The DoD Chief Information Officer (CIO) is responsible for all matters relating to the DoD information enterprise, such as cybersecurity, communications, information systems, and more. This office is responsible for the DoD Net-Centric Strategy.

Producibility

The Industrial Policy office supports the Under Secretary of Defense for Acquisition and Sustainment by providing detailed analyses and in-depth understanding of the increasingly global, commercial, and financially complex industrial supply chain essential to our national defense.

Producibility is addressed in the Defense Acquisition Guidebook (DAG), Chapter 3, Systems Engineering.

R&M Engineering

The responsibility for achieving R&M throughout the life cycle is assigned to the heads of the DoD Components. Program Managers for Major Defense Acquisition Programs are required to implement a life cycle R&M engineering program.

Standardization

The DoD's Defense Standardization Program identifies, influences, develops, manages, and provides access to standardization processes, products, and services for Warfighters, the acquisition community, and the logistics community to promote interoperability, reduce total ownership costs and sustain readiness.

Supportability

The Assistant Secretary of Defense for Sustainment (ASD(Sustainment)) serves as the principal staff assistant and advisor to the Under Secretary of Defense for Acquisition & Sustainment (USD(A&S)), Deputy Secretary of Defense (DEPSECDEF), and Secretary of Defense (SECDEF) on logistics and materiel readiness in the Department of Defense (DoD) and is the principal logistics official within the senior management of the DoD.

Survivability

Survivability is addressed from multiple perspectives: people, equipment, during test and evaluation and under special conditions such as nuclear warfare.

Survivability is addressed in the Defense Acquisition Guidebook (DAG). Please see Chapter 3, Systems Engineering; Chapter 5, Manpower Planning and Human Systems Integration; and Chapter 8, Test and Evaluation.

Test and Evaluation

It is DoD policy that the Deputy Assistant Secretary of Defense for Developmental Test and Evaluation (DASD(DT&E)) shall be the focal point for all policy, practice, procedures, and acquisition workforce issues relating to developmental test and evaluation (DT&E) within the DoD.

See DoDI 5000.89, Test and Evaluation and DoDD 5141.02, Director of Operational Test and Evaluation (DOT&E) plus other relevant issuance at the DoD Issuances website.

Trade Studies for Design Interface

Trade studies are performed for a variety of reasons, i.e., affordability, technical comparisons, performance analysis, feasibility of requirements, etc. Trade studies are addressed in the Defense Acquisition Guidebook (DAG), Chapter 3, Systems Engineering and Chapter 4, Life Cycle Sustainment.

Transportability

The Transportation Directorate, ODASD (Logistics) is responsible for establishing policies and providing guidance to DoD Components for efficient and effective use of DoD and commercial transportation resources. Transportation Policy is organized under the Office of the Deputy Assistant Secretary of Defense for Logistics.

D. U.S. Government Statute, Regulations, DoD Policy and Guidance

The list of DoD policy and guidance related to design interface is very extensive. The below list identifies just some of the DoD level key documents. Readers should consult with their respective organizations for specific design interface related policy and guidance.

Please note that due to the high rate of change occurring in policy and guidance, the letter designations found as part of a reference will be removed in this guide. Readers are encouraged to check the DoD reference source on a frequent basis to ensure they are using the current reference version.

Selected policy and guidance related to design interface include, but are not limited to the below:

- DoD Directive 5000.01, The Defense Acquisition System,
- DoDI 5000.02, Operation of the Adaptive Acquisition Framework
- Other policy located on the DoD AAF website
- Defense Acquisition Guidebook (DAG)
- SAE GEIA-STD-0007 Logistics Product Data
- SAE GEIA-HB-0007B Logistics Product Data Handbook
- ANSI/GEIA-STD-0009 Reliability Program Standard for Systems Design Development and Manufacturing
- RAM-C Rationale Report Outline Guidance
- Systems Engineering Plan (SEP) Outline
- Life Cycle Sustainment Plan (LCSP) Outline, Version 2.0: DAU Interactive Videos and Tool | OASD(L&MR) Memo and Outline, January 19, 2017
- Product Support Implementation Roadmap
- Product Support Strategy Development Tool (formerly PSM Toolkit)
- PSM Guidebook
- PBL Guidebook
- BCA Guidebook
- Logistics Assessment (LA) Guidebook
- DoD Open Systems Architecture Contract Guidebook for Program Managers, Version 1.1 June 2013
- DoDI 4540.07, Operation of the DoD Engineering for Transportability and Deployability Program

There are additional handbooks, manuals and other reference sources located below in the Best Practices section of this chapter.

E. Communities of Practice and Interest

The topic of design interface covers such a vast scope of equipment that there is no one community of practice. Typically, design interface communities focus on the supportability of a type of system, for example, ships and aircraft, or of a type of DoD mission.

The Preface of this IPS Elements Guidebook provides a listing of "golden references," many of which provide libraries, research portals and other resources for finding additional information on specific topics of design interface. Many OSD offices (listed under the Proponency section above) maintain a comprehensive website with links to DoD partner organizations, policy, and guidance, plus many other resources. Readers are encouraged to check the relevant proponent website for additional information.

Readers should check with their respective organizations for the communities of practice that focus on the area of design interface most relevant to their interests.

The DAU community hub is a website that consolidates the links to approximately 50 communities of practice related to DoD acquisition practices. Many of these communities are important to the Design Interface IPS Element.

The Defense Innovation Marketplace website was created to be a consolidated resource for both DoD and industry to help enable communication regarding industry research and development projects and innovation interests. This site contains information to assist industry in understanding DoD rules and regulations regarding contracting for innovation.

Underpinning the Science and Technology (S&T) executive committee leadership is an ecosystem of technical groups known as Communities of Interest (CoI). These groups cover 17 technical areas that span the cross-cutting science and technology in the Department. The scope of each of these CoIs and their associated technical sub-groups is shown in the Reliance 21 document.

Best Practices Sources

- DoD Logistics Assessment Guidebook (Appendix A)
- Defense Acquisition Guidebook (DAG) (Multiple chapters, emphasis on Chapters 3 & 4)
- DoD (Systems Engineering) Guidance and Tools
- Life Cycle Sustainment Plan Outline
- LOG CoP Integrated Product Support (IPS) Element site
- Product Support Implementation Roadmap
- SAE GEIA-STD-0007-B Logistics Product Data (Fee Required)
- SAE GEIA-HB-0007B Logistics Product Data Handbook (Fee Required)

- SAE TAHB-0007-1 Logistics Product Data Reports Handbook (Fee Required)
- SAE TA STD-0017 Product Support Analysis (Fee Required)
- SAE AS1390 Level of Repair Analysis (LORA) (Fee Required)
- SAE JA1011 Standard "Evaluation Criteria for Reliability-Centered Maintenance (RCM) Processes" (Fee Required)
- SAE JA1012 Guidebook "A Guide to the Reliability-Centered Maintenance (RCM) Standard" (Fee Required)
- SAE JA6097 "Using a System Reliability Model to Optimize Maintenance Costs: A Best Practices Guide" (Fee Required)
- SAE AS1390 "Level of Repair Analysis (LORA)" (Fee Required)
- S3000L International Specification for Logistic Support Analysis (Fee Required)
- Best Practices for Using Systems Engineering Standards (ISO/IEC/IEEE 15288, IEEE 15288.1, and IEEE 15288.2) on Contracts for Department of Defense Acquisition Programs and companion ODASD(SE) brief, April 2017.
- RAM-C Rationale Report Outline Guidance

F. Training Resources

The career fields that have a strong relationship with Design Interface include, but are not limited to, Engineering, Facilities Engineering, Information Technology, Life Cycle Logistics, Production, Quality and Manufacturing (PQM), Science and Technology Manager (S&T), and Test & Evaluation. More information on these and other acquisition career fields can be found on the DAU iCatalog.

DAU Courseware

DAU hosts hundreds of courses across 24 topic areas. It would be impossible to list all of the courses relevant to Design Interface IPS Element. A partial list is below:

- CLC 041 Predictive Analysis and Systems Engineering
- CLE 003 Technical Reviews
- CLE 009 System Safety in Systems Engineering
- CLE 011 Modeling and Simulation for Systems Engineering
- CLE 013 Modular Open Systems Approach to DoD Acquisition
- CLE 017 Technical Planning
- CLE 023 Modeling and Simulation for Test and Evaluation
- CLE 026 Trade Studies
- CLE 039 Environmental Issues in Testing and Evaluation

- CLE 062 Human Systems Integration
- CLE 064 Standardization in the Acquisition Life Cycle
- CLE 065 Standardization Documents
- CLL 008 Designing and Assessing Supportability in DoD Weapon Systems
- CLL 012 Supportability Analysis
- CLL 029 Condition Based Maintenance Plus (CBM+)
- CLL 057 Level of Repair Analysis (LORA) Fundamentals
- CLL 058 Level of Repair Analysis (LORA) Implementation
- CLM 035 Environmental, Safety and Occupational Health
- CLM 038 Corrosion Prevention and Control
- CLM 200 Item Unique Identification (IUID)
- LOG 103 Reliability, Availability, Maintainability
- LOG 211 Supportability Analysis
- LOG 215 Technical Data Management
- LOG 235 Performance Based Logistics
- LOG 340 Life Cycle Product Support CLC 041 Predictive Analysis and Systems Engineering
- PMT 352A Environmental, Safety and Occupational Health Module

DAU ACQuipedia Articles
The Defense Acquisition University maintains a website that is an online library of articles on specific topics related to DoD systems acquisition and sustainment. This library is called ACQuipedia.

ACQuipedia serves as an online encyclopedia of common defense acquisition topics. Each topic is identified as an article. Each article contains a definition, a brief narrative that provides context, and includes links to the most pertinent policy, guidance, tools, practices, and training which further augment understanding and expand depth.

ACQuipedia was developed as a collaborative project to create content around Defense Acquisition-related topics. Articles (topics) will be maintained as a collaborative effort of subject matter experts across the Defense Acquisition University (DAU). Future growth may expand the collaboration of subject matter experts beyond DAU.

ACQuipedia provides the acquisition workforce with quick access to information in a succinct and digestible format. Article content aggregates the most relevant references and learning assets to narrowly focus users and quickly provide high value information.

The below list is representative of the articles related to the Design Interface IPS Element.

- Automatic Test System (ATS) & Automatic Test Equipment (ATE)
- Condition Based Maintenance Plus (CBM+)

- Failure Modes & Effects Analysis (FMEA) and Failure Modes, Effects & Criticality Analysis (FMECA)
- Integrated Product Support (IPS) Elements
- Integrated Product Support (IPS) Element – Design Interface
- Interface Management
- Life Cycle Sustainment Plan (LCSP)/Product Support Strategy
- Logistics Modeling and Simulation (M&S)
- Mean Time Between Failure (MTBF)
- Net-Ready Key Performance Parameter (KPP)
- Post-Deployment Review
- Post IOC Supportability
- Product Support Analysis (MIL-HDBK-502A)
- Reliability Key System Attribute (KSA)
- Suitability
- Supportability Design Objectives
- Sustainment Key Performance Parameter (KPP)
- Systems Engineering Plan (SEP)
- Systems Engineering Process

Sustaining Engineering

Objective

Support in-service systems in their operational environments.

Description

Sustaining engineering spans those technical tasks (engineering and logistics investigations and analyses) to ensure continued operation and maintenance of a system with managed (i.e., known) risk. Sustaining engineering involves the identification, review, assessment, and resolution of deficiencies throughout a system's lifecycle.

Sustaining engineering returns a system to its baseline configuration and capability and identifies opportunities for performance and capability enhancement. It includes the measurement, identification and verification of system technical and supportability deficiencies, associated root cause analyses, evaluation of the potential for deficiency correction and the development of a range of corrective action options. Typically, Business Cases Analysis (BCA) and/or life-cycle economic analysis are performed to determine the relative costs and risks associated with the implementation of various corrective action options. Sustaining engineering also includes the implementation of selected corrective actions to include configuration or maintenance processes and the monitoring of sustainment health metrics. This includes:

- Collection and triage of all service use and maintenance data;
- Analysis of safety hazards, failure causes and effects, reliability and maintainability trends, and operational usage profiles changes;
- Root cause analysis of in-service problems (including operational hazards, deficiency reports, parts obsolescence, corrosion effects, and reliability degradation);
- The development of required design changes to resolve operational issues; and
- Other activities necessary to ensure cost-effective support to achieve peacetime and wartime readiness and performance requirements over a system's lifecycle.

Technical surveillance of critical safety items, approved sources for these items, and the oversight of the design configuration baselines (basic design engineering responsibility for the overall configuration including design packages, maintenance procedures, and usage profiles) for the fielded system to ensure continued certification compliance are also part of the sustaining engineering effort. Periodic technical review of the in-service system performance against baseline requirements, analysis of trends, and development of management options and resource requirements for resolution of operational issues should be part of the sustaining effort.

Overview

Sustaining engineering consists of a combination of systems engineering and product support life-cycle management strategies to achieve the desired sustainment metric outcomes for the program. These metrics include the DoD required Key Performance Parameter (KPP) of Availability (both Materiel and Operational), the Key System Attributes (KSAs) of Reliability, Maintainability and Operations and Support Cost, the metrics Logistics Footprint, Mean Downtime, plus other subordinate program metrics. The focus is on understanding the cost and logistics infrastructure and footprint associated with meeting the Warfighter requirements and the process to track, control and/or reduce the need for product support over the life cycle of the weapon system.

Historically, Sustaining Engineering activities were the primary responsibility of engineering and product development, with Sustaining Engineering activities conducted during Operations & Support being planned and implemented often under separate contract line items and separate management. The current view of integrated product support requires that the Life Cycle Sustainment Plan include and implement an integrated strategy, inclusive of all the Product Support Elements and Program functional areas, that is reviewed and reported on throughout the acquisition life cycle.

Sustaining Engineering activities are heavily influenced prior to system deployment by the design interface activities which focus on ensuring that the program KPPs and KSAs are achieved through a design to optimize availability and reliability at reduced life cycle cost. After deployment and during Operations and Sustainment (O&S), the activities of sustaining engineering (including product improvement, reliability fixes, continuing process improvements and technology refresh) continue the activities of design influence.

Why Sustaining Engineering is Important

Once the weapon system is fielded, achieving the support concept, and sustaining operational capability requires the involvement of the logistics, engineering, testing, program management, contracts, supply chain, and financial management experts. The overall product support strategy, documented in the Life-Cycle Sustainment Plan (LCSP)/Product Support Strategy, should include life-cycle support planning and address actions to assure long-term sustainment and continually improve product affordability for programs in initial procurement, re-procurement, and post-production support. A performance-based product support process will be used to align the support activities necessary to meet these objectives.

In today's world with the fast pace of technology, process, and skill-based changes, a continuous challenge to improve, upgrade, prevent or simply refresh the technical foundations of a weapon system confronts the PM/PSM. The sum of the technical activities (primarily maintenance and activities typically aligned to systems engineering areas), along with supporting activities such as financial, supply chain, etc., necessary to ensure the weapon system continues to meet user requirements and program KPP/KSAs is known as Sustaining Engineering.

Product Support Manager Activities

3.1. Post deployment ongoing operational data analyses
DoD Components should begin product support planning as soon as the Milestone Decision Authority (MDA) determines that a materiel solution is needed to satisfy the capability requirement. This timing often precedes formal establishment of a program of record and staffing of a program office. PMs should use the insights and critical thinking embodied in such acquisition deliverables as the AoA; Reliability, Availability, Maintainability, and Cost (RAM-C) Rationale Report; and Concept of Operations (CONOPS) and Operational Mode Summary/Mission Profile (OMS/MP); and in requirement documents such as the Initial Capabilities Document (ICD) and Capability Development Document (CDD) as the logical basis for the sustainment plan.

The LCL/PM uses analytical techniques that enable comparisons of requirements, technologies, and systems against legacy/analogous systems to assess alternative sustainment strategies. Alternatives could include commercial and organic sources (when not constrained by law) of repair and supply, alternative levels of repair, or use of other DoD Components' or allied capabilities. The LCL/PM should analyze potential new sustainment technologies for inclusion in the sustainment strategy. The LCL/PM also conducts use studies to understand the impact to sustainment of the intended operational environment. The results of these analyses inform the program schedule, development of resource requirements, and the LCSP/Product Support Strategy. Further guidance can be found in the Product Support Business Case Analysis (BCA) Guidebook.

3.2. Engineering considerations

3.2.1. Relation to Systems Engineering
The PM uses the systems engineering process to assess technological risk that might result in failure to achieve performance requirements. As the PM considers system design alternative risk and opportunity analyses of candidate technologies, the PM should also consider the risks to achieving reliability goals, maintainability of the technology in its intended environment, and life cycle cost implications of the candidate technology. Risk considerations may include repair technologies that may need to be created and changes to the existing skill sets of maintenance personnel. The PM also identifies opportunities to apply new technologies and techniques that can enhance the maintainability of equipment and reduce life cycle cost. More information is found in the Defense Acquisition Guidebook (DAG), Chapters 3, Systems Engineering, and 4, Life Cycle Sustainment.

3.2.2. Engineering and Technical Support
In accordance with Federal Acquisition Regulation (FAR) 37.203, the acquisition of advisory and assistance services is a legitimate way to improve Government services and operations.

Accordingly, advisory and assistance services may be used at all organizational levels to help managers achieve maximum effectiveness or economy in their operations.

3.3. Analyses

The Product Support Analysis (PSA) process is a wide range of analyses that are conducted within the Systems Engineering process. Inputs and outputs for the system level Product Support Analysis include system analysis and engineering at the hardware-operating-support trade level as well as outputs to the interfacing activities in the form of boundary conditions or goals for both engineering performance and Integrated Product Support (IPS) Element concepts and plans. These outputs affect design and operational concepts; identify gross product support resource requirements of alternative concepts; and relate design, operational, and supportability characteristics to system readiness objectives and goals.

The PSA Handbook, MIL-HDBK-502A, addresses seventeen analysis processes for the assessment and verification of the adequacy and effectiveness of the Product Support Analysis process. This critical aspect of Product Support is conducted throughout the system/equipment's life cycle to demonstrate, within stated confidence levels, the validity of the analysis and products developed from the analysis, and to adjust the analysis results and products as required. This part of the process starts with early planning for verification of support concepts and continues through development, acquisition, deployment, and operations to include assessment and verification of Post Deployment support.

MIL-HDBK-502A offers guidance on DoD's implementation of SAE Standard TASTD0017, Product Support Analysis, which was originally issued in November 2012 as TechAmerica Standard TA-STD-0017, Product Support Analysis. SAE TASTD0017 is a commercial standard and is available for purchase from SAE at TASTD0017: Product Support Analysis - SAE International.

Additional analysis tools and techniques are provided in the Defense Acquisition Guidebook (DAG). Fort Belvoir, VA: Defense Acquisition University.

3.3.1. Safety hazards

Safety factors consist of those system design characteristics that serve to minimize the potential for mishaps -- causing death or injury to operators, maintainers, and supporters or threatening the survival and/or operation of the system. Prevalent issues encompass factors that threaten the safe operation and/or survival of the platform: walking and working surfaces, including work at heights; pressure extremes; and control of hazardous energy releases such as mechanical, electrical, fluids under pressure, ionizing or non-ionizing radiation (often referred to as "lock-out/tag-out"), fire and explosions. More information can be found in the Defense Acquisition Guidebook (DAG), Chapter 5, Manpower Planning and Human Systems Integration.

See also the Design Interface chapter, 2.8.5. Safety and Occupational Health Plan Development and Management, within this guidebook.

3.3.2. Failure Causes and Effects

The Failure Modes, Effects, and Criticality Analysis (FMECA) Report provides an analysis of independent single item failures and the resulting potential impact on mission success, performance, safety, and maintainability. This analysis is intended to promote design corrective actions by identifying potential failure risk and maintainability issues in order that appropriate corrective actions may be taken early to eliminate or control high risk items to improve operational readiness and reduce life cycle cost.

3.3.3. Reliability and Maintainability Trends

Programs use reliability and maintainability metrics to measure and report progress. These measures form the basis to assess readiness for Milestone decisions, IMP criteria, and contract incentives/actions. The metrics and measures are relevant to the current program phase and specifically the end of phase decision(s) to be made.

Per the Systems Engineering Plan (SEP) Outline, version 3.0, for reliability, Program Managers will use a reliability growth curve to plan, illustrate, and report progress. Growth curves are stated in a series of intermediate goals and tracked through fully integrated, system-level test and evaluation events until the reliability threshold is achieved. Additionally, guidance is provided for tracking reliability and maintainability trends using technical performance measures and metrics to summarize the program's strategy for tracking and reporting the maturation of system development, design, and production in terms of progress against established plans.

The Reliability, Availability, Maintainability and Cost (RAM-C) Rationale Report will document the supporting rationale for the JCIDS sustainment parameters. The focus of the trade studies in the RAM-C report will be the sensitivity analysis made between the sustainment parameters (reliability, availability, maintainability, and O&S cost).

There are also multiple Data Item Description (DID) reports to assist the program in tracking reliability and maintainability trends. These documents are found in the DoD Assist Database and include the below examples:

- DI-SESS-81497, Reliability and Maintainability Predictions Report
- DI-SESS-81585, Reliability and Maintainability Test Plan
- DI-SESS-81613, Reliability and Maintainability (R&M) Program Plan

The JCIDS Manual provides extensive guidance and examples for reliability and maintainability parameters and measures.

See also the Design Interface chapter, 2.4 RAM Design, within this guidebook.

Reliability Growth
The Systems Engineering Plan (SEP) Outline, version 3.0, and the Defense Acquisition Guidebook (DAG), Chapter 3, provides guidance on tracking system reliability growth during the system's acquisition life cycle.

Per MIL-HDBK 189, Reliability Growth Management, reliability growth management procedures have been developed to improve the reliability of DoD weapon systems. Reliability growth techniques enable acquisition personnel to plan, evaluate and control the reliability of a system during its development stage. The reliability growth concepts and methodologies presented in this handbook have evolved over the last few decades by actual applications to Army, Navy and Air Force systems. Through these applications, reliability growth management technology has been developed to the point where considerable payoffs in system reliability improvement and cost reduction can be achieved.

3.3.4. Operational Usage Profiles Changes
The DoD has adopted the term, "operations tempo," as a measure of the pace of an operation or operations in terms of equipment usage -- aircraft "flying hours," ship "steaming days" or tank "driving miles." The "OPTEMO" increases with the intensity of and number of operations. The planned or forecasted OPTEMP is important to define in the weapon system's requirements documentation as defined in the JCIDS Manual.

Per the Product Support Manager Guidebook, one of the primary objectives of the product support strategy is to ensure the program can achieve the sustainment KPP and KSAs. As used in operations, the PSM assesses the effectiveness of the sustainment approach in terms of these measures as a basis for evaluating and revising the product support strategy. Changes may be required due to changes in operational requirements (operational tempo, operational environment, mission changes), sustainment challenges (infrastructure and/or capabilities), funding constraints, or political shifts.

See also the Maintenance Planning and Management, 5.9, OPTEMPO Variance, within this guidebook.

3.4. Root Cause Analysis of In-Service Problems such as:
A Root Cause Analysis is performed to identify the real source (i.e., root cause) of a problem. The process includes a sequential series of steps that will both determine the root causes as well as document the basis for this determination. There are many different techniques in use to achieve this same end and are referred to as Failure Analyses, Problem Investigations, etc.

The Data Item Description (DID) titled Critical Defect Investigation Report, DI-MGMT-81989, documents the investigation results of a critical defect identifies the occurrence(s) of critical defects and their root cause, segregated suspect material, planned corrective action, and the request for authority to restart. This Data Item Description (DID) contains the format and content preparation instructions for the data product generated by the specific and discrete task requirements as delineated in the contract.

There are a wide range of processes that have satisfied the DoD's intent for cause analysis. These processes run the gamut from complex and expensive to simple and free. These processes come in three basic forms: 1) Commercially purchased programs, 2) In-house programs that specifically identify the root cause, and 3) In-house programs that informally identify root cause.

Readers are encouraged to check with their respective organizations for specific guidance on root cause analysis procedures.

3.4.1. Operational hazards

Defense Acquisition Guidebook (DAG), Chapter 5, defines occupational health factors as those system design features that serve to minimize the risk of injury, acute or chronic illness or disability and/or reduce job performance of personnel who operate, maintain, or support the system. Prevalent issues include noise, chemical safety, atmospheric hazards (including those associated with confined space entry and oxygen deficiency), vibration, ionizing and non-ionizing radiation and human factors issues that can create chronic disease and discomfort such as repetitive motion diseases. Many occupational health problems, particularly noise and chemical management, overlap with environmental impacts. Human factor stresses that create the risk of chronic disease and discomfort overlap with occupational health considerations.

Per DoDI 6055.05, Occupational and Environmental Health (OEH), it is DoD policy to: a) protect DoD personnel from accidental death, injury, and illness caused by hazardous occupational or environmental exposures, and b) eliminate mishaps, deaths, injuries, and illnesses by applying risk management strategies toward achieving an annual goal of significant reductions in all mishaps, injuries, and illnesses, with the ultimate goal of zero mishaps, injuries, and illnesses, and compliance with DoD safety and health standards and policies.

3.4.2. Corrosion effects

Corrosion Prevention and Control (CPC) is defined as the corrosion of military equipment and facilities costs the DoD over $20 billion annually. In addition, corrosion degrades system availability; safety; and Environment, Safety and Occupational Health (ESOH) factors. Therefore, acquisition officials should fully consider corrosion prevention and mitigation as early as possible in the acquisition life cycle (even prior to Milestone A) and implement appropriate strategies to minimize the life-cycle impact. Additional references include:

- DoD Directive 5000.01, The Defense Acquisition System
- DoDI 5000.02, Operation of the Adaptive Acquisition Framework
- Other policy located on the DoD AAF website
- DoDI 5000.67, Prevention and Mitigation of Corrosion on DoD Military Equipment and Infrastructure
- Defense Acquisition Guidebook (DAG), Chapter 3, Systems Engineering

See also the Design Interface chapter, 2.14, Corrosion Control and Prevention, within this guidebook.

3.4.3. Reliability degradation

Reliability degradation results in an increasing percentage of systems not meeting their reliability requirements and the cost of supporting fielded systems was increasingly higher than expected. Degradation occurs for many reasons, e.g., deterioration over time of the materials that compose the system, environmental effects, and stresses due to system operation. The analysis of reliability degradation is composed of many different types of testing and assessment, depending on what type of information is sought. The DAU ACQuipedia articles Reliability Growth, Reliability Centered Maintenance (RCM), and Reliability Key System Attribute (KSA) all contain additional helpful information.

Per the Defense Acquisition Guidebook (DAG), Chapter 3, Systems Engineering, vulnerability is a characteristic of a system that causes it to suffer a definite degradation (loss or reduction of capability to perform the designated mission) as a result of having been subjected to a certain (defined) level of effects in an unnatural (manmade) or natural (e.g., lightning, solar storms) hostile environment. Vulnerability is also considered a subset of survivability. Design and testing ensure that the system and crew can withstand manmade hostile environments without the crew suffering acute chronic illness, disability, or death.

The Failure Modes & Effects Analysis (FMEA) and Failure Modes, Effects & Criticality Analysis (FMECA) plays a critical role in identifying failure modes and defining their impact at the local level (i.e., part level), thru the next higher level (i.e., circuit card) and at the system level, (e.g., the equipment level) in terms of their impact on operations. Failures due to an individual failure mode may exhibit a given failure rate until a corrective action (termed a fix) is made in the design, operation, maintenance, or manufacturing process that mitigates the failure mechanism.

3.4.4. Special Considerations for Software Sustainment Engineering

Software Sustainment involves orchestrating the processes, practices, technical resources, information, and workforce competencies for systems and software engineering, to enable systems to continue mission operations and to be enhanced to meet evolving threat and capability needs.

See also the Information Technology (IT) Systems Continuous Support, Chapter 12, within this guidebook.

3.5. Development of Required Design Changes to Resolve Operational Issues

Per the Defense Acquisition Guidebook (DAG), Chapter 4, Life Cycle Sustainment, as the product support strategy is executed, Program Management monitors the performance of the operating system and identifies risks and issues to continuing to achieve the Warfighter's sustainment goals affordably. As shortfalls in system performance operation are identified, the

Program Manager conducts analyses to determine the best Courses of Action (CoA). Corrective actions may require maintenance plan changes, process changes, modification of agreements, changes to product support elements, or system design changes. The PS IPT may need to conduct BCAs, systems engineering trades, and logistics analyses to determine the most effective CoA. Potential CoAs may include changes to maintenance procedures, levels of repair, or product support elements, or system/component redesigns.

Product Improvement
Product improvement efforts encompass the spectrum from recapitalization to complete replacement with a new acquisition. Typically, it is more cost effective and less risky to update and rebuild a weapon system, rather than acquire a completely new system, if the existing platform, those which are both fielded and still under development, can accommodate the new performance, capability, and sustainment requirements.

There are many ways available to program management to plan for and implement product improvement to include Value Engineering (VE) and Value Engineering Change Proposals (VECP), Engineering Change Proposals (ECP) and Working Capital Fund (WCF).

Preplanned Product Improvements
Preplanned product improvement is a systematic acquisition strategy in which evolutionary improvements of existing systems during their useful life are planned and facilitated using designs to accommodate future changes and improvements. Preplanning proposes a stepped requirement process in which a product using current technology is fielded sooner to help counter the existing threat. The initial design should allow for future improvements, and anticipated improvements should be communicated to the entire defense industry.

Reports by the Government Accountability Office (GAO) on preplanned product improvement can be found on their GAO website.

Users are encouraged to review DoD Directive 5000.01, The Defense Acquisition System, and DoDI 5000.02, Operation of the Adaptive Acquisition Framework, plus other policy located on the DoD AAF website and DoD Issuances website.

Service Life Extension Planning
The Service Life Extension Program (SLEP) & Service Life Assessment Program (SLAP) is a generic term for maintenance or modification(s) to fielded systems undertaken to extend the life of the system beyond what was previously planned, resulting in zero time or cycles reset, as opposed to simple repair, sometimes conducted as part of a formalized reset process.

Aging Weapon System Management
Aging weapons systems management is composed of a number of initiatives usually focused on a specific type of system such as aircraft, submarines, or ground vehicles. The area of aging weapon system management is typically composed of a combination of obsolescence, diminishing manufacturing sources and material shortages, continuous modernization,

technology insertion, supply chain management, and special issues such as lead-free electronics.

There are multiple Congressional Budget Office (CBO) and Government Accountability Office (GAO) reports that address this topic.

Continuous Modernization and Improvement
Continuous modernization is a process by which state-of-the-art technologies are inserted continuously into weapon systems to increase reliability, lower sustainment costs, and increase the war fighting capability of a system to meet evolving customer requirements throughout an indefinite service life. Continuous Modernization is aided by the use of performance standards, COTS/NDI preferences, commercial specifications and standards, and open system architectures. All enable the rapid insertion of new technologies across the weapon system life cycle. With continuous modernization, new technologies can be rapidly introduced into a weapon system to meet new requirements, thereby extending the serviceable life of a system indefinitely. Keep in mind, however, that the continuous modernization process must be repeated over and over to:

- Anticipate obsolescence.
- Ensure emerging requirements can be anticipated.
- Ensure technologies are available to satisfy emerging requirements.

Users are encouraged to review DoD Directive 5000.01, The Defense Acquisition System, and DoDI 5000.02, Operation of the Adaptive Acquisition Framework, plus other policy located on the DoD AAF website and DoD Issuances website.

There are many specific modernization initiatives and programs across the DoD, for example, Digital Engineering and Facilities. The 2018 National Defense Strategy stated that the Defense Department must have to ensure its advantage over potential adversaries – driving modernization across all facets of the DoD.

Related topics include:

- Diminishing Manufacturing Sources and Material Shortages (DMSMS)
- Government-Industry Data Exchange Program (GIDEP)
- Technology Insertion/Technology Refreshment
- Counterfeit Parts
- Engineering Change Proposals (ECP)
- Obsolescence Management
- Service Life Extension Program (SLEP) & Service Life Assessment Program (SLAP)
- Continuous Process Improvement (CPI) and Lean Six Sigma (LSS)

Recapitalization

Per the OSD Report to Congress, Sep 2006, Recapitalization, or RECAP, is the rebuild and/or systematic upgrade of currently fielded systems to ensure operational readiness and a zero time/zero-mile status. Recapitalization is different from daily sustainment operations in that it involves a rebuild, replacement, modernization and/or restoration of the item. Recapitalization refers to the end use item that can be a facility, a weapon system or even a major subsystem such as an engine. Objectives of a recapitalization project can include extending service life, reducing Operations and Support costs, improving system reliability, and enhancing capability.

Recapitalization work enhances the weapon system by adding new technological features as the equipment is being completely overhauled. RECAP is also conducted to account for damage/stress on vehicles due to the higher OPTEMPO and harsh usage environment. RECAP can be further subdivided into rebuild programs, which return equipment to original design specifications with required upgrade due to obsolescence of subcomponents, and upgrade programs, where capability is significantly enhanced. For the DoD, RECAP is typically done in a depot/arsenal, by a contractor (usually the Original Equipment Manufacturer), or by a partnership of the two entities. Funding for recapitalization is provided mostly in procurement accounts.

Army Regulation 750–1, Army Materiel Maintenance Policy, provides policy and guidance for recapitalization of U.S. Army systems.

Good overviews of the challenges related to DoD weapon systems recapitalization can be found in U.S. Government Accountability Office (GAO) reports.

Readers should contact their respective organizations for specific regulations regarding recapitalization. More information on depot maintenance is found in the Maintenance Planning and Management IPS Element chapter of this Guidebook.

Value Engineering

Value Engineering (VE), with DoD origins dating back to April 1954 in the Navy's Bureau of Ships, plays an integral and enduring role in accomplishing the DoD's mission to provide the military forces needed to deter war and protect the security of our nation. Components use VE to systematically analyze the functions of programs, projects, systems, products, items of equipment, facilities, buildings, services, and supplies in order to achieve the essential functions at the lowest life cycle cost consistent with required performance, reliability, quality, and safety. DoD civilian and military personnel focus their use of VE, either on its own or in conjunction with other value-improving initiatives, on gaining full value from every dollar. Components retain DoD resource benefits resulting from the use of VE.

VE consists of two parts: VE proposals (VEP) and VE change proposals (VECP). VEPs are developed and submitted by individual employees or contractors under contract to provide VE services or studies. VECPs are submitted under the VE clause of a contract.

The DoD VE program has two elements:

- DoD military and civilian personnel VE effort in which value engineering proposals (VEP) are used to implement change.
- DoD contractor VE effort (required or voluntary) in which value engineering change proposals (VECP) are used to implement change after DoD acceptance.

The Department of Defense Instruction 4245.14, "DoD Value Engineering (VE) Program" (DoDI 4245.14), implements section 1711 of title 41, United States Code, "Value Engineering" (41 USC 1711), and Office of Management and Budget Circular No. A-131, "Value Engineering" (OMB A-131), to ensure the "effective administration of the DoD VE Program." FAR Part 48, "Value Engineering," "prescribes policies and procedures for using and administering value engineering techniques in contracts."

Guidance and Resources include:

- Defense Acquisition Guidebook (DAG) CH 3-2.4.4 Value Engineering
- Value Engineering: A Guidebook of Best Practices and Tools (SD-24)
- Defense Acquisition University Continuous Learning Module CLE 001, "Value Engineering".

Engineering Change Proposals
According to DI-SESS-80639, Engineering Change Proposal (ECP), an Engineering Change Proposal (ECP) provides the documentation in which the engineering change is described and how the proposed change will be implemented. MIL-HDBK 61, Configuration Management Guidance, states that ECP documentation is used to establish how an engineering change is described, justified, and submitted to (a) the current document change authority for approval or disapproval of the design change in the documentation and (b) to the procuring activity for approval or disapproval of implementing the design change in units to be delivered or retrofit into assets already delivered.

3.6. Materiel Improvement Plan (MIP) review boards
A Materiel Improvement Project (MIP) identifies a planned effort to investigate and resolve deficiencies or proposed enhancements. It implies an extraordinary effort to monitor and control related actions. It may require an extended effort and/or involve multiple agencies. Examples of where a MIP would be applicable are on system integration situations, where a deficiency reported on a single component involves corrective actions on multiple components or items within a system. Another example would be where multiple Deficiency Reports (DR) have been submitted on a single item.

The MIP review board is the Program Manager's key process for management and oversight of the deficiency reporting and resolution process. The review board provides management oversight and visibility of all open reports, their status, and when necessary, energizes resources to ensure timely resolution. It is intended to be a management level review.

3.7. DMSMS mitigation

Diminishing Manufacturing Sources and Material Shortages (DMSMS) management is a multidisciplinary process to mitigate risks resulting from obsolescence due to the loss of manufacturing sources or material shortages. It involves recognizing and identifying instances of DMSMS, assessing the potential for negative impacts to readiness, analyzing potential mitigation strategies, and implementing cost-effective strategies to ameliorate negative outcomes. Occurrences of DMSMS issues are inevitable, so program managers must manage them in a way that cost will effectively:

- Eliminates schedule delays.
- Avoids (or at least minimizes the scope of) out-of-cycle redesign, and
- Prevents degradations to mission performance, safety, and readiness.

The SD-22, Diminishing Manufacturing Sources and Material Shortages: A Guidebook of Best Practices for Implementing a Robust DMSMS Management Program provides best practices for robust DMSMS management. Designed primarily for the DMSMS practitioner, it should also be useful for program managers, engineers, and life-cycle logisticians.

3.7.1. Parts obsolescence

SD-19, Parts Management Guide, provides government and industry managers a pragmatic approach toward parts management to enhance weapons systems operational and logistics readiness and to reduce the logistics footprint and total ownership cost. The guidance in this document, when used in conjunction with MIL-STD-3018, Parts Management, will help ensure successful parts management to support current acquisition strategy.

Microelectronics parts in military systems require continual updating, and obsolescence is one of the main reasons. Microelectronics technologies become obsolete about every 18 months and the DoD has systems dating back half a century. For the DoD to fall behind in supporting this technology is to risk becoming obsolete itself. The Defense Microelectronics Activity provides electronic parts obsolescence management and engineering analysis.

Relevant DAU courses found in the DAU iCatalog include: CLL 032, Preventing Counterfeit Electronic Parts from entering the DoD Supply System; CLL 206, Introduction to Parts Management; and CLL 207, DMSMS Basic Component Research.

See also the Supply Support and Information Technology (IT) Systems Continuous Support chapters within this guidebook.

3.7.2. Technology Refresh

Technology Refreshment is a broad subject, since it is a factor that must be considered during all phases of the lifecycle. During both pre-acquisition and acquisition phases, decisions are made that will determine long-term requirements for technology refreshment. Poor technical performance, new requirements, and technological advances may necessitate technology updates or refreshments in legacy systems.

The Defense Acquisition Guidebook (DAG), Chapter 4, Life Cycle Sustainment, states that during the O&S phase, a program may require modifications to meet emerging requirements, improve performance, address safety issues, reduce operating costs, or extend operational life. Additionally, modern acquisition programs are dependent on technology and thus may require technology refresh and insertion at a higher rate than legacy systems. Across DoD, the definition of modification varies from the replacement of a component to an MDAP-sized investment.

3.7.3. Technology insertion

Technology Insertion (TI) can be defined as the process of incorporating and exploiting new or improved technology into existing platforms, systems, and equipment. Technology insertion integrates mature technologies with requirements and product support planning in order to expand system capability, as well as increase readiness, reduce life-cycle costs, and reduce the logistics footprint. A program can avoid significant costs by determining optimum technology insertion dates. For example, a redesign to upgrade a product should simultaneously seek to eliminate obsolete or near obsolete parts (as identified via a health assessment), because it is more cost effective to resolve a Diminishing Manufacturing Sources and Materiel Shortages (DMSMS) issue simultaneously, rather than as a standalone, out-of-cycle redesign.

Related topics include:

- Diminishing Manufacturing Sources and Material Shortages (DMSMS)
- Government-Industry Data Exchange Program (GIDEP)
- Technology Refreshment
- Counterfeit Parts
- Engineering Change Proposals (ECP)
- Obsolescence Management
- Service Life Extension Program (SLEP) & Service Life Assessment Program (SLAP)
- Continuous Process Improvement (CPI) and Lean Six Sigma (LSS)

3.8. Engineering dispositions

An engineering disposition is commonly known as a formal reply from an Engineer with the authority to grant a requested activity (i.e., repair or change) to the specified system.

The below list indicates the types of activities which may occur as a result of sustaining engineering analysis and engineering technical support which result in changes or repair to a system or its support product. These activities serve to complete, improve, correct, or review for decision a situation intended to improve sustainment metric outcomes:

- Technical manual and technical order updates; (see the Technical Data Management IPS Element chapter in this Guidebook and LOG 215 Technical Data Management)
- Repair or upgrade vs. Disposal or retirement; (see section 3.10 below)
- Maintenance data evaluation automation; (see section 3.11 below)
- Engineering change proposals; (see section 3.5 above)
- Technology insertion; (see section 3.7.3 above)
- Materiel Improvement Plan (MIP) review boards. (see section 3.6 above)

MIL-HDBK 61, Configuration Management Guidance, describes how ECPs must be dispositioned (approved or disapproved) for implementation by a properly constituted Government Configuration Control Board (CCB).

3.9. Technical manual and technical order updates

A technical manual is a publication that contains instructions for the installation, operation, maintenance, training, and support of weapon systems, weapon system components, and support equipment. TM information may be presented in any form or characteristic, including but not limited to hard copy, audio and visual displays, magnetic tape, discs, and other electronic devices. A TM normally includes operational and maintenance instructions, parts lists or parts breakdown, and related technical information or procedures exclusive of administrative procedures. Technical Orders (TO) that meet the criteria of this definition may also be classified as TMs. Readers should review the Technical Data IPS Element chapter of this guidebook for more information on Interactive Electronic Technical Manuals (IETM) and the S1000D standard for the procurement and production of interactive electronic technical publications.

In the DoD ASSIST database, there are over 90 active documents to assist with the development of technical manuals.

See also the Technical Data IPS Element chapter within this guidebook for additional information.

3.10. Repair or upgrade vs. disposal or retirement

The decision to repair, upgrade, dispose or retire a weapon system, a subsystem thereof, or a product/process of the support infrastructure is dependent upon many factors to include needs of the Warfighter, obsolescence, cost, etc. Product Support Managers should establish internal decision processes addressing these topics.

Per the JCIDS Manual, when a capability solution is approaching end of service life, there are three courses of action:

- If the capability is obsolete or otherwise not required in the future, the validation authority will rescind the validation and the DoD Sponsor will dispose of the capability solution. The capability requirements portfolio will be updated to reflect the removal of the capability requirements.
- If the originally validated capability requirements remain valid, then a replacement capability solution can be acquired to meet the same performance attributes under the authority of the originally validated document. The capability requirements portfolio will be updated to reflect the replacement capability solution.
- If adversary threats, strategic guidance, or other operational context have changed such that upgraded capabilities are required for the replacement system, a new capability requirements document will be generated by the Sponsor.

3.11. Maintenance evaluation automation
Per DoDD 4151.18, Maintenance of Military Materiel, DoD maintenance operations shall be supported by robust, effective management information at all levels. Maintenance management information systems shall provide a basis for scheduling, production control, and financial management as well as for assessment of personnel and materiel performance and quality assurance. The DoD Components shall give preference to the use of commercial off-the-shelf information technology products, such as enterprise resource planning. The DoD Components shall select systems that are consistent with the DoD Component enterprise architectures when acquiring or developing information technology products and that are compliant with the DoD Business Enterprise Architecture.

Below is an example of a maintenance evaluation automation:

U.S. Navy's Maintenance and Material Management (3-M) System
The Ship's 3-M System is the nucleus for managing a float and applicable shore station equipment. This system provides maintenance and material managers throughout the Navy with a process for planning, acquiring, organizing, directing, controlling, and evaluating the manpower and material resources used to support maintenance. The Ship's 3-M System is designed to provide for managing maintenance and maintenance support to achieve maximum equipment operation readiness.

3.12. Failure Reporting, Analysis and Corrective Action System (FRACAS)
Failure Reporting, Analysis, and Corrective Action System (FRACAS) provides a disciplined closed-loop process for solving reliability and maintainability issues at the design, development, production and fielding phases of the life cycle of a system. It is an essential element of any reliability and maintainability program found in defense systems.

Product Quality Deficiency and Discrepancy Reporting
According to DLA Manual 4000.25, Ch. 24. Chapter 24 Product Quality Deficiency Report Program, "the DoD PQDR program requires DoD Component capture and exchange product quality deficiency information to facilitate root cause determinations, corrective actions, reliability analysis, and recoupment actions (contractor caused deficiencies)." There are three primary systems that process deficiency reports within the Department of Defense and the Coast Guard. PDREP is by the far the largest system that processes PQDRs. It is used by Navy (except aviation), US Marine Corps, Coast Guard, Army, DLA, DCMA, and Air Force ground. JDRS is used by Air Force aviation and Navy aviation. All Weapons Information Systems (AWIS) is used by the aviation ordnance community to process deficiency reports for ordnance.

Mishap Investigation
DoDI 6055.07, Mishap Notification, Investigation, Reporting and Record Keeping states that it is DoD policy to: a. Protect DoD property from damage and DoD personnel from accidental death, injury, or occupational illness. b. Protect the public from risk of death, injury, illness, or property damage because of DoD activities.

Users should check with their respective organizations for specific regulations addressing mishap investigations.

A. Sustaining Engineering Major Activities by Acquisition Phase

Activities of the Sustaining Engineering IPS Element
Each activity of the Sustaining Engineering IPS Element, as listed in the PSM Guidebook Appendix A, is under the responsibility of the Program Manager, the Product Support Manager, and the lead stakeholder from other areas as applicable, i.e., configuration management, engineering, environment, manufacturing, etc. Relevant Proponency DoD offices are listed in this chapter below in Section C, Proponency.

Input to the LCSP/Product Support Strategy
Detailed guidance on development of the Life Cycle Sustainment Plan (LCSP)/Product Support Strategy states that "The purpose of this annotated outline is to improve sustainment planning for Department of Defense (DoD) weapon systems. This may be achieved when programs make design decisions that achieve operational performance requirements and reduce demand for sustainment."

While information from Sustaining Engineering activities will impact many areas of the LCSP/Product Support Strategy, the below LCSP sections specifically address Sustaining Engineering:

- 3.1 Sustainment Strategy Considerations
- 4. Program Review Issues and Corrective Actions
- 5. Influencing Design and Sustainment
- 8.2 Sustainment Risk Management
- 9.3 Sustaining Engineering

As Sustaining Engineering activities continue through the life cycle and become more important during production and sustainment, their impacts will both directly and indirectly impact the system's KPP, KSA and APA parameters. The PSM and LCL should start these activities early in the system lifecycle for greatest impact.

When Is Sustaining Engineering Delivered and Managed in the Lifecycle?
The activities within the Sustaining Engineering IPS Element are best visualized in the DoD Product Support Implementation Roadmap Tool. This tool allows the User to check the box highlighting information specifically linked to the Sustaining Engineering Integrated Product Support Element.

Once the Sustaining Engineering IPS Element box is checked, the timeline expands to show the detailed activities and respective outputs for each activity by phase, as show in a partial illustration in Figure 3-1 below.

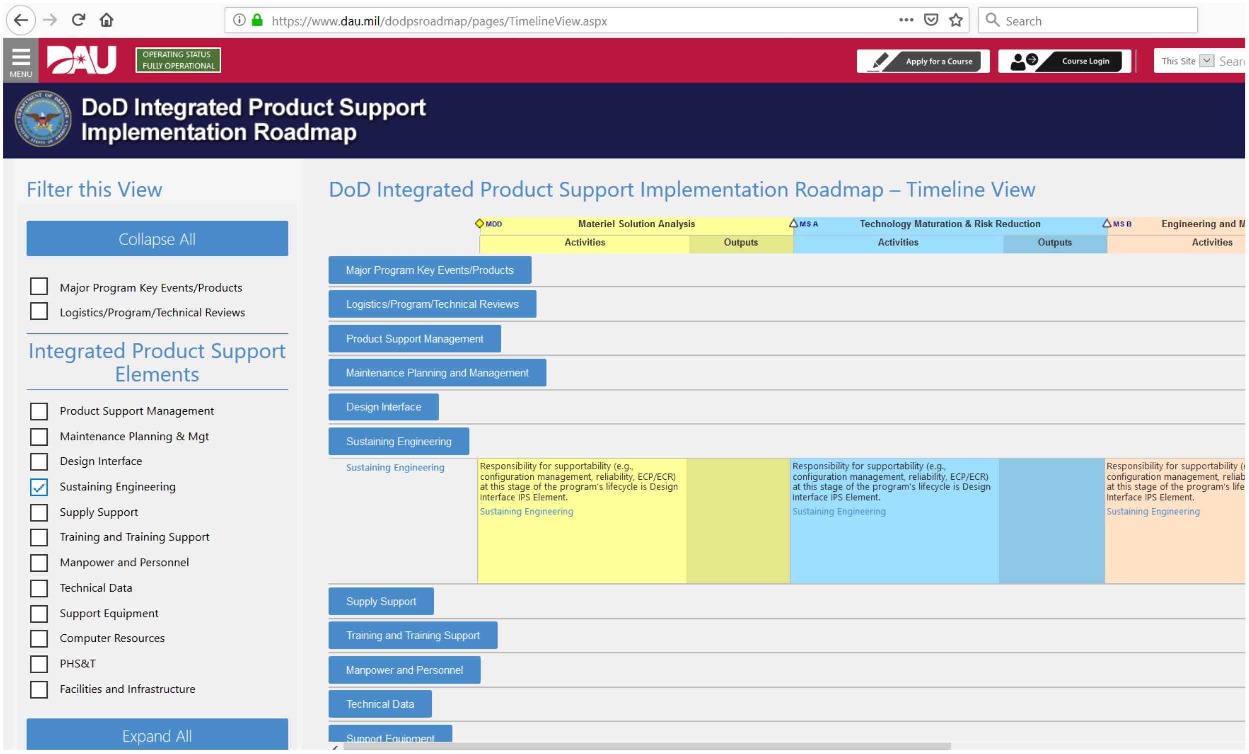


Figure 3-1, Screenshot of the DoD Integrated Product Support Implementation Roadmap Timeline View Homepage with the Sustaining Engineering IPS Element box checked. Notice the Sustaining Engineering activities and respective outputs are visible for each life cycle acquisition phase.

Each activity and output is then hyperlinked to a pop-up window that displays specific data related to that respective activity as shown in the screenshot below in Figure 3-2. The specific data is in-turn hyperlinked to allow the user to subsequently search for detailed information regarding any specific activity.

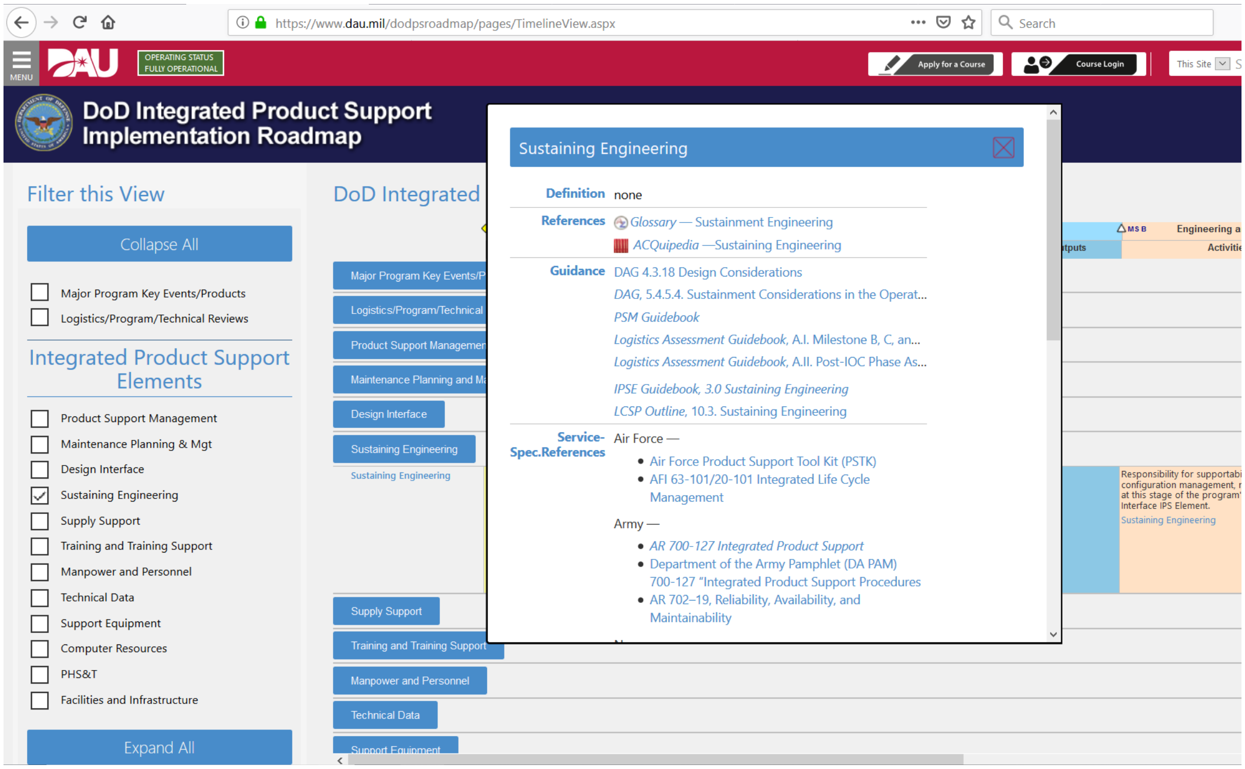


Figure 3-2, Screenshot of the DoD Integrated Product Support Implementation Roadmap Timeline View Homepage with the Sustaining Engineering IPS Element box checked. The User then clicked on the activity "Sustaining Engineering" from the listing of activities and outcomes for Sustaining Engineering. This data card provides further information for the User to search for further detailed information.

B. Data Item Description (DID) Deliverables

A Data Item Description (DID) is a completed document, typically identified in a Contract Data Requirements List (CDRL), that defines the data required of a contractor. The document specifically defines the data content, format, and intended use of the data. DIDs are found on the DLA Assist Database found at https://quicksearch.dla.mil.

Helpful Search Hint: All DID's start with the letters "DI-." Once your search results are shown, click on the column header "Document ID" to sort by alphabetical order. The "DI-" items will be easier to find. You can also insert "DI-" into the Document ID field. For the Status field, be sure to use the "Active" category from the drop-down list.

The below DIDs are a representative listing and is not inclusive of all Sustaining Engineering related DIDs.

- DI-CMAN-80639, Engineering Change Proposals
- DI-CMAN-81018, Tracking Report for Equipment Modification
- DI-ILSS-80386, Repairable Item Inspection Report
- DI-IPSC-81431, System/Subsystem Specifications

- DI-MFFP-81403, Corrosion Prevention and Control Plan
- DI-MGMT-80797, Producibility Analysis Report
- DI-MGMT-80933, Repair/Modification/Overhaul Status Report
- DI-MGMT-81238, Contractor Field Service Report
- DI-MGMT-81941 NOT 1, Obsolescence Alert Notice
- DI-MGMT-81948 NOT 1, Diminishing Manufacturing Sources and Material Shortages (DMSMS) Management Plan
- DI-MGMT-81949 NOT 1, Diminishing Manufacturing Sources and Material Shortages (DMSMS) Implementation Plan
- DI-MISC- 80359, Equipment Failure Info Report
- DI-MISC-80370, Safety Engineering Analysis Report
- DI-MISC-81371, Maintenance Data Collection Record
- DI-PSSS-81656, Bill of Materials (BOM) for Logistics and Supply Chain Risk Management
- DI-RELI-81315, FRACAS Report
- DI-SAFT-80101, System Safety Hazard Analysis Report
- DI-SESS-81613 (R&M) Program Plan
- DI-SESS-81628, Reliability Test Report
- DI-TMSS-81675, Equipment Technical Manual (Sanitized)
- DI-TMSS-81676, Subsystem Technical Manual (Sanitized)
- DI-TMSS-81677, System Technical Manual (Sanitized)
- DI-SESS-81968, Reliability and Maintainability (R&M) Allocation Report
- DI-SESS-81656, DMSMS Source Data
- DI-TMSS-80229, Technical Order Improvement Report and Reply

C. Proponency

Please note that DoD organizational changes may result in changes to Office designations and Proponency responsibilities that may not match the content in this Guidebook.

The Sustaining Engineering Element has many topical areas. The below listing identifies the DoD Proponent Office as they related to the Sustaining Engineering Element - but this list should not be considered as complete or all-inclusive. The reader is encouraged to check the Defense Acquisition Guidebook, DAU ACQuipedia library and other reference sources.

The following offices serve as proponents for issues related to Sustaining Engineering:

- For Advanced Capabilities: Directorate of Defense Research and Engineering for Advanced Capabilities
- For Sustainment: Office of the Assistant Secretary of Defense for Sustainment

Below are suggested sources for Proponency information for specific topical areas:

Corrosion
The Office of Corrosion Policy and Oversight is responsible for addressing the needs and meeting the goals of the DoD's Corrosion Prevention and Mitigation Program. The Corrosion Office develops Corrosion Prevention and Control (CPC) strategies for the DoD and oversees their implementation through the CPC Integrated Product Team (CPC IPT).

DMSMS
The DMSMS Program Office is within the Office of the Defense Standardization Program. A Diminishing Manufacturing Sources and Material Shortages (DMSMS) issue is the loss, or impending loss, of manufacturers or suppliers of items, raw materials, or software.

Reliability and Maintainability Engineering
The responsibility for achieving R&M throughout the life cycle is assigned to the heads of the DoD Components. Program Managers for Major Defense Acquisition Programs are required to implement a life cycle R&M engineering program.

System Safety
System safety is one of the specialty engineering functions of systems engineering. For Department of Defense (DoD) programs, system safety is guided by MIL-STD-882, Department of Defense Standard Practice: System Safety. System safety applies from the inception of a program of record through the demilitarization of the system.

Software Sustainment
This website below contains a link to a Software Sustainment overview by the Defense Acquisition University, dated 7 June 2017.

Technical Manuals
DoD has expressed goals for an interoperable digital logistics product/technical data environment to improve warfighter support and reduce the total costs to operate and maintain defense systems. IETMs, or Interactive Electronic Technical Manuals, provide dialog driven interaction with the user, guided diagnostic troubleshooting & fault isolation, and integration with training and other logistics support functions. Each DoD Component has specific regulations and guidelines regarding technical manual and technical order development, delivery, and sustainment. Readers are encouraged to contact their organization's support organization for relevant local references.

Value Engineering
Components use VE to systematically analyze the functions of programs, projects, systems, products, items of equipment, facilities, buildings, services, and supplies in order to achieve the essential functions at the lowest life cycle cost consistent with required performance, reliability, quality, and safety.

D. U.S. Government Statute, Regulations, DoD Policy and Guidance

The below policy and guidance are suggested as a core set of references. Note that this list does not contain policy and guidance from the DoD Components/Services. Readers should check with their respective organizations for additional policy and guidance specific to their program and product support requirements.

Please note that due to the high rate of change occurring in policy and guidance, the letter designations found as part of a reference will be removed in this guide. Readers are encouraged to check the DoD reference source on a frequent basis to ensure they are using the current reference version.

There are additional handbooks, manuals and other references located below in the **Best Practices** section of this chapter.

- DoD Directive 5000.01, The Defense Acquisition System
- DoDI 5000.02, Operation of the Adaptive Acquisition Framework
- Other policy located on the DoD AAF website and DoD Issuances website
- Defense Acquisition Guidebook (DAG) (Chapters 3 and 4)
- Title 10 US Code, Subtitle A, Part IV, Chapter 134, Subchapter 2244a. Equipment scheduled for retirement or disposal: limitation on expenditures for modifications
- RAM-C Rationale Report Outline Guidance
- Reliability and Maintainability (R&M) Engineering
- Systems Engineering Plan (SEP) Outline, Version 3.0
- Life Cycle Sustainment Plan (LCSP) Outline

E. Communities of Practice and Interest

The topic of design interface covers such a vast scope of equipment that there is no one community of practice. Typically, design interface communities focus on the supportability of a type of system, for example, ships and aircraft, or of a type of DoD mission.

The Preface of this IPS Elements Guidebook provides a listing of "golden references," many of which provide libraries, research portals and other resources for finding additional information on specific topics of design interface.

Many OSD offices (listed under the Proponency section above) maintain a comprehensive website with links to DoD partner organizations, policy, and guidance, plus many other resources. Readers are encouraged to check the relevant proponent website for additional information.

Readers should check with their respective organizations for the communities of practice that focus on the area of design interface most relevant to their interests.

The DAU community hub is a website that consolidates the links to approximately 50 communities of practice related to DoD acquisition practices. Many of these communities are important to the Sustaining Engineering IPS Element.

The DMSMS Knowledge Sharing Portal (DKSP) is supported by the Defense Standardization Program Office (DSPO) to be a non-biased source of products, services, information, educational resources, data interchange techniques, interactive forums, and related material to empower the DoD community (organic and industrial) to implement best practices for monitoring, tracking, resolving, and performing logistic and engineering analyses related to the impact of obsolescence. DKSP resources are extensive and include: a comprehensive listing of DMSMS tools (free and subscription based); DMSMS training materials; a library containing directives, manuals, presentations, papers, and newsletters; a calendar of DMSMS related events; and links to other useful sites and points of contact.

Best Practices Sources

- Product Support Implementation Roadmap
- Logistics Assessment (LA) Guidebook (ILA)
- SD-22 DoD Diminishing Manufacturing Sources & Material Shortages (DMSMS) Guidebook
- MIL-HDBK-2155 Failure Reporting, Analysis and Corrective Action Taken
- RAM-C Report Manual
- IPS Element Guidebook
- Logistics Community of Practice (LOG CoP) Homepage
- IPS Elements (LOG CoP Site)
- Sustaining Engineering IPS Element Site on the DAU LOG CoP
- MIL-STD-882E Standard Practice for System Safety

F. Training Resources

DAU Courseware
A complete list of DAU training resources can be found at the DAU iCatalog. Courses are classified as Training Courses (Regular [certification and assignment specific] training courses), Continuous Learning, and Targeted Training (Alternate means to meet training requirements).

- LOG 101 Acquisition Logistics Fundamentals
- LOG 102 Fundamentals of System Sustainment Management
- LOG 103 Reliability, Availability, and Maintainability (RAM)
- LOG 204 Configuration Management
- LOG 206 Intermediate Systems Sustainment
- LOG 211 Supportability Analysis
- LOG 215 Technical Data Management
- LOG 235 Performance-Based Logistics

- LOG 340 Life Cycle Product Support
- LOG 350 Enterprise Life Cycle Logistics Management
- LOG 465 Executive Product Support Manager's Course
- ENG 101 Fundamentals of Systems Engineering
- CLB 007 Cost Analysis
- CLE 001 Value Engineering
- CLE 003 Technical Reviews
- CLE 004 Introduction to Lean Enterprise Concepts
- CLE 017 Technical Planning
- CLE 036 Engineering Change Proposals (ECP) for Engineers
- CLE 301 Reliability and Maintainability
- CLL 001 Life Cycle Management and Sustainment Metrics
- CLL 005 Developing a Life Cycle Sustainment Plan (LCSP)
- CLL 006 Public-Private Partnerships
- CLL 008 Designing for Supportability in DoD Systems
- CLL 011 Performance Based Logistics (PBL)
- CLL 012 Supportability Analysis
- CLL 015 Product Support Business Case Analysis
- CLL 020 Independent Logistics Assessments
- CLL 027 Introduction to Software Life Cycle Management
- CLL 029 Condition Based Maintenance Plus (CBM+)
- CLL 030 Reliability Centered Maintenance
- CLL 032 Preventing Counterfeit Parts from Entering the DoD Supply System
- CLL 036 Product Support Manager (PSM)
- CLL 037 DoD Supply Chain Management Fundamentals
- CLL 051 System Retirement, Materiel Disposition, Reclamation, Demilitarization & Disposal
- CLL 059 Sustaining Engineering
- CLL 200 DMSMS: What Program Management Needs to Do and Why
- CLL 201 Diminishing Manufacturing and Materiel Shortages (DMSMS) Fundamentals
- CLL 202 Diminishing Manufacturing and Materiel Shortages (DMSMS) Executive Course
- CLL 206 Parts Management Executive Overview
- CLL 207 DMSMS Basic Component Research

ACQuipedia Articles
The DAU ACQuipedia serves as an online encyclopedia of common defense acquisition topics. Each topic is identified as an article. Each article contains a definition, a brief narrative that provides context, and includes links to the most pertinent policy, guidance, tools, practices, and training which further augment understanding and expand depth.

ACQuipedia was developed as a collaborative project to create content around Defense Acquisition-related topics. Articles (topics) will be maintained as a collaborative effort of subject matter experts across the Defense Acquisition University (DAU). Future growth may expand the collaboration of subject matter experts beyond DAU.

ACQuipedia provides the acquisition workforce with quick access to information in a succinct and digestible format. Article content aggregates the most relevant references and learning assets to narrowly focus users and quickly provide high value information.

Below is a listing of linked ACQuipedia articles relevant to Maintenance Planning and Management. The reader is encouraged to visit the homepage to see additional articles.

- Condition Based Maintenance Plus (CBM+)
- Corrective Maintenance Time
- Corrosion Prevention and Control
- Counterfeit Parts
- Defense Logistics Agency (DLA)
- Diminishing Manufacturing Sources and Material Shortages (DMSMS)
- Engineering Change Proposals (ECP)
- Engineering Technical Services (ETS), Field Service Representatives (FSR), and Logistics Assistance Representatives (LAR)
- Failure Modes & Effects Analysis (FMEA) and Failure Modes, Effects & Criticality Analysis (FMECA)
- Failure Reporting, Analysis, and Corrective Action System (FRACAS)
- Integrated Product Support (IPS) Element – Sustaining Engineering
- Integrated Product Support (IPS) Elements
- Life Cycle Sustainment Plan (LCSP)
- Materiel Availability
- Mean Downtime (MDT)
- Mean Time Between Failure (MTBF)
- Modification Management
- Obsolescence Management
- Performance Based Logistics (PBL) Implementation
- Post IOC Supportability
- Post-Production Software Support (PPSS)
- Product Support Analysis (MIL-HDBK-502)
- Product Support Business Case Analysis (BCA)
- Reliability Centered Maintenance (RCM)

- Reliability Growth
- Repair Turnaround Time (RTAT)
- Service Life Extension Program (SLEP) & Service Life Assessment Program (SLAP)
- Software Sustainment
- Suitability
- Supportability Design Objectives
- Supportability Testing (Logistics Test & Evaluation)
- Sustainability
- Systems Engineering in Operations and Support
- Technology Refreshment
- Value Analysis
- Value Engineering (VE) and Value Engineering Change Proposals (VECP)

Supply Support

Objective

Identify, plan for, resource, and implement management actions to acquire repair parts, spares, and all classes of supply to ensure the best equipment/ capability is available to support the Warfighter or maintainer when it is needed at the lowest possible Total Ownership Cost (TOC).

Description

Supply support consists of all management actions, procedures, and techniques necessary to determine requirements to acquire, catalog, receive, store, transfer, issue and dispose of spares, repair parts, and supplies. This means having the right spares, repair parts, and all classes of supplies available, in the right quantities, at the right place, at the right time, at the right price. The process includes provisioning for initial support, as well as acquiring, distributing, and replenishing inventories.

Overview

DoD Supply Support provides effective and efficient end-to-end customer service to meet operational requirements for all classes of supply. To supply materiel to DoD units throughout the world, the DoD Components and Agencies maintain a supply chain consisting of weapon system support contractors, retail supply activities, distribution depots, transportation channels including contracted carriers, wholesale Integrated Materiel Managers (IMM), weapon system product support integrators, commercial distributors and suppliers including manufacturers, commercial and organic maintenance facilities, and other logistics activities (e.g., engineering support activities, testing facilities, reutilization and marketing offices).

Per JP 4-09, "Distribution Operations," the DoD supply chain is a global network of DoD and commercial supply, maintenance, and distribution activities that acquires and delivers materiel and logistic services to the joint force. Its fundamental goal is to maximize force readiness while optimizing the allocation of limited resources. Distribution is an integral component of supply chain operations—the vital part of the supply chain that provides for the delivery of the right thing to the right place at the right time.

Historically, Supply Support activities were the primary responsibility of the manufacturing group, with Supply Support during sustainment being planned and implemented often under separate contract line items and separate management. The current view of integrated product support requires that the Life Cycle Sustainment Plan include and implement an integrated strategy, inclusive of all the Product Support Elements and Program functional areas, that is reviewed and reported on throughout the acquisition life cycle.

Supply Chain Management

Supply Chain Management (SCM) is a term often used in the Department of Defense and industry and holds different meanings for different audiences. The challenge is always to balance the various processes to develop the best enterprise solution. What the "best" solution needs to be depends on the requirement. There is the constant trading between performance and cost.

The supply chain transforms raw material into materials for use in the next process and ultimately into a finished good. Supply chain activities provide time, place, and utility to items as the progress through it. Therefore, until a finished product is sold, and revenue collected, the entire supply chain is a cost center and typically a focus for efficiency and cost reduction.

The DoDM 4140.01 Volume 1 identifies ten core strategies for DoD supply chain materiel management. The DoD Components:
(1) Structure materiel management to provide responsive, consistent, and reliable support to the warfighter during peacetime and war.
(2) Establish end-to-end processes focused on achieving warfighter readiness goals and meeting customer needs in the most efficient way possible within the bounds of acceptable risk, including security risk.
(3) Provide best-value materiel and services to support rapid power projection and operational sustainment of U.S. forces as required by the National Military Strategy.
(4) Use the supply chain operational reference processes of plan, source, make and maintain, deliver, and return as a framework for developing, improving, and conducting materiel management activities to satisfy customer support requirements as efficiently as possible.
(5) Consider all life-cycle costs associated with materiel management, including acquiring, distributing, transporting, storing, maintaining, repairing, protecting, and disposing.
(6) Identify a dominant supply chain strategy from supply chain characteristics and apply the strategy consistently for a given type of item, commodity, class, customer, or supplier.
(7) Employ risk management strategies to identify and assess potential supply chain disruptions: (a) Within the DoD supply chain (e.g., insufficient quality, unreliable suppliers, imbedded threats or access points, machine break-down, uncertain demand, vulnerability from interruptions and interdiction of supplies, including fuel and electric power). (b) Outside the DoD supply chain (e.g., flooding, attacks, labor strikes, natural disasters, large variability in demand).
(8) Reduce exposure to potential disruptions, monitor the supply chain to provide as much early warning as possible, and mitigate the effects of problems that do occur.
(9) Will maintain records and documentation for purposes of audits prescribed in this manual.
(10) Protect Defense missions by implementing materiel management procedures that prevent the introduction of unauthorized or counterfeit materiel.

The reader is encouraged to review the ACQuipedia articles related to the supply chain and supply support as well as the DoDM 4140.01 Volume 1 for further information on supply chain processes and business practices.

Wholesale versus Retail
The DoDM 4140.01 Volume 1 defines the terms retail and wholesale:

- Retail means the level of inventory below the wholesale level, either at the consumer level for the purpose of directly providing materiel to ultimate users or at the intermediate or region level for the purpose of supplying consumer levels or ultimate users in a geographical area.
- Wholesale means the highest level of organized DoD supply that procures, repairs, and maintains stocks to resupply the retail levels of supply. Synonymous with wholesale supply, wholesale level of supply, wholesale echelon, and national inventory.

Classes of Supply
All items which must be distributed to the Warfighter have been divided into ten categories, or classes, based upon their respective requirements for procurement, packaging, storage, handling, transportation. These requirements may be in areas of safety, environmental, size, hazard category, end use, shelf life, etc. These categories are intended to facilitate supply management and planning. Each class is further broken down into subclasses to further delineate distribution requirements. DoD Joint Publication, JP 4-09, "Distribution Operations," provides a detailed description of each class of supply and the unique requirements for each class as part of a "Commander's Checklist for Distribution of Materiel and Movement of Forces" in Appendix C.

The ten Supply Classes are designated by Roman numerals as listed below:

I. Rations and gratuitous issue of health, morale, and welfare items;
II. Clothing, individual equipment, tentage, tool sets, and administrative and housekeeping supplies and equipment;
III. Petroleum, oils, and lubricants;
IV. Construction materials;
V. Ammunition;
VI. Personal demand items;
VII. Major end items, including tanks, helicopters, and radios;
VIII. Medical;
IX. Repair parts and components for equipment maintenance;
X. Nonstandard items to support nonmilitary programs such as agriculture and economic development.

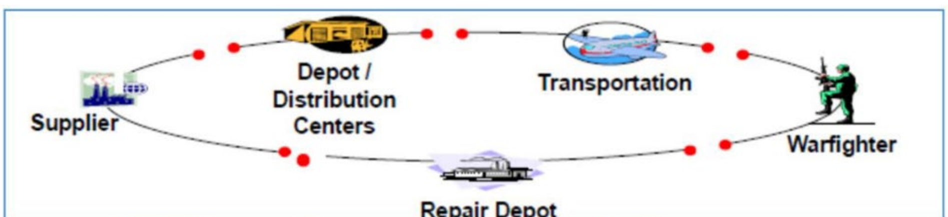
Why Supply Support is Important
Support extends across the DoD logistics enterprise. The DoD logistics enterprise encompasses global logistics capabilities provided by Combatant Commands, Military Services, Defense Agencies, designated process owners, the national industrial base, non-defense U.S.

Government agencies, multinational governments and military forces, non-governmental organizations, and both domestic and international commercial partners.

Understanding, clarifying, and institutionalizing the diverse roles, relationships, and responsibilities of all these enterprise partners are essential to planning, executing, controlling, and assessing logistics enterprise operations. Enterprise partners, stakeholders, and process owners must collaborate to optimize use of resources and capabilities from all available sources and to integrate and synchronize logistics processes to support the Warfighter.

A Supply Chain Management (SCM) strategy addressing all stakeholders is critical to the success of any Performance Based Life Cycle Product Support (PBL) effort. Materiel support is a critical link in weapons systems supportability. All the skilled labor, advanced technology, and performance mean little without the “right part, in the right place, at the right time.” The supply chain is also a primary venue for utilizing industry flexibility, capability, and proprietary spares support.

The interfaces or “touch points” between and among all the stakeholder organizations with the program’s supply chain must be identified and understood in order to determine how best to manage each part of the supply chain and what the impacts of decisions might be.



Interface	Impact
Inventory and transportation planning	• Inventory positioning decisions • Higher transportation costs • Longer customer wait times
DoD Logistics IT systems	• Lack of information exchange • Little visibility into assets
Repair capacity and new inventory procurement	• Higher materiel costs – buying new instead of fixing old
Maintenance planning and technical data/RBOMs	• Depot inefficiencies – consumables are not available when needed
Collaboration between supplier and customer in predicting demand	• Demand plan accuracy not uniformly captured • Lack of necessary parts • Longer customer wait times
Customer wait time information not always captured at each node	• Internal processes contributing to CWT – without nodal data it is difficult to drive focused improvement • Higher inventory requirements – high CWT leads to higher safety stock requirements
DoD supply chain not fully leveraged	• Based on historical performance, DoD losing sales opportunities needed to take full advantage of economies of scale

Figure 4-1. Functional Interfaces Impact and are Impacted by Supply Chain Performance

Product Support Manager Activities

4.1. Initial provisioning

Provisioning is an integral part of Supply Chain Management (SCM) and closely aligned with cataloging. Provisioning is the management process of determining and acquiring the range and quantity of support items necessary to operate and maintain an end item of materiel for an initial period of service. Materiel managers and Primary Inventory Control Activities (PICA) will work with program managers to address logistics requirements and related supply chain costs within the total life-cycle systems management. They will ensure that item technical and logistics data relevant to end item supply support are documented and accessible to DoD and commercial materiel managers responsible for provisioning, follow-on support, and evaluation of supply chain performance. The objective of provisioning data management is timely access to all data required to identify, acquire, and assess support items.

The Initial Period of Service consists of the Initial Support Period (ISP) and the Demand Development Period (DDP). The ISP is the period of time extending from initial system operational determination to the expected initial date of demand support. The DDP is the period of time extending from the expected initial date of demand support to a point in time when requirements may be forecast using actual demands.

DoDM 4140.01, DoD Supply Chain Materiel Management Policy, is composed of eleven volumes. It establishes policy and assigns responsibilities for management of materiel across the DoD supply chain.

Provisioning Guidance Conference

Provisioning is the process of determining the range and quantity of specific items of supply necessary to operate and maintain an end item for an initial period of operation. Initially, a DoD Component (Army, Navy, Air Force, Marine Corps) awards a contract for a required end item. The end item can range from a small instrument to a complex major item or weapon system. After contract award, a guidance conference is held.

The purpose of the guidance conference, normally scheduled 60-90 days after contract award, is to ensure that the Contractor and the Government have a firm understanding of the contractual requirements, to establish funding, and to assign responsibilities, actions, and timelines for all stakeholders in support of the provisioning spares conference. The results of the guidance conference are published as minutes of the conference and are signed by representatives from the government and the contractor. These minutes become part of the contract. The reader is encouraged to check with their respective organizations for specific provisioning conference regulations.

Provisioning Technical Documentation

Provisioning technical documentation is required for all systems and equipment acquired or modified under the acquisition program unless all supply support will be provided by the contractor for the life of the system. Planning for supply support and initial provisioning is required to begin concurrently with the development of performance requirements for the system or as early as possible in the system's life cycle.

For Department of Defense (DoD) provisioning technical documentation, there is a specific format for delivery of provisioning data. Per DoDM 4140.01, DoD Supply Chain Materiel Management Policy, Volume 2, materiel managers will identify the necessary usage data to be collected and delivered by the contractor in a format compatible with the automated system used in the U.S. Government's requirements determination process. The reader is encouraged to check with their respective organizations for specific provisioning technical documentation requirements.

4.2. Routine Replenishment Management, Including Buffer and Safety Stock Management
Routine replenishment includes post-fielding resupply of all supply classes to support on-going operations. Per DoDM 4140.01, DoD Supply Chain Materiel Management Policy, Volume 2, provisioning requirements should be extended based on engineering data through the demand development period (DDP) as addressed in Section 7 of this volume. After the DDP for support items is complete, any pre-planned increases in end item density or operating usage should not be the basis for further procurement of initial spares. Those requirements will be considered replenishment spares and should be satisfied using the provisioning requirements process.

Buffer Stock or Safety Stock Management
Safety stock (also called buffer stock) is a term used by logisticians to describe a level of extra stock that is maintained to mitigate risk of stock-outs (shortfall in raw material or packaging) due to uncertainties in supply and demand. Adequate safety stock levels permit business operations to proceed according to their plans. Safety stock is held when there is uncertainty in the demand level or lead time for the product; it serves as an insurance against stock-outs.

Per DoDM 4140.01, DoD Supply Chain Materiel Management Policy, Volume 2, as a buffer against backorders caused by fluctuations in demand over lead times, repair cycle times, attrition rates, and in other variables, DoD Components should stock safety stocks. Those stocks should decrease as fluctuations in demand decrease.

4.3. Demand Forecasting and Readiness Based Sparing (RBS)
Readiness-Based Sparing (RBS) is the practice of using advanced analytics to set spares levels and locations to maximize system readiness. Readiness-Based Sparing determines the inventory requirements for achievement of readiness goals:

- What to stock: parts, components, sub-systems (multi-indenture)
- Where to stock: strategic distribution points (SDP), forward distribution points (FDP), and/or at operational-level distribution points (multi-echelon)
- Taken together, these make up a two-dimensional Multi-Indenture, Multi-Echelon—or "MIME" RBS
- Typically, the RBS model objective is to achieve readiness (such as Operational Availability) at the least investment.

Demand forecasting is the prediction of demand for an item or group of items for a future period of time. The demand forecast for a forecastable item can be used to set readiness-based requirements levels or demand-based requirements levels for the item. Per DoDM 4140.01, DoD Supply Chain Materiel Management Policy, Volume 2, provides additional information.

Availability Based Sparing (ABS)
Availability Based Sparing (ABS) was mandated by DoD policy in the mid-1980's and implemented by the Services. The premise is that sparing is directly linked to an item's availability rating, not to historical demand. Implementation of the Readiness-Based Sparing (RBS) process is now synonymous with availability-based sparing.

Per DoDM 4140.01, DoD Supply Chain Materiel Management Policy, Volume 2, where multi-echelon RBS models are not yet available, DoD Components will:
1. Base wholesale stockage of weapon system-essential items either on demand-based requirements with readiness-oriented time goals (e.g., goals that support weapon system availability targets) or on limited-demand or non-demand-based requirements.
2. Base retail stockage of weapon system-essential items on demand-based requirements that have their support goals driven by weapon system readiness or on non-demand-based requirements.

Long Lead Time Items
Long lead items or long lead time items are those components of a system or piece of equipment for which the times to design and fabricate are the longest, and therefore, to which an early commitment of funds may be desirable to complete the system by the earliest possible.

Per DoDM 4140.01, DoD Supply Chain Materiel Management Policy, Volume 2, the procuring DoD Component may award a contract for long lead time items for provisioned items support using multiyear contracting, as outlined in Subpart 217.172 of the DFARS for long-lead time support items: (1) To obtain limited quantities of long lead time items at not less than minimum economic rates and (2) Which require early ordering to ensure timely delivery due to their complexity of the items' design due to complicated manufacturing processes, or limited production.

Market Analysis and Benchmarking
Market analysis or Market Research is a process for gathering data on product characteristics, suppliers' capabilities, and the business practices that surround them. Includes the analysis of that data to inform acquisition decisions. There are two types of market research, strategic market research and tactical market research.

Benchmarking is the practice of comparing business processes and performance metrics to industry bests and best practices from other companies. Dimensions typically measured are quality, time, and cost. Benchmarking is used to measure performance using a specific indicator (cost per unit of measure, productivity per unit of measure, cycle time of x per unit of measure or defects per unit of measure) resulting in a metric of performance that is then compared to others. The DoD Supply Chain Metrics Guide contains additional information on supply chain benchmarking goals.

The DoD Defense Pricing and Contracting website provides additional guidance and links to resources for market analysis and market intelligence.

4.4. Bill of Materials (BOM) Management and Maintenance

A bill of materials or product structure (also referred to as a bill of material, BOM, or associated list) is a list of the raw materials, sub-assemblies, intermediate assemblies, sub-components, parts, and the quantities of each needed to manufacture an end product. A BOM can define products as they are designed (engineering bill of materials), as they are ordered (sales bill of materials), as they are built (manufacturing bill of materials), or as they are maintained (service bill of materials).

The Bill of Materials (BOM) will provide information that can be used to establish the production status of parts used in a system. The BOM will also provide Diminishing Manufacturing Sources and Material Shortages (DMSMS) management essential information that enables the identification, forecasting, mitigation, and management of Hardware and Software obsolescence as a part of the Department of Defense (DoD) Program Manager's Total System Life Cycle Management responsibilities. The data will be used in DMSMS forecasting tools to allow for standard and efficient sharing of information on common items. The BOM will also provide logisticians and supply chain risk managers with additional data they require to ensure supportability requirements and supply chain risks are identified or mitigated during the development of a system.

4.5. Support Equipment Initial Provisioning

Support equipment may need the Program Office to execute provisioning processes as for the weapon system. Support and test equipment can be segmented into "common" and "peculiar" categories.

- Common Support Equipment (CSE) includes items that are currently in the DoD inventory and are applicable to multiple systems. Because CSE is already in the DoD inventory, its technical documentation, support requirements, provisioning records and maintenance requirements are cataloged as part of the federal logistics information system.
- Peculiar Support Equipment (PSE) includes items that are unique to the system and have no other application in DoD. PSE requires development of provisioning technical documentation in federal cataloging records. PSE will require life cycle support, however, support that is currently not available in the DoD system but will have to be developed concurrently with development of the major systems.

Please see the Support Equipment IPS Element chapter in this Guidebook for more information.

4.6. Support Equipment Routine Replenishment Provisioning

Support equipment will need routine replenishment either of the entire product if it is non-repairable, i.e., most hand tools and electronic components, or of the equipment's repair parts, i.e., complex test equipment or training equipment.

Please see the Support Equipment IPS Element chapter in this Guidebook for more information.

4.7. Reparable, repair part, and consumable procurement

Actual procurement of reparables, repair parts and consumables is dependent upon many factors such as appropriation type, source of supply, DoD Component and Agency procedures governing procurement activities, etc. Product Support Managers should review their respective DoD Component and Agency procurement practices for each item needing to be procured.

Reparables

Per DoDM 4140.01, DoD Supply Chain Materiel Management Policy, Volume 2, a reparable item is an item of supply subject to economical repair and for which the repair (at either depot or field level) is considered in satisfying computed requirements at any inventory level. The term "reparable" is synonymous with "repairable item."

Spares

Per DoDM 4140.01, DoD Supply Chain Materiel Management Policy, Volume 2, when used in reference to stockage computations in this issuance, a spare is an individual item stocked in case another individual item of the same type is worn out, broken, or lost.

Repair parts

The terms "spare part" and "repair part" are often used synonymously. A repair part is used to replace another individual item of the same type that is worn out, broken, or lost, during maintenance, overhaul, or restoration of an equipment, machine, or system.

Examples are: A reparable item used in connection with the maintenance of an end item or weapon system is commonly referred to as a reparable repair part but may be referred to as a spare part. A consumable item used in connection with the maintenance of an end item or weapon system is commonly referred to as consumable repair part but may be referred to as a repair part.

Consumables

Per DoDM 4140.01, DoD Supply Chain Materiel Management Policy, Volume 2, a consumable item is an item of supply or an individual item (except explosive ordnance and major end items of equipment) that is normally expended or used up beyond recovery in the use for which it is designed or intended.

Replenishment Part

Per the DFARS E-103.26, a replenishment part is a part, repairable or consumable, purchased after provisioning of that part, for: replacement; replenishment of stock; or use in the maintenance, overhaul, and repair of equipment such as aircraft, engines, ships, tanks, vehicles, guns and missiles, ground communications and electronic systems, ground support, and test equipment.

4.8. Cataloging

Per DoDM 4140.01, DoD Supply Chain Materiel Management Policy, Volume 2, Cataloging is the process of uniformly identifying, describing, classifying, numbering, and publishing in the Federal Catalog System all items of personal property (items of supply) repetitively procured, stored, issued, or used by federal agencies.

The Defense Logistics Agency (DLA) Logistics Information Service (DLIS) is responsible for data strategy, management, operational control and accomplishment of logistics data support for all National Stock Number (NSN) items in the Federal Catalog System (FCS) used in supply management operations within and between the United States Military Services, other DoD activities, federal and civil agencies, and foreign governments.

NIIN and NSN Assignment

A National Item Identification Number (NIIN) or National Stock Number (NSN) is simply the official label applied to an item of supply that is repeatedly procured, stocked, stored, issued, and used throughout the NATO supply system. It is a unique, item identifying, series of numbers. When an NSN is assigned to an item of supply, data is assembled to describe the item, including: item name, manufacturer's reference number, unit price, and physical and performance characteristics. NSNs are an essential part of the military logistics supply chain used in managing, moving, storing, and disposing of material. NSNs are used to identify and manage almost every imaginable item from aircraft parts to toilet paper, from space vehicles to nuts and bolts. There are over 17 million active NSNs and more than 10 million historical NSNs (no longer used). These NSNs represent more than 42 million manufacturer's part numbers from more than 2.6 million suppliers.

Per DoDM 4140.01, DoD Supply Chain Materiel Management Policy, Volume 2, the NSN is the 13-digit stock number consists of the 4-digit federal supply classification code and the 9-digit National Item Identification Number (NIIN). The national item identification number consists of a 2-digit National Codification Bureau number designating the central cataloging office (whether North Atlantic Treaty Organization or other friendly country) that assigned the number and a 7-digit (xxx-xxxx) nonsignificant number. The NSN number is arranged: 9999-00-999-9999.

SM&R Codes

Source maintenance and recoverability (SM&R) codes are used to communicate maintenance and supply instructions to the various logistic support levels and using commands for the logistic support of systems, equipment, and end items. These codes are made available to their intended users by means of technical publications such as allowance lists, illustrated parts breakdown (IPB) manuals, repair parts, and special tools lists (RPSTL), maintenance manuals and supply documents. These codes are assigned to each support item based on the logistic support planned for the end item and its components.

4.9. Receiving

Per DoDM 4140.01, DoD Supply Chain Materiel Management Policy, Volume 4, All actions taken by a receiving activity from the physical turnover of materiel by a carrier until the on-hand balance of the accountable stock record file or in-process receipt file is updated to reflect the received materiel as an asset in storage, or the materiel is issued directly from receiving to the customer.

4.10. Storage

Storage is broadly defined within the supply chain as composed of the assets in storage and the storage activities or facilities. Per DoDM 4140.01, DoD Supply Chain Materiel Management Policy, Vol 5:

- In-storage is defined as the assets in storage at retail consumer level sites, at retail intermediate storage sites, at disposal activities, or in wholesale inventories, to include DoD materiel in the custody of a contractor.
- A storage activity is the organization element of a distribution system that is assigned responsibility for the physical handling of materiel incident to its check-in and inspection (receipt), its keeping and surveillance in a warehouse, shed, tank, or open area (storage), and its selection and shipment (issue).

Readers are encouraged to review the Packaging, Handling, Storage and Transportation (PHS&T) IPS Element chapter in this Guidebook for more information on storage.

4.11. Inventory management

Within a given supply chain, component and materiel inventory levels are key to control of life-cycle costs and system readiness. DoD 4140.01 “DoD Supply Chain Materiel Management Policy” states that one DoD supply chain materiel management goal is to “…operate as a high-performing and agile supply chain responsive to customer requirements during peacetime and war while balancing risk and total cost.” In terms of Inventory Management, this suggests tailoring supply support so as to minimize DoD investment while providing inventory where and when needed. This structuring of support should be done within the context of total life-cycle systems management, with a primary objective of responsive, consistent, and reliable support to the war fighter. That support should be dictated by performance agreements with customers to the maximum extent. For weapon system materiel, those agreements should be negotiated with weapon system users or their representatives as part of a performance-based logistics (PBL) strategy. For other materiel, the agreements should be negotiated between support providers and customer representatives.

Economic Order Quantity (EOQ)
DoDM 4140.01, DoD Supply Chain Materiel Management Policy, Volume 2, specifies that the Section 2384a of Title 10, United States Code, and the Section 3310 of Title 41, United States Code, mandate that DoD Components will procure supplies in a quantity that will result in the most advantageous total and unit cost to the government and that does not exceed the quantity reasonably expected to be required by the Component.

An EOQ is the quantity derived from a mathematical technique used to determine the optimum (lowest) total variable costs to order and hold inventory. Synonymous with procurement cycle level.

The Wilson EOQ is used to calculate the optimal quantity that can be purchased to minimize the cost of both the holding inventory and the processing of purchase orders. Variations include recognizing back orders, quantity discounts, or operational constraints.

War Reserve
Per the DoDM 4140.01, DoD Supply Chain Materiel Management Policy, Volume 2, stocked war reserve is specifically held to support a wartime requirement. The DoD Components will:
a. Size, manage, and position war reserve materiel to maximize flexibility to respond to a spectrum of regional contingencies, while minimizing the DoD investment in inventories.
b. Use peacetime operating stocks, training stocks, materiel available through industrial preparedness planning, host-nation support agreements, bilateral military agreements, and commercial sources to:
(1) Offset their investment in inventory to meet war reserve requirements.
(2) Reduce the risk of funding shortfalls.
(3) Ensure the warfighter receives the latest in materiel technology.
c. Only war reserve stocks for items that cannot be procured and made ready for deployment within required timeframes will be held in wholesale war reserve stocks. To ensure that sufficient wholesale war reserve stocks are held, materiel managers should also consider the risk of stock non-availability from the sources.

Warstopper Program
The Warstopper Program implements specific industrial preparedness measures for certain supply items, and preserves critical industrial capabilities to support the Department's readiness and sustainment requirements. These measures are applied to selected items such as chemical protective suits, nerve agent antidote auto-injectors, meals-ready-to eat (MRE), and some specialty steels. Peacetime demand for these items is inadequate to sustain an industrial base sufficient to meet readiness and mobilization requirements. DLA uses a rigorous business case evaluation to obtain a return on investment that maximizes warfighter benefits. The Warstopper Program is the single Agency program for the preservation of essential production capability. It provides the means to invest in improving industry responsiveness, typically without purchasing finished goods inventory. It includes the funding of Industrial Preparedness Measures (IPM) that support the "surge" of go-to-war materiel to increase supply availability of DLA procured items and provides for War Reserve Materiel (WRM) items as directed in Defense

planning documents. The Warstopper Program has led to cumulative inventory, War Reserve Materiel, cost avoidance of nearly $6 billion through the investment of approximately $927 million over the program's lifetime (1993).

4.12. Transfer

In the context of the supply chain, the transfer of material is defined as materiel being either shipped and received or received in place. Readers should see the DoDM 4140.01, DoD Supply Chain Materiel Management Policy, for more information on this topic.

Cross-leveling

Cross-leveling is the transfer of ownership of retention and potential reutilization assets between the Military Departments (including the U.S. Coast Guard) for application against a Total Munition Requirement (TMR) shortfall.

4.13. Issuance

Within the DoD supply system, the DoD has issue transaction processes to ensure information regarding all items transferred from one organization to another is documented. DoD 4000.25-1, Military Standard Requisitioning and Issue Procedures (MILSTRIP), governs issue of material. Readers should review their respective DoD Component and Agency guidelines for specific processes regarding material issue.

4.14. Redistribution

Per the DoD 4000.25-1, Military Standard Requisitioning and Issue Procedures (MILSTRIP), a REDISTRIBUTION ORDER (RDO) is issued by a responsible IMM to an accountable supply distribution complex directing release of materiel to another supply distribution activity within the same supply complex. For intra-Service use, an RDO may be used to direct release and shipment of materiel from a post, camp, station, or base to another similar activity to satisfy a specific demand.

Per the DoDM 4140.01, DoD Supply Chain Materiel Management Policy, Volume 6, the DoD Components may fill requests for materiel or requisitions through lateral redistribution of assets. Redistribution methodologies and procedures apply to all materiel assets, including fuel and medical, regardless of funding source. With the exception of ammunition, principal items and equipment are excluded. Redistribution (cross-leveling) procedures for ammunition are in Volume 11 of this manual.

4.15. Disposal

Per the DoDM 4140.01, DoD Supply Chain Materiel Management Policy, Volume 6, the DoD Components will transfer materiel to disposal activities with the minimal packaging necessary to ensure it is handled, transported, and received intact. The DoD Components will:
a. Establish routine procedures to recover long life reusable containers with defined requirements.

b. When feasible, use materiel available in the materiel disposition system to the extent practicable to offset the cost of planned procurements. Use serviceable disposition assets to offset the cost of planned repair actions.
c. Follow procedures in Volume 11 of this issuance for critical safety item turn-in.
d. Follow procedures and responsibilities for disposal in DoDM 4160.21 (4 volumes).
e. Follow procedures and responsibilities for demilitarization in DoDI 4160.28 and DoDM 4160.28.

Returns
Per the DoDM 4140.01, DoD Supply Chain Materiel Management Policy, Volume 6, materiel managers will oversee the returns process and will:
(1) Return materiel in a timely manner so that enough assets are available for use or reuse in the DoD supply chain to satisfy customer requirements. Base the decision to return materiel from supply classes I to X on economic and customer requirements considerations.
(a) Consider DoD Components' assets in determining future procurement or repair requirements for items whose projected requirements depend on forecasted demands.
(b) Dispose of materiel assets that exceed approved acquisition requirements unless economic or contingency reasons justify retaining them.
(2) Return materiel excess to retail supply activity requirements, materiel in need of depot level repair, or defective materiel.
(a) Categorize return or retrograde shipments automatically by type of return; (e.g., excess materiel, unserviceable materiel, defective or discrepant materiel, class of supply, or other redistribution stocks).
(b) Identify physical units of materiel by type of return using appropriate tags, labels, and color codes.

4.16. Material pricing
Per the DoD Guidebook for Acquiring Commercial Items, when determining a fair and reasonable price, market research should be conducted in order to compare the proposed price to comparable market pricing. Determining a fair and reasonable price is usually a more straight-forward process when acquiring commercially available off-the-shelf (COTS) items. One the other hand, determining a fair and reasonable price is challenging when the commercial market does not exist for a specific item or when market price data is not readily available. Ultimately, the effectiveness of price analysis will depend on what meaningful data the Government successfully obtains to conduct the pricing analysis.

The DoD Defense Procurement and Acquisition Policy website provides cost, pricing, and finance information on various related topics.

The approach to material sourcing is defined in DoDM 4140.01, DoD Supply Chain Materiel Management Policy, Volume 2, as:
The DoD Components will:
(1) Employ strategic sourcing and acquisition practices to provide life-cycle-support solutions that balance support goals, total supply chain costs, and performance factors.

(2) Include best-value selection among organic and commercial support alternatives in strategic sourcing and acquisition practices.
(3) Seek to minimize life cycle costs.
(4) Maximize the use of existing government-owned inventory before seeking new commercial support on all contracts and partnering agreements.
(5) In accordance with the procedures in Part 245.103-73 of the Defense Federal Acquisition Regulation Supplement, in all contracts where the contractor holds or manages government inventory, establish contract clauses that require the contractor to: (a) Regularly schedule (typically, semi-annually) inventory reporting.(b) Ensure that inventory levels meet program requirements.(c) Identify government inventory in excess of authorized amounts.
(6) In accordance with Executive Order 13693 and its implementing instructions, give preference in all procurements to recycled content products, energy and water efficient products and services, and Bio-Preferred and bio-based designated products, to include sustainable energy, except those products or services procured for combat or combat-related missions.
(7) Seek to minimize on-order assets above item approved acquisition objectives wherever cost effective and in the best interests of the U.S. Government.

4.17. Total Asset Visibility/AIT

Per the DoDM 4140.01, DoD Supply Chain Materiel Management Policy, Volume 2, the DoD Components will use DoD asset visibility capabilities to maximize existing inventories, DLA-managed assets, or component-owned assets at storage locations throughout DoD.
(1) Use asset visibility in all issuable or potentially issuable condition codes and requirements of retail supply activities to satisfy requirements across the supply chain.
(2) Provide the Combatant Commands with visibility of materiel assets on hand, in transit, and on order to their area of responsibility.
(3) Provide the Military Departments headquarters, subordinate units, and the weapon system managers of retail-level assets and requirements within their respective Military Departments with sufficient visibility of materiel to assess their capability to support operational and contingency plans and to support weapon system readiness.
(4) Participate in the DLA In-Storage Visibility Program and minimize restrictions on the use of available consumable inventories to offset other component’s orders and to fulfill open backorders for consumable materiel.
(5) Use visibility of assets in all condition codes transferred to the DLA Disposition Services to recall serviceable items instead of initiating a procurement or depot repair action for those items.

4.17.1. Serialized Item Management (SIM)

Per DoDI 4151.19, Serialized Item Management (SIM) for Life-Cycle Management of Materiel, it is DoD policy to implement SIM to enable effective and efficient life-cycle management of materiel through the creation, capture, and use of Life-Cycle Item Management (LCIM) data.

SIM capabilities will facilitate the effective management of populations of select items throughout their life cycle using data associated with a unique item by its UII. These capabilities will focus on using comprehensive and timely life-cycle data about each uniquely identified item. The goal of SIM is the effective management of populations of select items throughout their life cycle using data associated to a unique item by its Unique Item Identifier (UII).

4.17.2. Item Unique Identification (IUID)

Item Unique Identification (IUID) is a system of establishing unique item identifiers (UII) within the DoD by assigning a machine-readable character string or number to a discrete item, which serves to distinguish it from other like and unlike items. (Ref: MIL-STD-130, Identification Marking of U.S. Military Property).

Item Unique Identification (IUID) applies to all items for which the government's unit acquisition cost is $5,000 or more; items for which the government's unit acquisition cost is less than $5,000, when identified by the requiring activity as DoD serially managed, mission essential or controlled inventory; when the government's unit acquisition cost is less than $5,000 and the requiring activity determines that permanent identification is required; regardless of value for (a) any DoD serially managed subassembly, component, or part embedded within an item and, (b) the parent item that contains the embedded subassembly, component or part. Source*:* DoD Instruction 8320.04, Item Unique Identification (IUID) Standards for Tangible Personal Property.

4.17.3. Radio Frequency Identification (RFID)

Radio Frequency Identification (RFID) technologies facilitate the communication of item identification information via radio waves. RFID tags attached to, or incorporated into, an item hold data uniquely identifying a particular item while in-transit, in-storage, in-use, or in-maintenance. RFID system users retrieve data stored on those tags via communication between tags and readers (fixed or handheld), at a specific time and place. Two types of RFID technologies are currently used in the DoD system: active RFID and passive RFID. RFID requirements are independent from UID. Any existing UID label requirements remain regardless of the RFID requirement. RFID requirements do not supersede or replace any other marking/labeling requirements.

Bar Coding

A bar code is an array of rectangular bars and spaces in a predetermined pattern representing coded elements of data that can be automatically read and interpreted by automatic bar code reading devices.

4.18. Shelf-Life Management

Shelf-life is the total period of time beginning with the date of manufacture, cure, assembly, or pack (subsistence only), that an item may remain in the combined wholesale (including manufacturer's) and retail storage systems, and still remain usable for issue and/or consumption by the end user.

Typical Shelf-Life items include food, medicines, batteries, paints, sealants, adhesives, film, tires, chemicals, packaged petroleum products, hoses/belts, mission-critical O-rings, and Nuclear/Biological/Chemical equipment and clothing.

Per the DoDM 4140.01, DoD Supply Chain Materiel Management Policy, Volume 2, during acquisition, materiel managers will ensure that provisioned support items are coded and reviewed for shelf-life considerations and assign a shelf-life code according to the DoD Shelf-Life Item Management Program.

The Shelf Life Extension System (SLES) is the DoD Shelf-Life management system for internal shelf-life policy information for the supply chain (life-cycle management) of standard and hazardous shelf-life items contained in the Federal supply system. Note: registration is required to access the DLA SLES program website.

4.19. Buffer Management

Buffer management, in the context of supply support, is a general term used to identify actions taken to ensure available item quantities meet the demand. Per the DoDM 4140.01, DoD Supply Chain Materiel Management Policy, Volume 2, as a buffer against backorders caused by fluctuations in demand over lead times, repair cycle times, attrition rates, and in other variables, DoD Components should stock safety stocks. Those stocks should decrease as fluctuations in demand decrease.

4.20. Warranty Management

A warranty is an express or implied promise from the seller that certain facts about the items or services being sold are true. It provides a buyer with legal assurance that the seller is providing an item or service that will perform as represented before the purchase transaction was complete. The concept of "warranty" also refers to certain promises, made by the Government, of future events or conditions (such as availability of a construction work site) needed for the supplier to perform the contract. There are two broad categories of warranties*:* the implied warranty and express warranty*.*

Typically, warranties are on system or component reliability. The procedures for processing warranties should minimize impact on the user, particularly at the organizational level. Warranty provisions should enable the user to make warranty claims without delaying essential maintenance needed to restore system availability. For example, the Navy has in the past established warranties that allow Navy personnel to perform needed maintenance and then recover the cost incurred from the contractor.

Defective Materiel

Per the DoDM 4140.01, DoD Supply Chain Materiel Management Policy, Volume 2, defective materiel is materiel that, during its warranty period, fails to function properly due to design, materials, or manufacturing shortcomings. If the materiel is not covered by a warranty, it is considered defective if it fails to function properly either when it is initially installed or put to attempted use, or for a period of time that is substantially less than is common for similar materiel.

4.21. Supply Chain Assurance

The goals of supply chain assurance seek to reduce supply chain vulnerability via a coordinated holistic approach, involving all supply chain stakeholders, identifying and analyzing the risk of failure points within the supply chain.

Mitigation plans to manage these risks can involve logistics, finance, and risk management disciplines; the goal is to ensure supply chain continuity in the event of a scenario which otherwise has interrupted normal business. The term “supply chain assurance” has been generally superseded by the term “supply chain risk management.”

Supply Chain Risk Management

DoD Instruction 5200.44, Protection of Mission Critical Functions to Achieve Trusted Systems & Networks (TSN) identifies supply chain risk as the risk that an adversary may sabotage, maliciously introduce unwanted function, or otherwise subvert the design, integrity, manufacturing, production, distribution, installation, operation, or maintenance of a system so as to surveil, deny, disrupt, or otherwise degrade the function, use, or operation of such system.

Supply Chain Risk Management (SCRM) is the process for managing supply chain risk by identifying susceptibilities, vulnerabilities and threats throughout DoD’s supply chain and developing mitigation strategies to combat those threats whether presented by the supplier, the supplied product and its subcomponents, or the supply chain.

With potential damaging threats and liabilities that exist, SCRM should occur throughout the acquisition life cycle. SCRM includes working with appropriate DoD and Office of the Director of National Intelligence (ODNI) organizations on program threats (foreign and counterintelligence), technology vulnerabilities, contractor threat assessments, counterintelligence vulnerabilities, and global distribution risks. (Defense Acquisition Guidebook [DAG], Chapter, 4.3.6.T1, Risk Management Process Activities)

4.21.1. Counterfeit Material Prevention

Per the NAVSO P-7000, Counterfeit Materiel Process Guidebook, June 2017, counterfeit materiel refers to items that are unauthorized copies or substitutes that have been identified, marked, or altered by a source other than the items’ legally authorized supplier or have been misrepresented to be authorized items of the legally authorized supplier.

Examples include but are not limited to:

- Used materiel sold as new
- Materiel represented as having specific capability (e.g., speed, power, temperature, capacity) beyond what the part was specified by the Original Manufacturer (OM)

- Material construction other than the materiel's advertised construction
- Materiel containing additional features or capabilities not intended by the OM (e.g., added malicious functions, modified firmware, etc.).

"Counterfeit electronic part" means an unlawful or unauthorized reproduction, substitution, or alteration that has been knowingly mismarked, misidentified, or otherwise misrepresented to be an authentic, unmodified electronic part from the original manufacturer, or a source with the express written authority of the original manufacturer or current design activity, including an authorized aftermarket manufacturer. Unlawful or unauthorized substitution includes used electronic parts represented as new, or the false identification of grade, serial number, lot number, date code, or performance characteristics.

4.21.2. Malicious hardware and software prevention

Hardware and software may show the intentional insertion of malicious hard/soft coding, or defect to enable physical attacks or cause mission failure; includes logic bombs, Trojan "kill switches" and backdoors for unauthorized control and access to logic and data.

Program Protection

Per DoDI 5000.83, Technology and Program Protection to Maintain Technological Advantage, Program protection provides the processes, methodologies, and techniques to enable program offices to identify information, components, and technologies, as well as determine the most appropriate mix of measures to protect the information, components, and technologies from known security threats and attacks. These protection measures impact the development of the system being acquired, the operations of the program office, and the means by which the items are acquired. Also see the Defense Acquisition Guidebook (DAG), Chapter 9.

Hardware Assurance (HwA)

Per the Defense Acquisition Guidebook (DAG), Chapter 9, hardware assurance is the level of confidence that microelectronics (also known as microcircuits, semiconductors, and integrated circuits, including its embedded software and/or intellectual property) function as intended and are free of known vulnerabilities, either intentionally or unintentionally designed or inserted as part of the system's hardware and/or its embedded software and/or intellectual property, throughout the life cycle.

Criticality Analysis

Criticality analysis is an end-to-end functional decomposition performed by systems engineers to identify mission critical functions and components. Includes identification of system missions, decomposition into the functions to perform those missions, and traceability to the hardware, software, and firmware components that implement those functions. Criticality is assessed in terms of the impact of function or component failure on the ability of the component to complete the system mission(s).

Critical Components (CC)

A critical component is or contains Information and Communication Technology (ICT), including hardware, software, and firmware, whether custom, commercial, or otherwise developed, and which delivers or protects mission critical functionality of a system or which, because of the system's design, may introduce vulnerability to the mission critical functions of a system.

4.21.3. Unauthorized Technology Transfer Prevention
The Defense Technology Security Administration (DTSA) mission is to identify and mitigate national security risks associated with the international transfer of advanced technology and critical information to maintain the U.S. warfighter's technological edge and support U.S. national security objectives so that:

a. Critical U.S. military technological advantages are preserved.
b. Proliferation of weapons of mass destruction and their means of production and delivery and diversion of defense-related goods to terrorists are prevented.
c. Legitimate defense cooperation, including building partner capacity with foreign friends and allies, is supported in a timely manner.
d. The health of the defense industrial base is supported.

Strategic Materials
DLA Strategic Materials is the leading U.S. agency for the analysis, planning, procurement, and management of materials critical to national security. We serve our clients through a unique combination of technical expertise, global/geopolitical material supply analysis, and management & tracking of a broad range of existing & future critical materials.

Special Topic: Class V, Conventional Ammunition
The DoD Munitions and Explosives Safety Community of Practice shares knowledge throughout the safety and munitions enterprise. According to "Joint Conventional Ammunition Policies and Procedures (JCAPP), the "objectives of the Single Manager for Conventional Ammunition (SMCA) mission, as stated in DoD Directive 5160.65, are to achieve the highest possible degree of efficiency and effectiveness in the DoD operations required to acquire top quality conventional ammunition, and also in the wholesale conventional ammunition logistics functions.

Selected DoD and DoD Component-Unique Supply Systems and Tools Listing
Per the DoDM 4140.01, DoD Supply Chain Materiel Management Policy, Volume 7, to ensure a high-performing and agile supply chain, DoD Components will incorporate modern technologies into DoD materiel management to handle materiel management information, automatically identify items in storage and in transit, and analyze process improvements.

DAU's Tools and Resources Database provides access to hundreds of desktop references and software tools owned and/or approved by the DoD. Tools searches can be filtered by topic.

DAU's Life Cycle Logistics Community of Practice (LOGCoP) provides over a thousand links to desktop references and software tools specifically for the Life Cycle Logistics community. The links are grouped into fifteen topic areas.

A. Supply Support Major Activities by Acquisition Phase

Activities of the Supply Support IPS Element
Each activity of the Supply Support IPS Element, as listed in the PSM Guidebook Appendix A, is under the responsibility of the Program Manager, the Product Support Manager, and the lead stakeholder from other areas as applicable, i.e., configuration management, engineering, environment, manufacturing, etc. Relevant Proponency DoD offices are listed in this chapter below in Section C, Proponency.

Input to the LCSP/Product Support Strategy
Detailed guidance on development of the Life Cycle Sustainment Plan (LCSP)/Product Support Strategy states that "The purpose of this annotated outline is to improve sustainment planning for Department of Defense (DoD) weapon systems. This may be achieved when programs make design decisions that achieve operational performance requirements and reduce demand for sustainment."

While information from Supply Support activities will impact many areas of the LCSP/ Product Support Strategy, the below LCSP sections specifically address Supply Support:
3.1 Sustainment Strategy Considerations
3.2 Sustainment Relationships
3.3 Product Support Arrangements
8.2 Sustainment Risk Management

As Supply Support activities continue through the life cycle, their impacts will both directly and indirectly impact the system's KPP, KSA and APA parameters. The PSM and LCL should start these activities early in the system lifecycle for greatest impact.

When Is Supply Support Delivered and Managed in the Life Cycle?
The activities within the Supply Support IPS Element are best visualized in the DoD Product Support Implementation Roadmap Tool. This tool allows the User to check the box highlighting information specifically linked to the Supply Support Integrated Product Support Element.

Once the Supply Support IPS Element box is checked, the timeline expands to show the detailed activities and respective outputs for each activity by phase, as show in a partial illustration in Figure 4-2 below.

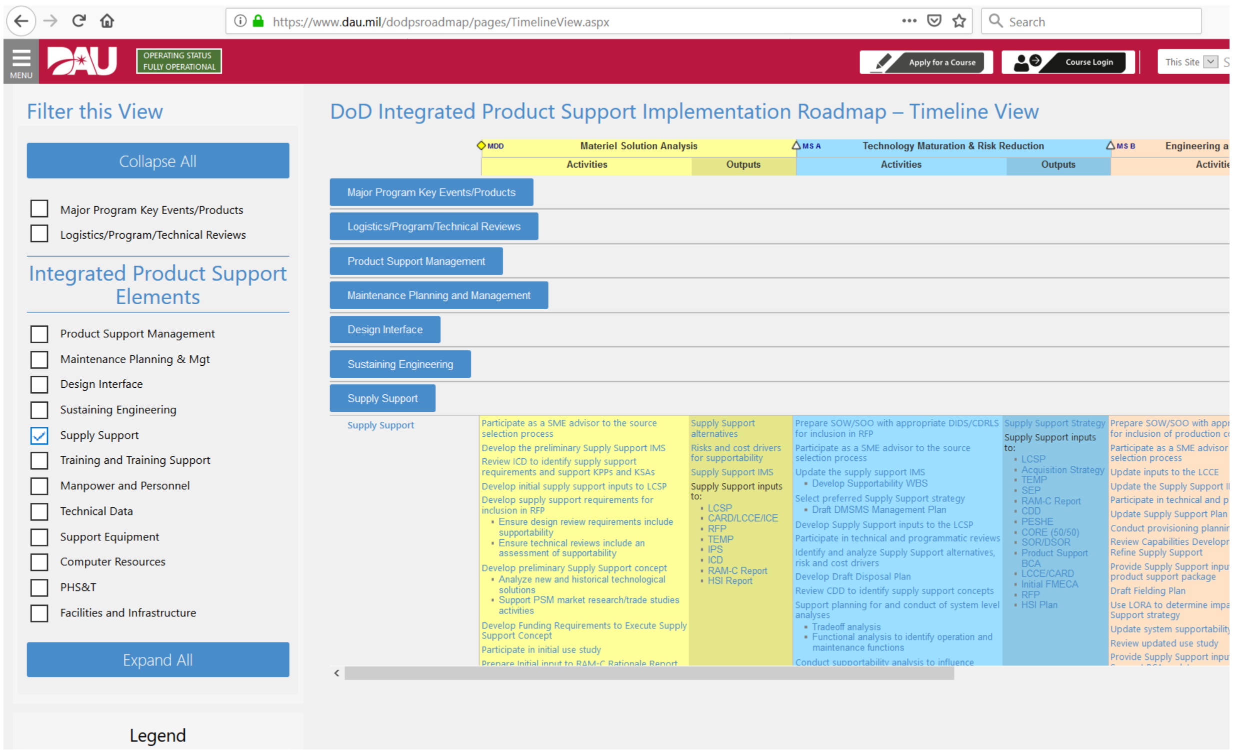


Figure 4-2, Screenshot of the DoD Integrated Product Support Implementation Roadmap Timeline View Homepage with the Supply Support IPS Element box checked. Notice the Supply Support activities and respective outputs are visible for each life cycle acquisition phase.

Each activity and output is then hyperlinked to a pop-up window that displays specific data related to that respective activity as shown in the screenshot below in Figure 4-3.   The specific data is in-turn hyperlinked to allow the user to subsequently search for detailed information regarding any specific activity.

(Table of Contents)

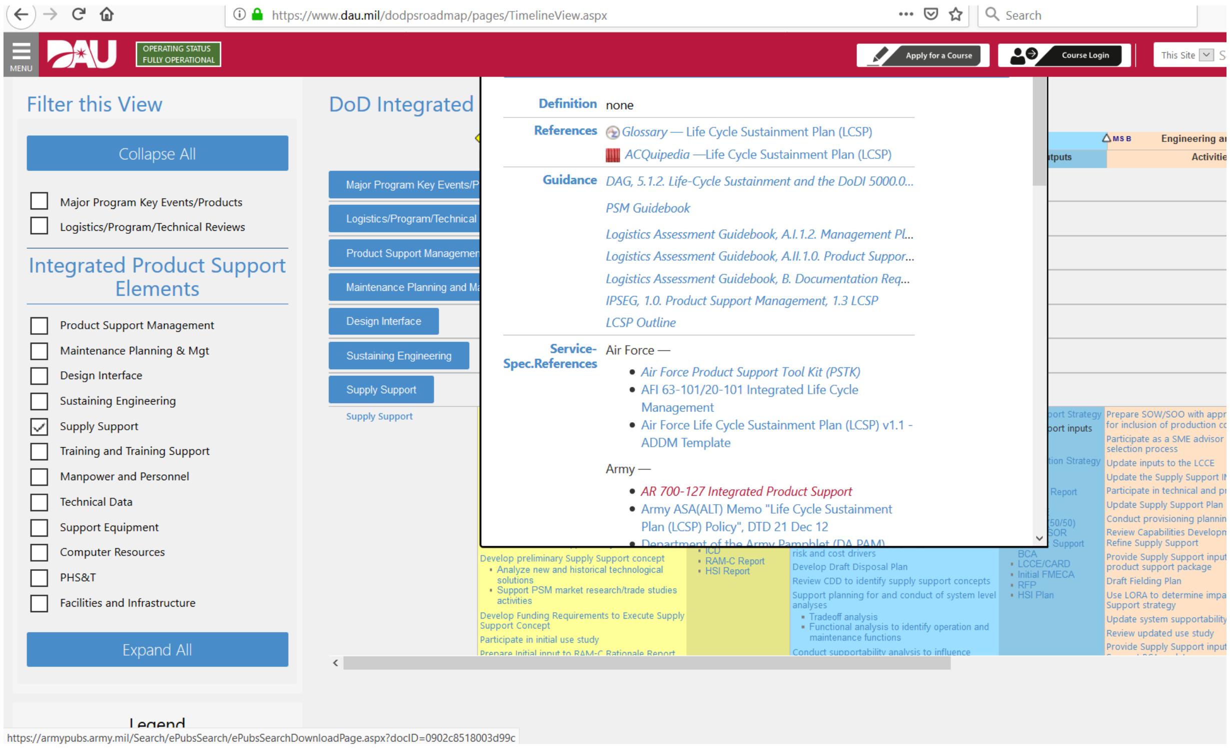


Figure 4-3, Screenshot of the DoD Integrated Product Support Implementation Roadmap Timeline View Homepage with the Supply Support IPS Element box checked. The User then clicked on the outcome “Life Cycle Sustainment Plan (LCSP)” from the listing of activities and outcomes for Supply Support. This data card provides further information for the User to search for further detailed information.

B. Data Item Description (DID) Deliverables

A Data Item Description (DID) is a completed document, typically identified in a Contract Data Requirements List (CDRL), that defines the data required of a contractor. The document specifically defines the data content, format, and intended use of the data. DIDs are found on the DLA Assist Database.

Helpful Search Hint: All DID’s start with the letters “DI- .” Once your search results are shown, click on the column header “Document ID” to sort by alphabetical order. The “DI-“ items will be easier to find. You can also insert “DI-“ into the Document ID field. For the Status field, be sure to use the “Active” category from the drop-down list.

The below DIDs are a representative listing and not inclusive of all Supply Support related DIDs.

- DI-ALSS-81529, Logistics Management Information (LMI) Data Product
- DI-ALSS-81530, Logistics Management Information (LMI) Summaries
- DI-ALSS-81544, Provisioning Data Cover Page
- DI-ALSS-81545, Interactive Computer Aided Provisioning System (ICAPS) Data Exchange
- DI-ALSS-81557, Supplemental Data for Provisioning (SDFP)

- DI-SESS-81639, Warranty Performance Report
- DI-SESS-81712, Provisioning Parts List Index
- DI-SESS-81713, Provisioning Performance Schedule (PPS)
- DI-SESS-81714, Provisioning Screening Data
- DI-SESS-81715, Provisioning Parts List (PPL)
- DI-SESS-81716, Supplementary Provisioning Technical Documentation
- DI-SESS-81758, Logistics Product Data
- DI-SESS-81759, Logistics Product Data Summaries

C. Proponency

Please note that DoD organizational changes may result in changes to Office designations and Proponency responsibilities that may not match the content in this Guidebook. At the OSD level, the following offices may serve as proponents for issues related to Supply Support:

Provisioning, Inventory Management, Supply Chain Management, Anti-Counterfeit
The Office of the Assistant Secretary of Defense for Sustainment, Logistics, Supply Directorate functions are 1) to develop, integrate, standardize and maintain currency of policy and guidance for DoD materiel management, supply and logistics support to the warfighter and 2) monitor and maintain the efficiency and effectiveness of the supply and logistics enterprise through appropriate performance measures.

Program Protection, System Security Engineering, Joint Federated Assurance Center -
The Office of the Secretary of Defense (R&E) is engaging in a variety of initiatives to strengthen systems engineering competency in the DoD. The office works to advance the state of practice to address a range of engineering challenges, among them workforce development, system security engineering, and technical risk management.

Parts Management
The Defense Parts Management Program is an integrated effort to streamline the selection of preferred or commonly used parts during the design of weapon systems and equipment under an overarching Systems Engineering framework. This process determines the optimum parts while considering all the factors that may affect program outcomes. Key benefits of parts management include reducing the proliferation of parts, enhancing system supportability, and reducing total ownership costs.

Supply Chain Assurance
The Office for Defense Pricing and Contracting (DPC) is responsible for all Pricing, Contracting, and Procurement policy matters, including e-Business, in the Department of Defense (DoD). DPC executes policy through the timely update of the DFARS and PGI. There is a page on their website dedicated to the supply chain assurance topic.

Total Asset Visibility (Item Unique identification [IUID])
The Office for Defense Pricing and Contracting (DPC) is responsible for all Pricing, Contracting, and Procurement policy matters, including e-Business, in the Department of Defense (DoD). DPC executes policy through the timely update of the DFARS and PGI. There is a page on their website dedicated to the IUID topic.

Unauthorized Technology Transfer
Defense Technology Security Administration (DTSA) administers the development and implementation of DoD technology security policies on international transfers of defense-related goods, services, and technologies.

D. U.S. Government Statute, Regulations, DoD Policy and Guidance

The below statutes, regulations, policy, and guidance are suggested as a core set of references. Note that this list does not contain policy and guidance from the DoD Components/Services.

Please note that due to the high rate of change occurring in policy and guidance, the letter designations found as part of a reference will be removed in this guide. Readers are encouraged to check the DoD reference source on a frequent basis to ensure they are using the current reference version.

Readers should check with their respective organizations for additional policy and guidance specific to their program and product support requirements.

- DoD Directive 5000.01, The Defense Acquisition System
- DoDI 5000.02, Operation of the Adaptive Acquisition Framework
- Other policy located on the DoD AAF website and DoD Issuances website
- 10 USC 2337, Life-cycle Management and Product Support
- 10 USC 2441, Sustainment reviews
- 10 USC 2460, Definition of depot-level maintenance and repair
- Defense Acquisition Guidebook (DAG) Chapters 3, 4 and 9
- DFARS Part 208, Required Sources of Supplies and Services
- DFARS Part 211, Describing Agency Needs
- DoDI 4140.67, DoD Counterfeit Prevention Policy
- DoDI 4151.19, Serialized Item Management (SIM) for Materiel Maintenance
- DoDI 5200.39, Critical Program Information (CPI) Identification and Protection Within Research, Development, Test, and Evaluation (RDT&E)

- DoDI 5200.44, Protection of Mission Critical Functions to Achieve Trusted Systems & Networks (TSN)
- DoDM 4140.01, DoD Supply Chain Materiel Management Procedures (11 volumes)
- SD-18, Part Requirement & Application Guide
- SD-22, Diminishing Manufacturing Sources and Material Shortages
- DepSecDef memo, Enhanced Section 806 Procedures for Supply Chain Risk Management in Support of Department of Defense (DoD) Trusted Systems and Networks," dated March 13, 2018
- USD(A&S) memo, Acquisition Workforce Implementation of Enhanced Procedures for Supply Chain Risk Management in Support of Department of Defense Trusted Systems and Networks, dated December 28, 2018.

There are additional handbooks, manuals and other reference sources located below in the Best Practices section of this chapter.

E. Communities of Practice and Interest

The topic of design interface covers such a vast scope of equipment that there is no one community of practice. Typically, design interface communities focus on the supportability of a type of system, for example, ships and aircraft, or of a type of DoD mission.

The Preface of this IPS Elements Guidebook provides a listing of "golden references," many of which provide libraries, research portals and other resources for finding additional information on specific topics of design interface.

Many OSD offices (listed under the Proponency section above) maintain a comprehensive website with links to DoD partner organizations, policy and guidance, plus many other resources. Readers are encouraged to check the relevant proponent website for additional information. Readers should check with their respective organizations for the communities of practice that focus on the area of design interface most relevant to their interests.

The DAU community hub is a website that consolidates the links to approximately 50 communities of practice related to DoD acquisition practices.

- Commercial Off the Shelf Products and Commercial Services
- Cybersecurity
- Data Management
- DMSMS Knowledge Sharing Portal
- Information Technology/Software

- Life Cycle Logistics
- Performance Based Logistics (PBL)
- Production, Quality & Manufacturing
- Program Management
- Systems Engineering

Guidance and Best Practices Sources

- Product Support Manager (PSM) Guidebook
- Product Support Analytical Tools Database
- Performance Based Logistics (PBL) Guidebook
- Integrated Product Support (IPS) Element Guidebook
- Logistics Assessment Guidebook
- Public-Private Partnering (PPP) for Product Support Guidebook
- Operating and Support (O&S) Cost Management Guidebook
- Product Support Business Case Analysis (BCA) Guidebook
- Condition Based Maintenance (CBM+) Guidebook
- SD-22 Diminishing Manufacturing Sources & Material Shortages (DMSMS) Guidebook
- Risk and Opportunity (RIO) Guide
- Life Cycle Sustainment Plan (LCSP) Outline
- An extensive listing of information sources related to Defense Technology Security
- SAE GEIA-STD-0007, Logistics Product Data
- SAE GEIA-HB-0007B, Logistics Product Data Handbook

F. Training Resources

DAU Courseware

A complete list of DAU training resources can be found at the DAU iCatalog. Courses are classified as Training Courses (Regular training courses), Continuous Learning, and Targeted Training. Supply support topics are primarily covered under the Life Cycle Logistics courses.

- LOG 101 Acquisition Logistics Fundamentals
  - LOG 235 Performance-Based Logistics
  - CLE 022 Program Manager Introduction to Anti-Tamper
  - CLE 040 IUID Marking
  - CLE 074 Cybersecurity throughout DoD Acquisition
  - CLL 002 DLA Support to the PM
  - CLL 007 Lead-Free Electronics Impact on DoD Programs
  - CLL 032 Preventing Counterfeit Parts from Entering the DoD Supply System
  - CLL 037 Supply Chain Management Fundamentals
  - CLL 038 Provisioning and Cataloging

- CLL 062 DoD Counterfeit Prevention Awareness
- CLL 113 Hazardous Materials Packaging
- CLL 120 The DoD Shelf-Life Program
- CLL 200 DMSMS; What Program Management Needs to Do and Why
- CLL 201 DMSMS Fundamentals
- CLL 206 Introduction to Parts Management
- CLL 207 DMSMS Basic Component Research
- CLM 129 Requisitions, Issue, and Shipment
- CLM 037 Physical Inventories
- CLM 044 Radio Frequency Identification
- CLM 200 Item Unique Identification
- CLM 202 Serialized Item Management

DAU ACQuipedia Articles

The DAU ACQuipedia serves as an online encyclopedia of common defense acquisition topics. Each topic is identified as an article. Each article contains a definition, a brief narrative that provides context, and includes links to the most pertinent policy, guidance, tools, practices, and training which further augment understanding and expand depth.

ACQuipedia was developed as a collaborative project to create content around Defense Acquisition-related topics. Articles (topics) will be maintained as a collaborative effort of subject matter experts across the Defense Acquisition University (DAU). ACQuipedia provides the acquisition workforce with quick access to information in a succinct and digestible format.

Article content aggregates the most relevant references and learning assets to narrowly focus users and quickly provide high value information.

Below is a listing of linked ACQuipedia articles relevant to Supply Support. The reader is encouraged to visit the homepage to see additional articles.

- Cataloging
- Counterfeit Parts
- Defense Logistics Agency (DLA)
- Diminishing Manufacturing Sources and Material Shortages (DMSMS)
- Integrated Product Support (IPS) Elements
- Integrated Product Support (IPS) Element - Supply Support
- Inventory Management
- Item Unique Identification (IUID)
- Life Cycle Management (LCM)
- Life Cycle Sustainment Plan (LCSP)

- Market Research
- Obsolescence Management
- Parts Management
- Primary Inventory Control Activity (PICA) and Secondary Inventory Control Activity
- Procurement Lead Time
- Provisioning
- Readiness-Based Sparing (RBS)
- RFID - Radio Frequency Identification
- Shelf-life
- Single Manager for Conventional Ammunition (SMCA)
- Stock and Part Numbers
- Supply Chain Management (SCM)
- Supply Classes
- Warranties

Maintenance Planning & Management

Objective

Identify, plan, resource, and implement maintenance concepts and requirements to ensure the best possible equipment/capability is available when the Warfighter needs it at the lowest possible TOC.

Description

Maintenance planning and management establishes maintenance concepts and requirements for the life of the system, for hardware and software, including:

- Levels of repair
- Repair times
- Testability requirements
- Support equipment needs
- Training and Training Aids Devices Simulators and Simulations (TADSS)
- Manpower skills
- Facilities
- Inter-service, organic and contractor mix of repair responsibility
- Deployment Planning/Site activation
- Development of preventive maintenance programs using reliability centered maintenance
- Condition Based Maintenance Plus (CBM+)
- Diagnostics/Prognostics and Health Management
- Sustainment
- PBL planning
- Post-production software support

Overview

Maintenance planning and management is the development process that defines the repair and upkeep tasks, schedule, and resources required to care for and sustain a weapons system with the focus being to define the actions and support necessary to attain the system's Operational Availability (A_o) objective. It is considered part of the Life Cycle Sustainment Plan (LCSP)/Product Support Strategy development starting as early as the Technology Maturation and Risk Reduction Phase in the system's life-cycle. It includes the identification of all the manpower and funding resources required to develop and implement the maintenance and modernization plan.

Maintenance of DoD's weapon systems and military equipment is a critical element in the readiness and sustainability of combat forces. A maintenance program effectively aligned to deliver A_o will optimize life cycle cost and total ownership cost.

DoD maintenance is accomplished by two different yet complementary components: depot-level and field-level maintenance activities. The two components are distinguished largely by their relative capabilities, flexibility, agility, and capacity.

The activities occurring within the scope of this IPS Element should be integrated with other product support element areas in keeping with KPP and KSA optimization goals and constraints.

Why Maintenance Planning & Management Is Important

Maintenance planning and management activities are heavily influenced prior to system deployment by the design interface activities which focus on ensuring that the program's KPPs are achieved through design that is focused on optimizing availability and reliability at reduced life cycle cost. After deployment and during Operations and Sustainment (O&S), the activities of sustaining engineering (including product improvement, reliability fixes, continuing process improvements and technology refresh) continue those of design interface and integrate both back with engineering and manufacturing activities and forward to collect and validate system operational performance with the user. The Product Support Manager is thus capable of implementing a total enterprise sustainment strategy.

Seeking to prevent, reduce and improve maintenance actions will have a direct impact on both availability outcomes and reduction of life cycle costs. There are many avenues to improve or prevent maintenance and many reasons why.

Historically, maintenance planning and management activities were the primary responsibility of engineering and product development, with maintenance execution activities being planned and implemented often under separate contract line items.

Product Support Manager Activities

5.1. Maintenance Concept Design

The Maintenance Concept is a "statement of general guidelines to be used in developing the detailed maintenance plan for a system." The guidelines established by the maintenance concept are the foundation for maintenance planning. Areas addressed by the maintenance concept include a strategy for allocation of maintenance tasks to the different levels of maintenance; the repair policy with regard to similar types of items contained in the system; the criteria for scheduling maintenance tasks; and the anticipated availability of resources, in gross terms, to support maintenance.

Maintenance Strategy

Per DoDI 4151.18, Maintenance of Military Materiel, maintenance programs for DoD materiel shall be structured and managed to achieve inherent performance, safety and reliability levels of the materiel. Maintenance tasks restore safety and reliability to their inherent levels when deterioration has occurred. Maintenance programs are structured for meeting readiness and sustainability objectives (including mobilization and surge capabilities) of national defense strategic and contingency requirements.

Preventive maintenance

Preventive maintenance includes all actions performed to retain an item in a specified condition by providing systematic inspection, detection, and prevention of incipient failures.

Corrective maintenance

Per the JCIDS Manual, corrective maintenance is the ability of the system to be brought back to a state of normal function or utility, at any level of repair, when using prescribed procedures and resources. All indicated and recorded failures, even those that do not affect successful completion of a mission, eventually result in some corrective action. Corrective action often includes some level of repair or inspection to mitigate the failure. Logistics reliability deals with mission and sustainment related failures. Repair (called corrective maintenance), in this case can consist of removal and replacement, in-place repair, or some combination thereof for the failed item.

Condition Based Maintenance

Condition Based Maintenance Plus (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 on evidence of need, integrating reliability centered maintenance (RCM) analysis with those enabling processes, technologies and capabilities that enhance the readiness and maintenance effectiveness of DoD systems and components.

Maintenance Task Analysis (MTA)

Maintenance Task Analysis (MTA) is the identification of the steps, spares and materials, tools, support equipment, personnel skill levels as well as any facility issues that must be considered for a given repair task. Also included in the MTA are elapsed times required for the performance of each task. MTAs cover both corrective and preventative maintenance tasks and, when complete, identify all physical resources required to support a system.

Maintenance Plan

A system's Maintenance Plan evolves from the maintenance concept. It prescribes maintenance actions, including intervals; repair levels and locations; personnel numbers and skills; technical data; tools; equipment; facilities; and spares and repair parts for each significant item of a system or equipment.

5.2. Core capability Management
Per DoDI 4151.20, Depot Maintenance Core Capabilities Determination Process, the core capability requirements determination process underpins the establishment and retention of a broad set of public sector depot maintenance capabilities necessary for the DoD. The core capability requirements determination process is used to identify required core capabilities and the workloads necessary to effectively sustain those capabilities. The required core capabilities and depot maintenance workloads necessary to sustain those capabilities will be calculated by Military Services and then aggregated to determine the overall DoD core requirements.

Core Logistics Analysis
Core Logistics Analysis addresses those capabilities are deemed as "essential for the national defense" and are defined by both 10 U.S.C. 2464 and the DAU Glossary of Defense Acquisition Acronyms and Terms as a "…capability that is Government-owned and Government-operated (including Government personnel and Government-owned and Government-operated equipment and facilities) to ensure a ready and controlled source of technical competence and resources necessary to ensure effective and timely response to a mobilization, national defense contingency situations, and other emergency requirements."

Core is defined by DoD Instruction 4151.20 as "the depot maintenance capability (including personnel, equipment, and facilities) maintained by the Department of Defense at Government-owned, Government-operated facilities as the ready and controlled source of technical competence and resources necessary to ensure effective and timely response to a mobilization, national defense contingency situations, and other emergency requirements. Depot maintenance for the designated weapon systems and other military equipment is the primary workload assigned to DoD depots to support core depot maintenance capabilities."

5.3. Title X 50/50 management
10 USC 2466 is a statute that mandates a 50% ceiling, measured in dollars, on the amount of depot maintenance workload that may be performed by contract for a military department or Defense Agency during a fiscal year. Although 10 USC 2466 is commonly associated with the core logistics statute (10 USC 2464), there are some significant differences that the reader will find in the DAU ACQuipedia articles.

5.4. Public-Private Partnerships
According to DoD Instruction (DoDI) 4151.21, a Public Private Partnership*, i*s a "cooperative arrangement between an organic product support provider and one or more private sector entities to perform defense-related work, use DoD facilities and equipment, or both. Other government organizations, such as program offices, inventory control points, and sustainment commands, may be parties to such agreements." The Public-Private Partnering for Product Support Guidebook clarifies that even though the definition cited from this instruction is in a depot maintenance context, the term applies to the broader range of Integrated Product Support (IPS) Elements and activities. The terms 'public-private partnership' and 'public-private partnering' may be used interchangeably and are both often abbreviated as "PPP."

5.5. Maintenance execution
DoD Directive 4151.18, Maintenance of Military Materiel provides the overall policy framework for the accomplishment of DoD maintenance. It does not, however, specifically identify what work should be accomplished at the field-level. It should be noted that while the Office of the Secretary of Defense is responsible for establishing overarching DoD maintenance policy, the three Service Secretaries are ultimately responsible for equipping their forces and maintaining their equipment (10 U.S.C. 3013 [Army], 10 U.S.C. 5013 [Navy] and 10 U.S.C. 8013 [Air Force]).

DoD Directive 4151.18 requires that maintenance programs allocate tasks to appropriate levels of maintenance (i.e., field and depot) based on criteria derived from warfighter requirements and cost-effective analysis.

Field Level Maintenance
Field Maintenance Definition: Field-level maintenance is comprised of two sub-levels, shop-type work (Intermediate) as well as on-equipment maintenance (Organizational).

Intermediate Level
Intermediate maintenance is the maintenance level between depot and organizational.

Organizational Level
Organizational maintenance is that maintenance that is the responsibility of and performed by a using organization on its assigned equipment. Its phases normally consist of inspecting, servicing, lubricating, and adjusting, as well as the replacing of parts, minor assemblies, and subassemblies. Of note is that organizational-level maintenance describes work performed in the field, on the flight line, or at the equipment site, and is not only accomplished by maintenance personnel, but also by equipment operators.

Depot Level Maintenance
Depot level maintenance entails materiel maintenance requiring the major repair, overhaul, or complete rebuilding of weapon systems, end items, parts, assemblies, and subassemblies; manufacture of parts; technical assistance; and testing. Each military service manages and operates its own organic depot-level maintenance infrastructure. Approximately 55 percent of the Department's FY 2016 depot-level workload was accomplished in organic facilities; the remainder was done in the private sector by commercial firms.

Depot Level Maintenance is neither appropriation- nor source-of-funds-specific. Depot maintenance can be and is funded by various appropriations, such as Procurement, Operations and Maintenance and Research, Development, Test & Engineering. Under certain circumstances, depot maintenance may be funded by cash payments from non-governmental organizations. Depot maintenance is not site-specific.

Depot maintenance is a capability, not a place. Thus, the performance of depot maintenance is not restricted to facilities commonly acknowledged to be "Depot Maintenance Activities," but rather can be performed at any location, including field locations, by personnel with the requisite skills, technical data, facilities, and equipment needed to perform assigned depot-level tasks.

Critical Safety Items

Per the Defense Acquisition Guidebook (DAG), Chapter 3, Systems Engineering, a Critical Safety Item (CSI) is a part, assembly, or support equipment whose failure could cause loss of life, permanent disability or major injury, loss of a system or significant equipment damage. Special attention should be placed on CSIs to prevent the potential catastrophic or critical consequences of failure. Significant problems occurred when DoD purchased CSIs from suppliers with limited knowledge of the item's design intent, application, failure modes, failure effects or failure implications.

5.6. Level of repair analysis – hardware

Level of Repair Analysis (LORA) is an analytical methodology used to determine where an item will be replaced, repaired, or discarded based on cost considerations and operational readiness requirements. For a complex engineering system containing thousands of assemblies, sub-assemblies, components, organized into several levels of indenture and with a number of possible repair decisions, LORA seeks to determine an optimal provision of repair and maintenance facilities to minimize overall life-cycle costs. Logistics personnel examine not only the cost of the part to be replaced or repaired but all of the elements required to make sure the job is done correctly. This includes the skill level of personnel, tools required to perform the task, test equipment required to test the repaired product, and the facilities required to house the entire operation.

A LORA has traditionally been an analysis tool for hardware. The Computerized Optimization Model for Predicting and Analyzing Support Structures (COMPASS) is a PC-based software tool approved by the U.S. Army that is designed to assist project managers in analyzing various maintenance concepts for their system and related equipment.

5.7. Level of repair analysis – software

Per GAO Report, GAO-19-173, Weapon System Sustainment, sustaining software is normally different from sustaining hardware. For example, when hardware breaks, technicians can remove the broken part—such as tread on a tracked vehicle— and install a working part. In contrast, sustaining software typically requires writing, testing, and deploying lines of code. Software provides critical functionality to nearly every hardware system that DoD uses: surface (for example, mobile network systems); air (for example, secure communications arrays in aircraft); sea (for example, submarine guidance systems); missile (for example, targeting systems); ordnance (for example, Common Remotely Operated Weapon Station); and space (for example, positioning software).

There exist literally hundreds of processes, tools, and techniques for analyzing software. One example is the Software Engineering Institute's Source Code Analysis Laboratory that analyzes a developer's source code and provides a detailed report of findings to guide the code's repair.

More information on software sustainment is found in the Information Technology (IT) Systems Continuous Support IPS Element chapter of this guidebook.

Software Maintenance

Software maintenance is the process of modifying a software system after delivery to correct faults, improve performance or adapt it to a changed environment (IEEE 12207, 1995). To that end, software maintenance is a subset of software sustainment. When hardware breaks, maintainers remove the faulty item and typically replace it with an identical functional item, restoring the asset to its operating functional baseline. However, when software fails it is due to a latent defect in the software code and is rectified by developing and distributing different code to correct the defect, essentially creating a new version of the product baseline. Therefore, software maintenance drives additional considerations inherent to creating a new version (baseline), including configuration management/control, updated manuals and training, distribution process (release management), etc.

The reader should also see the Information Technology (IT) Systems Continuous Support IPS Element chapter of this guidebook.

5.8. Failure Modes Effects and Criticality Analysis (FMECA) Required repair times determination

The Failure Modes & Effects Analysis (FMEA) and Failure Modes, Effects & Criticality Analysis (FMECA) plays a critical role in identifying failure modes and defining their impact at the local level (e.g. part level), thru the next higher level (e.g., circuit card) and at the system level, (e.g., the equipment level) in terms of their impact on operations. Failures due to an individual failure mode may exhibit a given failure rate until a corrective action (termed a fix) is made in the design, operation, maintenance, or manufacturing process that mitigates the failure mechanism (i.e., cause).

5.9. OPTEMPO variance management

In the context of equipment maintenance, higher than expected utilization rates and fatigue caused by operating environment and mission requirements may result in reduced service life expectancies for some of the Department's military equipment. This can lead to new and emerging requirements for capital planning and military equipment replacement and recapitalization.

The reader should also see 3.3.4. Operational usage profiles changes in the Sustaining Engineering IPS Element chapter of this guidebook.

PERSTEMPO

Per GAO Reports, the pace of operations for individuals is commonly referred to as personnel tempo (PERSTEMPO) and can affect quality of life, work satisfaction, and overall morale for members and their families. See DoDI 1336.07 Management of Personnel Tempo

5.10. Routine versus battle-damage repair management
BDAR is essential repair, which may be improvised, carried out rapidly in a battle environment in order to return damaged or disabled equipment to temporary service. Each DoD Component addresses battle damage assessment and repair to meet the needs of its infrastructure and weapon systems.

Examples include: the U.S. Army's FM 4-30.31, Recovery and Battle Damage Assessment and Repair, provides the authoritative doctrine guidance on using recovery and repair assets on the battlefield. Funding for battle damage and repair varies by situation and organization; and the CJCSI 3162.02, Methodology for Combat Assessment, provides methodology for assessment of battle damage, collateral damage and munitions effectiveness.

5.11. Built-in and manual testability management
Per MIL-HDBK 338, Electronic Reliability Design Handbook, defining and developing a product's diagnostic capability depends on factors such as:

- The product's performance and usage requirements,
- Maintenance support requirements (e.g., levels of maintenance),
- Technology available to improve diagnostics in terms of test effectiveness; reduce the need for test equipment, test manuals, personnel, training, and skill levels; and reduce cost,
- The amount of testability designed into the product,
- Previously known diagnostic problems on similar systems,
- Each of these factors will play a role in determining the approach to detecting and isolating faults.

Built-in Test (BIT)
Per MIL-HDBK 338, Electronic Reliability Design Handbook, Built-In Test (BIT) is an integral capability of the mission equipment which provides an onboard, automated test capability, consisting of software or hardware (or both) components, to detect, diagnose, or isolate product (system) failures. The fault detection and, possibly, isolation capability is used for periodic or continuous monitoring of a system's operational health, and for observation and, possibly, diagnosis as a prelude to maintenance action.

Built-in Test Equipment (BITE)
Per MIL-HDBK 338, Electronic Reliability Design Handbook, Built-In Test Equipment (BITE) refers to any device permanently mounted in the prime product or item and used for the express purpose of testing the product or item, either independently or in association with external test equipment.

Manual Testability
Per MIL-HDBK 338, Electronic Reliability Design Handbook, while BIT reduces the need for maintenance manpower and External Test Equipment, other approaches may consider the use

of automatic or semi-automatic test equipment, manual testing using benchtop test equipment, or visual inspection procedures. In all cases, tradeoffs are required among system performance, cost, and test effectiveness.

The DoD has test equipment modernization programs on-going. For example, the U.S. Army's Test Equipment Modernization (TEMOD) program replaces obsolete General Purpose Electronic Test Equipment with new state-of-the-art equipment. This new equipment reduces the proliferation of test equipment, modernizes the Army's current existing inventory, and strongly supports other weapon systems. Acquisitions are commercial items that have significant impact on readiness, power projection, safety and training operations of the Army, Army Reserve and National Guard. The TEMOD program has procured 38 products that replace more than 334 models.

MIL-PRF-28800, Test Equipment for Use with Electrical and Electronic Equipment, is a performance specification found in the DoD Assist Database. The reader should also review the information in the Support Equipment IPS Element chapter of this guidebook.

5.12. Inter-service, organic, and contractor mix of repair responsibilities

By law and policy, the Department of Defense (DoD) maintains a "ready and controlled" source of technical competencies and resources necessary to ensure effective and timely response to mobilization, national defense contingency situations, and other emergency requirements. One of the keys to maintaining those competencies is embodied in the Department's major organic (that is, government-owned and operated) product support activities, augmented with commercial contract support. Organic and contract capabilities must work together to provide effective and efficient sustainment for the operating forces. A fully integrated defense product support industrial base, one that leverages the competencies, infrastructure, and resources of both the public and private sector, is essential to our national security. To facilitate this collaborative effort, a series of legal authorities specifically authorize depot maintenance activities and other product support activities to enter into public-private partnering arrangements, also referred to as partnering. Public-private partnering is an essential tool to sustain modern weapon systems through their life cycle. It serves as a bridge, melding the public and private sectors in support of increasingly complex advanced technologies, and the combined technical competence is essential to produce an assured mission response.

Joint Logistics/Maintenance

Per JP 4-0, Joint Logistics, DoD Service maintenance capabilities must be synchronized to provide the most effective materiel available to the joint force. Where practical, facilities for joint or cross-Service maintenance should be established, and inter-Service use of capabilities should be emphasized over single Service support. Lead Service or agency support, or in some cases multinational support, options may also provide more effective maintenance capabilities to support joint operations. These support options create greater synergy with systems common to two or more Services or multinational partners. Maintenance of ground systems, support equipment, communications electronics, and commercial systems can benefit from maintenance consolidation arrangements and can generate higher operational readiness, while reducing logistics footprint and cost.

5.13. Condition Based Maintenance Plus (CBM+); Diagnostics, Prognostics & Health Management

Condition Based Maintenance Plus (CBM+)

In accordance with DoDI 4151.22 Condition Based Maintenance Plus (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 on evidence of need, integrating reliability centered maintenance (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.

Prognostics and Health Management (PHM)

Per the JCIDS Manual, prognostics is the design ability of the system to proactively predict maintenance issues based on usage, time, actual performance and other factors. This attribute is enabled by data from sensors, health and condition monitoring, communications, and human interface capabilities. Prognostics supports Condition Based Maintenance sustainment strategies.

For example, most passenger vehicles today have a computer chip, or "brain," to detect when the oil or tire pressure is low. Task Force Thunder's UH-60A, L and M Blackhawks are equipped with similar equipment – the health and usage monitoring systems, or HUMS. These aircraft systems are designed to minimize maintenance, eliminate operator errors, and maximize flight hours. The technology also may eliminate unnecessary inspections that drive up maintenance costs and risk damage to healthy parts by allowing maintainers to predict when parts will need replacement.

The Prognostics and Health Management Society (PHM Society) is a non-profit organization dedicated to the advancement of PHM as an engineering discipline. The PHM Society was incorporated in early 2009 as a New York Corporation. The flagship event of the Society is the Annual Conference of the PHM Society.

Integrated Vehicle Health Maintenance (IVHM)

Integrated Vehicle Health Management (IVHM) is an end-to-end capability that transforms system data into operational support information to help enable optimized maintenance actions; improved readiness and availability; enhanced vehicle safety and reliability; product life extension; and product improvement and new design paradigms. This design and operation concept embrace an integration of sensors, communication technologies, and artificial intelligence to provide vehicle-wide abilities to diagnose problems and recommend solutions.

NASA is investing heavily in new technologies for IVHM. Integrated Vehicle Health Management (IVHM) systems are being developed for the Second-Generation Reusable Launch Vehicle (RLV), crew, and cargo transfer vehicles. These highly integrated systems will likely include advanced smart sensors, diagnostic and prognostics software for sensors and components, model-based reasoning systems for subsystem and system level managers, advanced on-board and ground-based mission and maintenance planners, and a host of other software and hardware technologies. These hardware and software technologies will be embedded in the vehicle subsystems, maintenance operations, and launch and mission operations elements, and will provide both real-time and life-cycle vehicle health information which will enable informed decision making and logistics management. Knowledge databases of the vehicle health state will be continuously updated and reported for critical failure modes, and routinely updated and reported for life cycle condition trending.

Readers are encouraged to contact their respective organizations for more information on implementation of IVHM. For example, the U.S. Navy's Condition and Environment Sensing and Reporting System (CAESAR) senses temperature and vibration in order to predict and improve missile reliability.

5.14. Reliability Centered Maintenance (RCM)

Reliability Centered Maintenance (RCM) is a systematic approach for identifying preventative or scheduled maintenance tasks for an equipment end item and establishing necessary preventative (or scheduled) maintenance task intervals.

RCM is based upon some important Principles:

- Function-oriented concept. The analysis attempts to preserve all functionality of a system, not just its operational capability.
- System focused. It is more concerned with maintaining the overall function of an entire system, not just the individual components that make up a system.
- Reliability centered. It considers the relationship between operating age and experienced failures. In short, RCM is not overly concerned with simple failure rate, but rather with the probability that a failure can occur at specific ages.
- Recognizes that design limitations exist in all equipment. Its objective is to maintain the inherent reliability of equipment as it is designed, thereby acknowledging that any change in inherent reliability is the result of design rather than effective maintenance. Maintenance can, at best, only achieve and maintain the level of reliability provided by the design. However, inherent to an effective RCM analysis is the idea that maintenance feedback can improve the original design.
- Driven by both safety and economics, with safety being a primary criterion.
- Defines failure as any unsatisfactory condition, whether it be a loss of function or a loss of quality. In the case of the former condition, operational capability is lost; in the case

of the latter, operational capability continues but at an unacceptable, and even degraded quality.
- RCM tasks must be effective. That is, they must reduce the probability of a defined failure, but at the same time be cost effective.
- Acknowledges that "run-to-failure" is an acceptable decision and is acceptable for some equipment. In short, not all failure modes require a maintenance intervention task.
- RCM is a living system. It gathers historical data and uses it to improve future design and maintenance tasks.

SAE JA1011, "Evaluation Criteria for Reliability-Centered Maintenance (RCM) Processes" and SAE JA1012, "A Guide to the Reliability-Centered Maintenance (RCM) Standard"
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 operating context.

- SAE JA1011, Evaluation Criteria for Reliability-Centered Maintenance (RCM) Processes, is intended to be used to evaluate any process that purports to be an RCM process in order to determine whether it is a true RCM process by specifying the minimum characteristics that a process must have in order to be an RCM process.
- SAE JA1012, A Guide to the Reliability-Centered Maintenance (RCM) Standard, amplifies and clarifies each of the key criteria listed in SAE JA1011 and summarizes additional issues to be addressed to apply RCM successfully.

5.15. Depot Workload Allocation, Planning, Activation, and Execution
Title 10, United States Code (U.S.C.), section 2466(d)(l), requires the Secretary of Defense to submit, not later than 90 days after the date on which the President's Budget for a fiscal year is submitted to Congress, a report identifying, for each of the Armed Forces (other than the Coast Guard) and each Defense Agency, the percentage of funds referred to in title 10, U.S.C., section 2466(a), that was expended during the preceding fiscal year and are projected to be expended during the current fiscal year and the ensuing fiscal year for performance of depot-level maintenance and repair workloads by the public and private sectors.

Depot Source of Repair (DSOR)
It is DoD policy per DoDI 4151.24, Depot Source of Repair (DSOR) Determination Process, that:
a. DSOR assignments support readiness, sustainment, and affordability objectives (including mobilization and surge capabilities) of national defense strategic and contingency requirements, pursuant to Section 2464 of Title 10, U.S.C.
b. Workloads necessary to sustain core logistics capabilities, pursuant to Section 2464 of Title 10, U.S.C., are assigned to DoD depot maintenance activities with the requisite competencies.
c. Priority in assigning workloads to sustain core capabilities will be given to Centers of Industrial and Technical Excellence (CITE) with the requisite core competencies. CITEs are established pursuant to Section 2474 of Title 10, U.S.C.

d. Initial DSOR assignments are determined jointly between the Military Departments and the Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)) for Acquisition Category (ACAT) I programs as described in Section 3.
e. DoD Components will follow the process outlined in this issuance any time a DoD Component elects to review a DSOR assignment.
f. The DSOR determination process: (1) Is an integral part of overall weapon system supportability analysis, acquisition, and life-cycle sustainment planning, including appropriate consideration for core logistics capabilities and sustaining workloads. (2) Facilitates establishing new organic depot-level maintenance capabilities through procurement funding.
g. The DSOR determination process will optimize existing capabilities within DoD before expending funds to establish new capabilities.
h. Funds will not be obligated to establish a depot-level maintenance capability or expand capacity of an existing capability at a specific site to repair a system, subsystem, or component without an approved DSOR assignment.

Depot Maintenance Interservice Support Agreement
Per DAU CLL 025, Depot Maintenance Interservice Support Agreements, depot facilities often have industrial and manufacturing capabilities with wide application. Depot maintenance offers opportunities for interservicing to ensure that DoD resources are used efficiently. Depot Maintenance Interservice Support Agreements (DMISA) are an execution tool by which depot maintenance support is provided for weapon systems across the DoD.

The DMISA is a formal agreement similar to a contract whereby one military Service (the Agent) agrees to provide depot maintenance support for another Service (the Principal). Typically, DMISAs are established to cover depot maintenance and related support functions for weapon systems, equipment end items, systems, subsystems, components, or commodity groups. DMISAs are used to assign workload for varying periods of performance with annual reviews.

Each Service and DoD agency is responsible for programming, budgeting, and funding to support the interservice arrangements to which it is party.

Depot Maintenance Capacity Measurement
In the depot maintenance context, the term capacity refers to the potential output of a depot maintenance activity. Capacity is expressed in Direct Labor Hours (DLH). Capacity utilization refers to the extent to which a depot maintenance activity uses its productive capacity. Utilization represents the difference between actual output and baseline capacity that could be produced if capacity was fully used. Utilization may be expressed as a percentage.

DoD 4151.18-H, Depot Maintenance Capacity and Utilization Measurement Handbook (or "Capacity Handbook") is the publication that governs capacity and utilization measurement.

The handbook provides updated measurement guidance for all Department of Defense (DoD) organic activities that perform depot-level maintenance of military materiel. The handbook includes:

- Methodologies for calculating capacity and utilization
- Requirements for recording, verifying, and reporting such information

Reset
According to the DoD Dictionary of Military and Associated Terms, "retrograde" refers to the process for the movement of non-unit equipment and materiel from a forward location to a reset program or to another directed area of operations, while "reset" refers to a set of actions to restore equipment to a desired level of combat capability commensurate with a unit's future mission.

Readers should refer to their respective organizations for policy and guidance related to reset. For example, U.S. Army Regulation 750-1, Army Materiel Maintenance Policy, provides detailed guidance on equipment reset.

A. Maintenance Planning & Management Major Activities by Acquisition Phase

Activities of the Maintenance Planning & Management IPS Element
Each activity of the Maintenance Planning & Management IPS Element, as listed in the PSM Guidebook Appendix A, is under the responsibility of the Program Manager, the Product Support Manager, and the lead stakeholder from other areas as applicable, i.e., configuration management, engineering, environment, manufacturing, etc. Relevant proponent DoD offices are listed in this chapter below in Section C, Proponency.

Input to the LCSP/Product Support Strategy
Detailed guidance on development of the Life Cycle Sustainment Plan (LCSP)/Product Support Strategy states that "The purpose of this annotated outline is to improve sustainment planning for Department of Defense (DoD) weapon systems. This may be achieved when programs make design decisions that achieve operational performance requirements and reduce demand for sustainment."

While information from Maintenance Planning & Management activities will impact many areas of the LCSP, the below LCSP sections specifically address Maintenance Planning & Management:
3.1 Sustainment Strategy Considerations
3.2 Sustainment Relationships
3.3 Product Support Arrangements
7.1 O&S Cost
8.1.2 Product Support Team
9.0 Supportability Analysis

As Maintenance Planning & Management activities continue through the life cycle, their impacts will both directly and indirectly impact the system's KPP, KSA and APA parameters. The PSM and LCL should start these activities early in the system lifecycle for greatest impact.

When Is Maintenance Planning & Management Delivered and Managed in the Lifecycle?

The activities within the Maintenance Planning & Management IPS Element are best visualized in the [DoD Product Support Implementation Roadmap Tool](https://www.dau.mil/dodpsroadmap/pages/TimelineView.aspx). This tool allows the User to check the box highlighting information specifically linked to the Maintenance Planning & Management Integrated Product Support Element.

Once the Maintenance Planning & Management IPS Element box is checked, the timeline expands to show the detailed activities and respective outputs for each activity by phase, as show in a partial illustration in Figure 5-1 below.

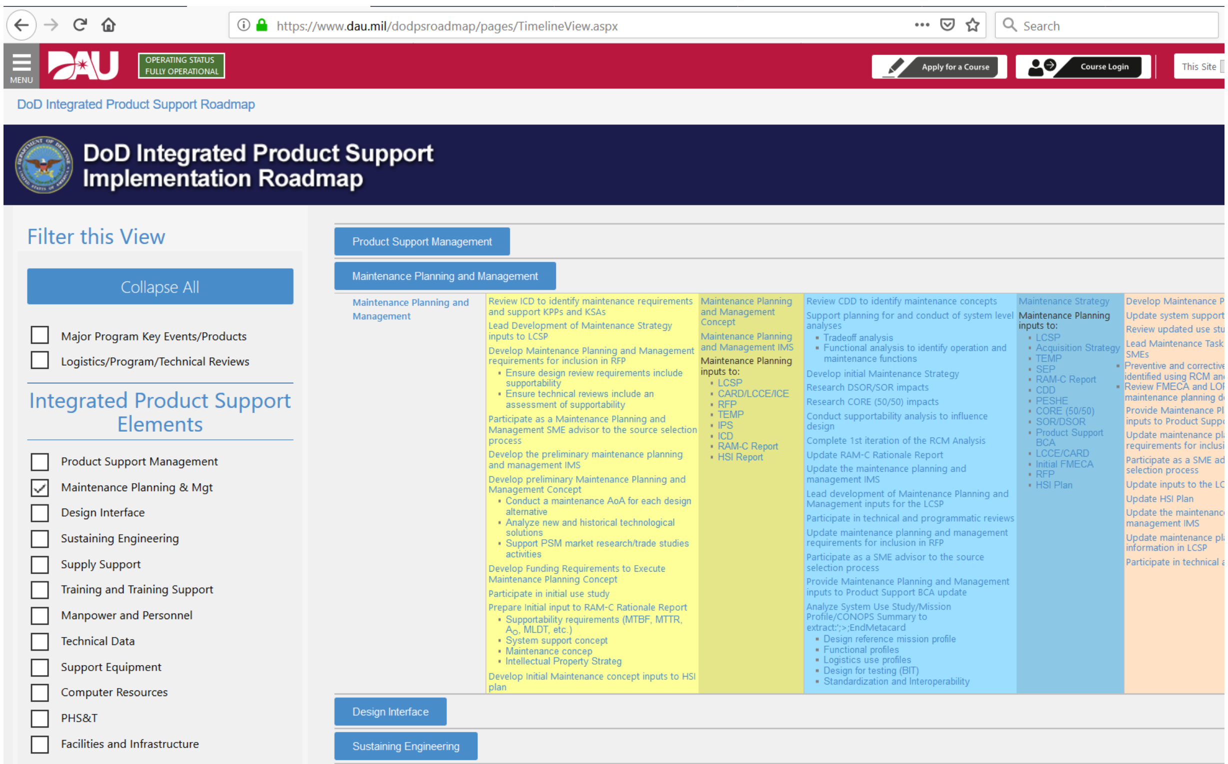


Figure 5-1, Screenshot of the DoD Integrated Product Support Implementation Roadmap Timeline View Homepage with the Maintenance Planning & Management IPS Element box checked. Notice the Maintenance Planning & Management activities and respective outputs are visible for each life cycle acquisition phase.

Each activity and output is then hyperlinked to a pop-up window that displays specific data related to that respective activity as shown in the screenshot below in Figure 5-2. The specific data is in-turn hyperlinked to allow the user to subsequently search for detailed information regarding any specific activity.

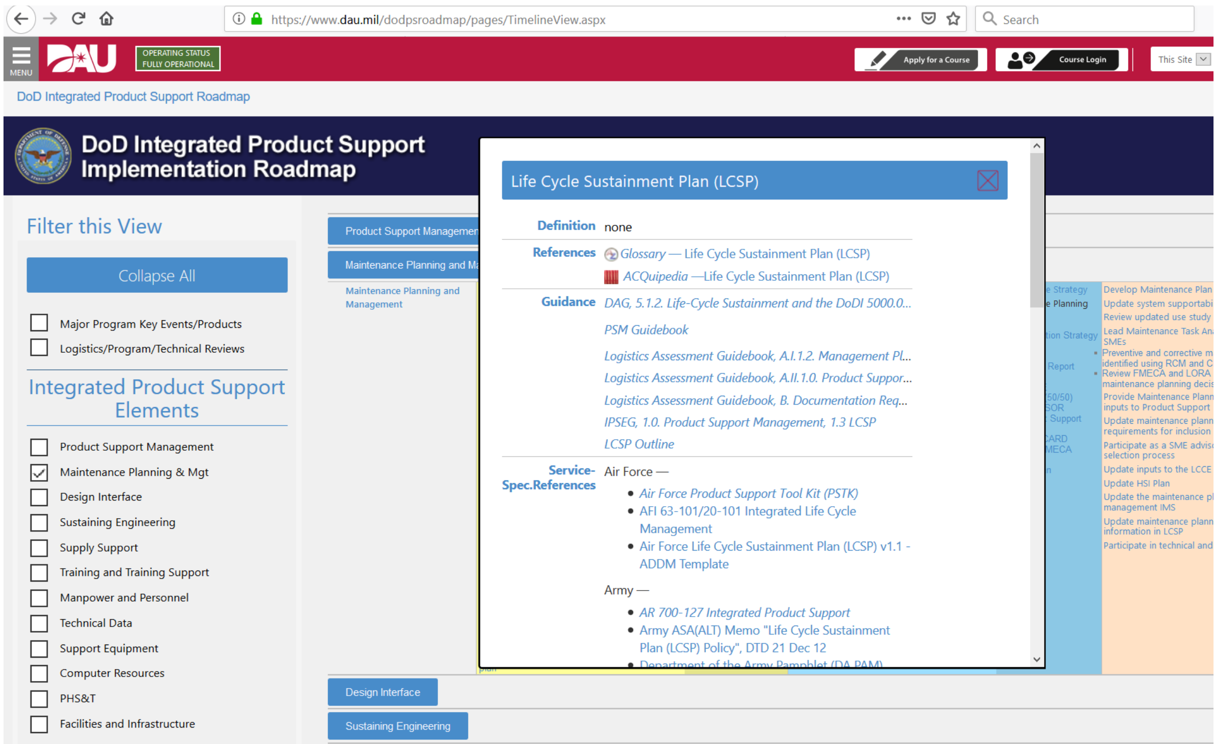


Figure 5-2, Screenshot of the DoD Integrated Product Support Implementation Roadmap Timeline View Homepage with the Maintenance Planning & Management IPS Element box checked. The User then clicked on the outcome "Life Cycle Sustainment Plan (LCSP)" from the listing of activities and outcomes for Maintenance Planning & Management. This data card provides further information for the User to search for further detailed information.

B. Data Item Description (DID) Deliverables

A Data Item Description (DID) is a completed document, typically identified in a Contract Data Requirements List (CDRL), that defines the data required of a contractor. The document specifically defines the data content, format, and intended use of the data. DIDs are found on the DoD Assist Database.

Helpful Search Hint: All DID's start with the letters "DI-." Once your search results are shown, click on the column header "Document ID" to sort by alphabetical order. The "DI-" items will be easier to find. You can also insert "DI-" into the Document ID field. For the Status field, be sure to use the "Active" category from the drop-down list.

The below DIDs are a representative listing and is not inclusive of all Maintenance Planning and Management related DIDs.

- DI-ALSS-80728, Depot Maintenance Production Report
- DI-ALSS-81547, Maintenance Data Record
- DI-FNCL-80462, Depot Maintenance Cost Report
- DI-ILSS-80111, Reliability-Centered Maintenance Analysis Data
- DI-ILSS-80234, Request for Programmed Depot Maintenance (PDM)

- DI-ILSS-80655, Level of Repair Analysis (LORA) Report
- DI-ILSS-80739, Depot Maintenance Study
- DI-ILSS-81225, Maintenance Support Plan
- DI-ILSS-81226, Interim Contractor Support (ICS) Parts Usage and Maintenance Data Collection Report
- DI-MGMT-80995, Maintenance Service Report
- DI-MISC-81371, Maintenance Data Collection Record
- DI-SESS-80294, Maintenance Test and Support Equipment Requirements List
- DI-SESS-80980, Reliability Centered Maintenance (RCM) Failure Modes and Effects Analysis (FMEA) Report

C. Proponency

Please note that DoD organizational changes may result in changes to Office designations and Proponency responsibilities that may not match the content in this Guidebook.

At the OSD level, the following offices may serve as proponents for issues related Maintenance Planning and Management:

- For Advanced Capabilities: Directorate of Defense Research and Engineering for Advanced Capabilities
- For Sustainment: Office of the Assistant Secretary of Defense for Sustainment

D. U.S. Government Statute, Regulations, DoD Policy and Guidance

The below policy and guidance are suggested as a core set of references. Note that this list does not contain policy and guidance from the DoD Components/Services. Readers should check with their respective organizations for additional policy and guidance specific to their program and product support requirements.

Please note that due to the high rate of change occurring in policy and guidance, the letter designations found as part of a reference will be removed in this guide. Readers are encouraged to check the DoD reference source on a frequent basis to ensure they are using the current reference version.

There are additional handbooks, manuals and other reference sources located below in the **Best Practices** section of this chapter.

- DoD Directive 5000.01, The Defense Acquisition System
- DoDI 5000.02, Operation of the Adaptive Acquisition Framework
- Other policy located on the DoD AAF website and DoD Issuances website
- Defense Acquisition Guidebook (DAG) (Chapter 4)
- 10 U.S.C. §2208 Working Capital Funds
- 10 U.S.C. §2366a MDAP Pre-Milestone A Approval Certification
- 10 U.S.C. §2366b MDAP Pre-Milestone B Approval Certification

- 10 U.S.C. §2460 Depot Maintenance
- 10 U.S.C. §2464 Core
- 10 U.S.C. §2466 "50-50 Rule"
- 10 U.S.C. §2469 "$3M Rule"
- 10 U.S.C. §2474 Partnering (CITE)
- 10 U.S.C. §2563 Partnering (Sales)
- DoDI 4151.18-H Depot Maintenance Capacity and Utilization Measurement Handbook
- DoDI 4151.20 Depot Maintenance Core Capabilities Determination Process
- DoDI 4151.21 Public-Private Partnerships for Depot-Level Maintenance
- DoDI 4151.22 Reliability Centered Maintenance (RCM) Manual
- MIL-HDBK-472 Maintainability Prediction
- MIL-HDBK-2155 Failure Reporting, Analysis and Corrective Action Taken
- MIL-HDBK-502, DoD Handbook, Product Support Analysis (08 March 2013)
- MIL-STD-3034 Reliability-Centered Maintenance (RCM) Process
- S4000M International Specification for Developing Scheduled Maintenance Programs
- S4000P International Specification for Developing and Continuously Improving Preventive Maintenance
- S5000F International Specification for Operational and Maintenance Data Feedback
- Condition Based Maintenance Plus (CBM+) Guidebook
- Corrosion Control and Prevention Guidebook
- DoD Depot Level Maintenance
- DoD Depot Maintenance Partnerships
- Logistics Assessment Guidebook - Appendix A: Integrated Product Support, Facilities & Infrastructure Criteria, Section 11.0
- Performance Based Logistics Guidebook
- Product Support Business Case Analysis Guidebook
- Product Support Manager (PSM) Guidebook

E. Communities of Practice and Interest

The topic of design interface covers such a vast scope of equipment that there is no one community of practice. Typically, design interface communities focus on the supportability of a type of system, for example, ships and aircraft, or of a type of DoD mission.

The Preface of this IPS Elements Guidebook provides a listing of "golden references," many of which provide libraries, research portals and other resources for finding additional information on specific topics of design interface.

Many OSD offices (listed under the Proponency section above) maintain a comprehensive website with links to DoD partner organizations, policy, and guidance, plus many other resources. Readers are encouraged to check the relevant proponent website for additional information.

Readers should check with their respective organizations for the communities of practice that focus on the area of design interface most relevant to their interests.

A good site for finding the laws, reports and plans related to depot management is on the "Internal Links" section at the website of the Deputy Assistant Secretary of Defense for Materiel Readiness.

The DAU community hub is a website that consolidates the links to approximately 50 communities of practice related to DoD acquisition practices. Many of these communities are important to the Maintenance Planning and Management IPS Element.

Best Practices Sources

- DoD Performance Based Logistics (PBL) Community of Practice (CoP)
- Product Support Implementation Roadmap
- LOG CoP Integrated Product Support (IPS) Element site
- U.S. Army Materiel Command Logistics Data Analysis Center (LDAC) Tools Suite
- OSD Maintenance Policy and Programs (MPP) Website
- ANSI for U.S. Government Agencies
- SAE JA1011 Standard "Evaluation Criteria for Reliability-Centered Maintenance (RCM) Processes"
- SAE JA1012 Guidebook "A Guide to the Reliability-Centered Maintenance (RCM) Standard"
- SAE JA6097 "Using a System Reliability Model to Optimize Maintenance Costs: A Best Practices Guide"
- SAE Standard AS1390 "Level of Repair Analysis (LORA)"
- See the website for the DDR&E, Advanced Capabilities, Reliability and Maintainability Engineering

F. Training Resources

DAU Courseware

A complete list of DAU training resources can be found at the DAU iCatalog. Courses are classified as Training Courses (Regular (certification and assignment specific) training courses), Continuous Learning, and Targeted Training (Alternate means to meet training requirements).

- LOG 101 Acquisition Logistics Fundamentals
- LOG 103 Reliability, Availability and Maintainability
- LOG 200 Product Support Strategy Development Part A
- LOG 201 Product Support Strategy Development Part B

- LOG 206 Intermediate Systems Sustainment Management
- LOG 211 Supportability Analysis
- LOG 215 Technical Data Management
- LOG 235 Performance Based Logistics
- LOG 340 Life Cycle Product Support
- LOG 465 Executive Product Support Manager's Course
- CLE 036 Engineering Change Proposals (ECP) for Engineers
- CLE 301 Reliability and Maintainability
- CLL 002 DLA Support to the PM
- CLL 005 Developing a Life Cycle Support Plan (LCSP)
- CLL 006 Public-Private Partnerships
- CLL 008 Designing for Supportability in DoD Systems
- CLL 011 Performance Based Logistics (PBL)
- CLL 012 Supportability Analysis
- CLL 020 Independent Logistics Assessment (ILA)
- CLL 022 Title 10 Depot Maintenance Statue Overview
- CLL 023 Title 10 U.S.C. 2464 Core Statute Implementation
- CLL 024 Title 10 Limitations on the Performance of Depot-Level Maintenance
- CLL 025 Depot Maintenance Interservice Support Agreement
- CLL 026 Depot Maintenance Capacity Measurement
- CLL 029 Condition Based Maintenance Plus (CBM+)
- CLL 030 Reliability Centered Maintenance
- CLL 046 The Twelve Integrated Product Support Elements
- CLL 057 Level of Repair Analysis (LORA) Fundamentals
- CLL 058 Level of Repair Analysis (LORA) Implementation

DAU ACQuipedia Articles
ACQuipedia serves as an online encyclopedia of common defense acquisition topics. Each topic is identified as an article. Each article contains a definition, a brief narrative that provides context, and includes links to the most pertinent policy, guidance, tools, practices, and training which further augment understanding and expand depth.

ACQuipedia was developed as a collaborative project to create content around Defense Acquisition-related topics. Articles (topics) will be maintained as a collaborative effort of subject matter experts across the Defense Acquisition University (DAU). Future growth may expand the collaboration of subject matter experts beyond DAU.

ACQuipedia provides the acquisition workforce with quick access to information in a succinct and digestible format. Article content aggregates the most relevant references and learning assets to narrowly focus users and quickly provide high value information.

Below is a listing of linked ACQuipedia articles relevant to Maintenance Planning and Management. The reader is encouraged to visit the homepage to see additional articles.

- Automatic Test System (ATS) & Automatic Test Equipment (ATE)
- Condition Based Maintenance Plus (CBM+)
- Core Logistics Analysis
- Depot Level Maintenance
- Depot Maintenance Inter-Service Support Agreement (DMISA)
- Depot Maintenance Statute - 10 USC 2460
- Depot Maintenance Statute - 10 USC 2464
- Depot Maintenance Statute - 10 USC 2466
- Depot Maintenance Statute - 10 USC 2469
- Depot Maintenance Statute - 10 USC 2474
- Failure Modes Effects & Criticality Analysis (FMECA)
- Funding Product Support Strategies
- Funding Product Support Strategies - Working Capital Funds (WCF)
- Integrated Product Support (IPS) Elements
- Integrated Product Support (IPS) Element - Maintenance Planning and Management
- Level of Repair Analysis (LORA)
- Maintenance Levels
- Maintenance Plan
- Performance Based Logistics (PBL) Contract Lengths
- Performance Based Logistics (PBL) Contracting Strategies
- Performance Based Logistics (PBL) Implementation
- Performance Based Logistics (PBL) Management
- Performance Based Logistics (PBL) Metrics - Overview
- Performance Based Logistics (PBL) Metrics - Thresholds vs. Objectives
- Performance Based Logistics (PBL) Overview
- Product Life-Cycle Management (PLM) Integrated Data/Decision Environment (IDE)
- Product Support Arrangements (PSA)
- Product Support Business Model (PSBM)
- Product Support - Demonstrate Capability
- Product Support - Develop Initial Strategy
- Product Support Integrator (PSI) and Product Support Provider (PSP)
- Product Support Manager (PSM)
- Product Support Package
- Product Support Plan (PSP)
- Product Support - Set Strategy
- Reliability Centered Maintenance (RCM)

- Supportability Analysis
- System Fielding and Site Activation

Packaging, Handling, Storage and Transportation (PHS&T) Planning & Management

Objective

Identify, plan, resource, and acquire packaging/preservation, handling, storage, and transportation (PHS&T) requirements to maximize availability and usability of the materiel to include support items whenever they are needed for training or mission success.

Description

PHS&T is the combination of resources, processes, procedures, design considerations, and methods to ensure that all system, equipment, and support items are preserved, packaged, handled, and transported properly, including environmental considerations, equipment preservation for the short and long storage, and transportability. Some items require special environmentally controlled, shock isolated containers for transport to and from repair and storage facilities via all modes of transportation (land, rail, air, and sea).

Overview

PHS&T addresses these four functional areas:

- **Packaging:** provides for product security, transportability, storability. The nature of an item determines the type and extent of protection needed to prevent its deterioration, physical and mechanical damage. Shipping and handling, as well as the length and type of storage considerations, dictate cleaning processes, preservatives, and packaging materials.

- **Handling:** involves the moving of materiel from one place to another within a limited range and is normally confined to a single area, such as between warehouses, storage areas, or operational locations, underway replenishment, shipboard cargo holds, aircraft, or movement from storage to the mode of transportation.

- **Storage:** infers the short or long term storing of items. Storage can be accomplished in either temporary or permanent facilities of varying conditions, i.e., general purpose, humidity-controlled warehouses, refrigerated storage and shipboard.

- **Transportation:** the movement of equipment and supplies using standard modes of transportation for shipment by land, air, and sea. Modes of transportation include cargo, vehicle, rail, ship, and aircraft.

Packaging, Handling, Storage and Transportation (PHS&T) focuses on the unique requirements involved with packaging, handling, storing, and transporting not only the major end items of the weapon system but also spare parts, other classes of supply and infrastructure items. The requirements and constraints which a military environment imposes on these activities can significantly affect availability, reliability, and life cycle costs of the weapon system.

Per DoDI 4140.01, Volume 9, each DoD Component provides PHS&T for weapon system acquisition programs. PHS&T decisions are the purview of a Service's PHS&T Technical Authority and PSMs need to ensure communication with PHS&T specialists is established early in the life cycle. PHS&T applies to anything being shipped or stored, does not matter if it is the entire system or a repair part. Additionally, PHS&T items may require their own life cycle product support, such as maintenance of re-usable containers or special storage facilities.

Examples of unique military requirements include storage of materiel in extreme environments for long periods of time, transport into and out of remote regions where commercial carriers are not present, international customs and inspection requirements, and the routine shipping of dangerous and hazardous items.

Why PHS&T is Important

PHS&T processes are essential components of effective Supply Chain Management. An efficient PHS&T system introduces minimal procurement delays or errors, and results in material shipments at the "right place at the right time," thus improving system availability and lowering overall life cycle cost. Typically, a PHS&T system will include elements of total asset visibility.

The outcomes of PHS&T activities not properly being addressed directly impact the Key Performance Parameter of Availability and life cycle cost management in several ways, for example:

- Transportation problems where items are delayed, or more significantly, cannot be shipped due to physical or regulatory restrictions;
- Storage issues where shelf-life has expired, or improper storage has caused degradation of the product;
- Poor packaging or marking resulted in lost items during shipping;
- Incorrect handling resulted in damage to the item being shipped.

Since all items, even software data, are subject to PHS&T requirements and considerations. The Product Support Manager must ensure that PHS&T is given thorough consideration starting early in the design process. Historically, PHS&T activities were the primary responsibility of the manufacturers, with PHS&T sustainment being planned and implemented often under separate contract line items and separate management.

Product Support Manager Activities

The principal objectives of the Product Support Manager, their Deputy for Logistics and their subject matter expert for PHS&T is to address the following key PHS&T objectives which should conform to the requirements established by their Service's PHS&T Technical Authority:

- Obtain item specific PHS&T technical data sufficient to develop military packaging requirements or obtain military packaging requirements themselves conforming to the format of MIL-STD-2073-1 for use by Services' inventory control points in contract actions for spares procurements and repairs, organic or interservice repair actions during the operations and sustainment phase.
- Plan for the PHS&T requirements for items with special characteristics, i.e., items which may be oversize, extremely heavy and/or present challenges in handling storage and transportation outside the usual practices of the military distribution system. These items may require special or periodic maintenance prior to use, special over the road routing, special clearances for air transport, etc.
- Identify candidates for specialized Long-life Reusable Containers (LLRC) and plan for the timely development of same. Typically, this activity is coordinated with the Services' PHS&T Technical Authority to identify item characteristics and distribution scenarios, technical data requirements, cost, and schedules.
- Plan for the packaging and marking to military standards of material to be transitioned or capitalized into the supply system at the conclusion of contractor logistics and /or interim support periods.

6.1. Short- and long-term preservation

Military preservation is the application of materials and/or methods designed to protect an item during shipment, handling, indeterminate storage, and distribution to consignees worldwide.

The process of evaluating an item by chemical and physical characteristics is significant in determining the preservation requirements. MIL-STD-2073-1, DoD Standard Practice for Military Packing, covers methods of preservation to protect materiel against environmentally induced corrosion and deterioration, physical and mechanical damage, and other forms of degradation during storage, multiple handling, and shipment of materiel in the Defense Transportation System (DTS).

Storage

Storage refers to the short or long term holding of items in a designated location and facility. Storage can be accomplished in either temporary or permanent facilities. All DoD Components maintain inventory and store items.

DoDM 4104.01 Volume 5, DoD Supply Chain Materiel Management Procedures: Delivery of Materiel ensures materiel is maintained in ready-for-issue condition or to prevent deterioration of unserviceable materiel. COSIS includes a quality assurance program for inspection and test; a system for reporting and recording quality assurance data; provisions for entry of the condition of materiel into the total item property record, and a system to ensure that corrective actions are completed for deficiencies uncovered during inspections to restore the items to serviceable condition or protect unserviceable materiel from deterioration.

Per DoDI 4140.01, Volume 9, additional areas of storage considerations include:

- storage quality control to improve efficiency, reduce processing time, and facilitate monitoring for recurring problems and contractor performance
- item protection
- uniform in-the-clear and machine-readable marking requirements
- use of standardized and unitized loads

Readers should review the Information Technology (IT) Systems Continuous Support IPS Element chapter in this guidebook for further information on data storage.

Storage Infrastructure
The DoD owns, leases and contracts for storage infrastructure under short and long-term durations for physical and electronic property and technical data.

Readers should review the Technical Data, Facilities and Infrastructure, and Information Technology (IT) Systems Continuous Support IPS Elements in this guidebook for more information.

6.2. Packaging requirements determination
Army Regulation 700–15/NAVSUPINST 4030.28E/AFJMAN 24–206/MCO 4030.33E/DLAR 4145.7, Packaging of Materiel, defines the requirement for all DoD Agencies and Services to specify in procurement awards the use of MIL-STD-2073-1E, DoD Standard Practice For Military Packing or ASTM D3951, Commercial Packaging, when appropriate. Per MIL-STD-2073-1, DoD Standard Practice For Military Packaging, military packaging is a means of specifying the military preservation, packaging and packing that a given item requires to ensure that it is not degraded during shipment and storage in the military distribution system. It is the application of any exterior protective methods, materials, or devices to ensure the integrity of the preserved item. Typically, determination of packaging requirements is performed by packaging Subject Matter Experts (SME) at the cognizant Services' inventory control points and can only be developed if adequate PHS&T technical data is acquired by the PSM and provided to the SME.

DoD Components now provide packaging data on-line. For example, DLA and the Military Services maintain a packaging website to help commercial vendors and DoD Service-owned maintenance and repair facilities to interpret the packaging requirements. Readers should also check with their respective organizations for relevant packaging requirements.

Use of Packaging Material
Per MIL-STD-2073-1, DoD Standard Practice For Military Packaging, the use of new packaging materials or products is encouraged and recommended if their protective capabilities are equivalent to, or exceed approved materials without increasing the overall cost to the Government. The decision to use a specific packaging material or method is should be made by the Services' Packaging Technical Authority.

Per MIL-STD-2073-1, DoD Standard Practice for Military Packaging, acceptable shipping containers for Levels A and B military packing are listed in table C-II. Selection criteria shall reflect the most economical container that provides the required protection for any given military packing application.

6.3. Containerization requirements determination
All DoD Components and Agencies have strict guidelines for container utilization and re-utilization. The Department of Defense has established a computerized Container Design Retrieval System (CDRS) for the purpose of precluding the proliferation of long-life reusable specialized containers and containerized pallets. CDRS is a computerized repository of over 6000 specialized containers. CDRS contains details for each container including size, weight, items carried, fragility level, drawings, location(s) of containers, quantity available, container item managers and more. This system is maintained by the Air Force Packaging Technology and Engineering Facility at Wright-Patterson AFB. Usage of the CDRS data base precludes the design of new specialized containers when a suitable container exists. This data has resulted in a proven history of substantial cost avoidance.

Per DTR 4500.9-R, Defense Transportation Regulation Individual Missions, Roles and Responsibilities, DLA is the freight container procurement manager for the DoD and has the authority to procure commercial off-the-shelf International Organization for Standardization (ISO) containers for the Services, including ISO containers with special features as required (e.g., Chemical Agent Resistant Coating [CARC] paint and retaining rings). DLA will develop contracting mechanisms for the Services and Agencies to use for these types of procurements.

Per DoDI 4500.57, Transportation and Traffic Management, United States Transportation Command (USTRANSCOM) manages the intermodal container program, to include developing processes and procedures for the disposition of all containers, including DoD-owned and commercially-owned and -leased containers, and recommending development of global container technology investments and tracking systems for containers moving in the Defense Transportation System (DTS).

In general, the DoD Services manage their own long-life reusable containers.

6.4. Shelf-life requirements determination

Per DoDM 4140.27, Volume 1, DoD Shelf-Life Management Program: Program Administration, shelf-life is the total period of time beginning with the manufactured date, cure date (elastomeric and rubber products only), assembled date, packed date (subsistence only), or packaging date (SAE AS5502 items only) and terminated by the date which an item must be used (expiration date) or subjected to inspection or test (inspect/test date), restoration, or disposal action. Shelf-life is not to be confused with service life. Materiel managers will:
a. Ensure that provisioning support items are coded and reviewed for shelf-life considerations in accordance with Volume 5 of DoDM 4140.01 and DoD 4100.39-M, Federal Logistics Information System (FLIS) Procedures and where possible:
(1) Give emphasis to properly identify the item's shelf-life and the Items Type Storage Code assigned to prevent storage under adverse condition and visually inspect prior to use, using the defect characteristic codes.
(2) Determine potential use of non-hazardous, non-shelf-life, and longer shelf-life items.
(3) Procure recycled items.
b. Acquire military specification items using shelf-life requirements contained in MIL-STD-961, Defense and Program-Unique Specifications Format and Content.
c. Assign source maintenance and recoverability codes to all shelf-life items to reflect items deteriorative nature as described in AR 700-82/OPNAVINST 4410.2A/AFMAN 21-106.
d. Use the complete set of data contained in DoDM Volume 2, Shelf-life Management Program: Material Quality Control Storage Standards (MQCSS) when determining how to properly extend the shelf-life of Type II items. The web-based Shelf-life Extension System (SLES) is the central DoD data repository for MQCSS information and the quality status list (QSL) of DoD-approved laboratory test results.

The joint publication (multiple designators) DLAR (JP) 4155.37 AR 702-18 NAVSUPINST 4410.56A AFMAN 23-232 (IP) MCO 4450.13B, July 28, 2015, Department of Defense (DoD) Shelf-Life Materiel Quality Control Storage Standards (MQCSS), prescribes uniform policies, responsibilities, and guidance for the development, preparation, dissemination, maintenance, and application of MQCSS for shelf-life materiel managed, owned, and used by the Military Departments, Defense Logistics Agency (DLA), General Services Administration (GSA), the Federal Aviation Administration (FAA), the U.S. Coast Guard (USCG), and the National Aeronautics and Space Administration (NASA).

6.5. Handling requirements determination

Handling involves the moving of items from one place to another within a limited range and is normally confined to a single area, such as between warehouses, storage areas, or operational locations, or movement from storage to the mode of transportation.

Material handling is the movement, storage, control and protection of materials, goods, and products throughout the process of manufacturing, distribution, consumption, and disposal. The focus is on the methods, mechanical equipment, systems, and related controls used to achieve these functions. The material handling industry manufactures and distributes the equipment and services required to implement material handling systems. Material handling systems range from simple pallet rack and shelving projects, to complex conveyor belt and

Automated Storage and Retrieval Systems (AS/RS). Material handling can also consist of sorting and picking as well as automatic guided vehicles.

The topic of handling within the DoD is addressed under multiple topic areas, to include shelf-life, marking/Item Unique Identification (IUID), transportation, and packaging. The regulations are also broken out by classes of supply and special categories of items such as food perishables, chemical weapons, ammunition, etc. The reader should become familiar with DoDM 4140.70, DoD Supply Chain Materiel Management Procedures for Storage and Material Handling and contact their organization for operational and Service-specific handling requirements.

More information on material handling equipment is found in the Support Equipment IPS Element chapter in this guidebook.

Special Materials Handling

The DoD has many policies and instructions/guidance for special materials handling, especially for those classes of supply which create hazards such as Class III (petroleum, oils, and lubricants) and Class V (ammunition).

Hazardous materials storage and handling policies and procedures shall be as uniform as possible. The DoD Components shall follow hazardous materials guidelines and policies set forth by the DoD and their respective headquarters. The DoD Components shall reduce the use of hazardous materials and long-term storage as much as possible. PSMs should check with their safety offices, shipping and transportation offices, Office of Safety and Health Administration (OSHA), and suppliers for current information regarding the handling of all materials.

Selected references include:

- DLAI 4145.11/TM 38-410/NAVSUP PUB 573/AFJMAN 23-209/MCO 4450.12A, Storage and Handling of Hazardous Materials, January 13, 1999
- Defense Explosives Safety Regulation (DESR) 6055.09, Edition 1, January 13, 2019
- DoDM 4140.01, Volume 11, DoD Supply Chain Materiel Management Procedures: Inventory Accountability and Special Management and Handling

6.6. Transportation requirements determination

The terms “transportation” and “transportability” have different meanings. Transportation is the movement of equipment and supplies using standard modes of transportation for shipment by land, air, and sea. Transportability is the capability of material to be moved by towing, self-propulsion, or carrier via any means, such as railways, highways, waterways, pipelines, oceans, and airways.

Transportability is a consideration for all acquisition categories and all acquisition sources, including new or modified equipment, re-procurements, and commercial or non-developmental systems.

The materiel developer and/or contractor is responsible for incorporating transportability considerations into equipment design. USTRANSCOM provides information for the transportation requirements to move cargo and passengers.

- Also see information above in Section 6.3 Containerization requirements determination.

- Readers should also review the Design Interface IPS Element chapter, section 2.7, Deployability Management.

Distribution
DoDI 5158.06, Distribution Process Owner (DPO), implements policy for overseeing, coordinating, and synchronizing the DoD-wide distribution processes, including force projection, sustainment, and redeployment/retrograde operations.

Joint Deployment and Distribution Enterprise
Per DoDI 5158.06, Joint Deployment and Distribution Enterprise (JDDE) Planning and Operations, the Joint Deployment and Distribution Enterprise (JDDE) is the complex of equipment, procedures, doctrine, leaders, technical connectivity, information, shared knowledge, organizations, facilities, training, and materiel necessary to conduct joint distribution operations.

Per JP 4-01, The Defense Transportation System, the Commander, United States Transportation Command (CDRUSTRANSCOM), as the DoD single manager for transportation, develops and directs the JDDE to support global force projection; provides end-to-end visibility of the joint distribution process; identifies opportunities for performance improvement; and provides responsive transportation support of joint, United States Government (USG), and SecDef approved multinational and nongovernmental logistical requirements.

Transportation Modes
Traditionally, the transportation modes have been defined as land, sea, and air (or road, rail, sea, and air). Depending on the context, readers may find the modes further subdivided or grouped differently.

For example, the U.S. Army Transportation Engineering Agency lists the below on their website:
- Highway Transport
- Lifting and Tiedown Provision Designs
- Rail Transport
- Aircraft
- Helicopters

- Sealift

Per the Joint Publication 4-01, The Defense Transportation System (DTS), DTS is that portion of the worldwide transportation infrastructure that supports DoD transportation needs in times of peace and war. It consists of three major sources of transportation resources and capabilities: military (organic), commercial (nonorganic), and host nation (HN). Resources include inland surface transportation (rail, road, and inland waterway), sea transportation (coastal and ocean), air transportation, and pipelines.

Hazardous Cargo

Per Defense Transportation Regulation – Part II, Cargo Movement, all DoD personnel (military, civilians, and contractors) participating in the movement of regulated hazardous materials must comply with the rules of regulatory bodies governing the safe transportation of regulated hazardous materials for modes of transportation. Regulated hazardous materials are materials determined by the Department of Transportation (DOT) to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce. These materials are segregated into classes and divisions and identified in 49 CFR 173.2, Hazardous Materials Classes and Index to Hazard Class Definitions.

Frustrated Cargo

Frustrated cargo is defined as any shipment of supplies and/or equipment which, while enroute to destination, is stopped prior to receipt and for which further disposition instructions must be obtained. Problems ranging from illegible, incomplete, or missing Military Shipping Labels (MSL), to ISPM-15 noncompliance, to poor coordination among contractors, Government Purchase Card (GPC) holders, and their transportation support offices can cause delays or "frustrations" along the transportation supply chain and sometimes result in shipments that never reach the intended recipients. Although policies and procedures already in effect provide guidance on shipping information requirements, the problem appears to lie in a lack of knowledge, misuse, or avoidance of these procedures among users.

6.7. Environmental control requirements determination

An essential step to designing a cushioned package system is to determine the severity of the environment in which it will be shipped. The general idea is to evaluate the method of distribution to determine the hazards which exist and the levels at which they are present. These hazards may include such things as temperature extremes, humidity levels, and compression loads during storage. A key reference is MIL-STD-2073-1, DoD Standard Practice For Military Packaging. This standard covers methods of preservation to protect materiel against environmentally induced corrosion and deterioration, physical and mechanical damage, and other forms of degradation during storage, multiple handling, and shipment of materiel in the Defense Transportation System (DTS) and in commerce.

6.8. Physical shock control requirements determination

Per MIL-STD-2073-1, DoD Standard Practice for Military Packaging, items that require special protection against shock are described as “critical physically.” The fragility factor of an item is the maximum force acceleration or deceleration expressed in units of gravity (Gs) that can be applied to an item in its non-operating state without causing physical damage or changes in its operational characteristics. The fragility factor is expressed in units of acceleration for a defined shock pulse. Shock pulse forms and durations that approximate the transportation and handling environment are to be used in determining the fragility factor. Representative fragility factors for various classes of items are listed in Table I (MIL-STD 2073-1).

Shock and vibration absorption is provided via packaging by cushioning materials or isolators that protect the contents and packaging components from physical damage during handling, shipment, and storage. A cushioning medium shall be placed as close to the contents as practicable. A non-corrosive wrap shall be placed between the item and all corrosive type cushioning media.

6.9. Static shock control requirements determination

Static (or electrostatic) shock occurs when an electric charge can be created between two surfaces that contact and separate, and at least one of the surfaces has a high resistance to electric current (i.e., is an insulator). Electronic items that are susceptible to damage or degradation as a result of an electrostatic discharge event are known as Electrostatic Discharge Sensitive (ESDS) items. Protection for all electrostatic discharge sensitive items requires the use of packaging materials to counteract electrostatic and electromagnetic field forces.

All ESDS items shall be packaged in a facility that has an approved Electrostatic Discharge (ESD) control program. ESD Control Program requirements are typically specified in accordance with the contract. If ESDS items are being procured and there are no ESD Control Program requirements specified in the contract, then an ESD program shall be developed and implemented in accordance with MIL-STD-1686, Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices).

DLA maintains a website dedicated to questions regarding ESDS and packaging requirements.

6.10. Security classification requirements determination

Classified cargo requires protection in the interest of national security. Classified cargo shipments have characteristics that require them to be identified, accounted for, secured, segregated, or handled in a special way to ensure their safeguard or integrity. Sensitive cargo is cargo that could threaten public safety if it is compromised. Sensitive cargo must be properly secured and identified so sufficient security can be provided. For more information. Readers should review DTR 4500.9, Part II, Cargo Movement, Chapter 205 that defines handling and transporting classified cargo. Readers may also contact the DLA Packaging helpdesk for latest references and guidelines.

DoDM 5200.01, Volume 3, DoD Information Security Program: Protection of Classified Information, provides guidance for safeguarding, storage, destruction, transmission, and transportation of classified information.

6.11. Container Reutilization

Per MIL-STD-2073-1, DoD Standard Practice For Military Packaging, a reusable container is a shipping and storage container that can be reused without impairment of its protective function and that can be repaired or retrofitted to prolong its life or modified to adapt it for shipment of items other than that for which it was originally intended. Reusable shipping and storage containers are further defined as Long life containers (100 trips minimum), short life containers (10 trips minimum), multi-application containers, and specialized containers. These containers are managed by the Service-component that specifies the requirements to protect items during storage and transportation and specifies the requirements in procurement awards.

Intermodal Containers and Systems

Per DoDI 4500.57, Transportation and Traffic Management, use of standardized International Organization for Standardization (ISO) containers provides the DoD with a capability to deploy, sustain, and redeploy forces, equipment, and supplies cost effectively. Container management is a responsibility of all DoD Components and the use of USTRANSCOM's Joint Container Management System is mandatory.

USTRANSCOM provides overall container management support to CCMDs. CCMDs provide operational support while the containers are within the AOR. Generally, DoD-owned or -leased containers are managed by the DoD Component that owns or leases them. Service-unique containers are managed by the Military Service that purchased or leased the container. Program transportation coordinators work with short and long-haul transportation providers regarding usage of containers.

Best practices for container utilization are generally obtained from operators of major transportation/logistics hubs and ports for land, sea, and air operations. These practices typically revolve around container tracking, container content tracking, load plans, loading and unloading processes, and container utilization.

6.12. Marking

A marking is the numbers, letters, bar codes, labels, tags, symbols, or colors applied to provide identification and to expedite handling during shipment and storage.

MIL-STD-129, Military Marking for Shipment and Storage, provides the minimum requirements for uniform military marking for shipment and storage on unit, intermediate and exterior shipping containers. Additional marking may be required by the contract or the cognizant activity. MIL-STD-129 defines the bar code, Radio Frequency Identification (RFID), and Automatic Identification Technology (AIT) media procedures for asset visibility.

Product marking uses MIL-STD-130, Identification Marking of U.S. Military Property as a set of standards followed by the DoD concerning the proper requirements and methods of marking, identifying, and keeping track of military property. This includes anything that is produced, stocked, stored, or issued by or for the Department of Defense. Also see section 4.17.2. Item Unique Identification (IUID) in this guidebook.

A. PHS&T Major Activities by Acquisition Phase

Activities of the PHS&T IPS Element
Each activity of the PHS&T IPS Element, as listed in the PSM Guidebook Appendix A, is under the responsibility of the Program Manager, the Product Support Manager, and the lead stakeholder from other areas as applicable, i.e., configuration management, engineering, environment, manufacturing, etc. Relevant proponent DoD offices are listed in this chapter below in Section C, Proponency.

Input to the LCSP/Product Support Strategy
Detailed guidance on development of the Life Cycle Sustainment Plan (LCSP)/Product Support Strategy states that "The purpose of this annotated outline is to improve sustainment planning for Department of Defense (DoD) weapon systems. This may be achieved when programs make design decisions that achieve operational performance requirements and reduce demand for sustainment."

While information from PHS&T activities will impact many areas of the LCSP, the below LCSP sections specifically address PHS&T:
3.1 Sustainment Strategy Considerations
3.2 Sustainment Relationships
3.3 Product Support Arrangements
7.1 O&S Cost
8.1.2 Product Support Team
9.0 Supportability Analysis

As PHS&T activities continue through the life cycle, their impacts will both directly and indirectly impact the system's KPP, KSA and APA parameters. The PSM and LCL should start these activities early in the system lifecycle for greatest impact.

When Is PHS&T Delivered and Managed in the Lifecycle?
The activities within the Maintenance Planning & Management IPS Element are best visualized in the DoD Product Support Implementation Roadmap Tool. This tool allows the User to check the box highlighting information specifically linked to the Maintenance Planning & Management Integrated Product Support Element.

Once the Maintenance Planning & Management IPS Element box is checked, the timeline expands to show the detailed activities and respective outputs for each activity by phase, as show in a partial illustration in Figure 6-1 below.

Figure 6-1, Screenshot of the DoD Integrated Product Support Implementation Roadmap Timeline View Homepage with the Maintenance Planning & Management IPS Element box checked. Notice the Maintenance Planning & Management activities and respective outputs are visible for each life cycle acquisition phase.

Each activity and output is then hyperlinked to a pop-up window that displays specific data related to that respective activity as shown in the screenshot below in Figure 6-2. The specific data is in-turn hyperlinked to allow the user to subsequently search for detailed information regarding any specific activity.

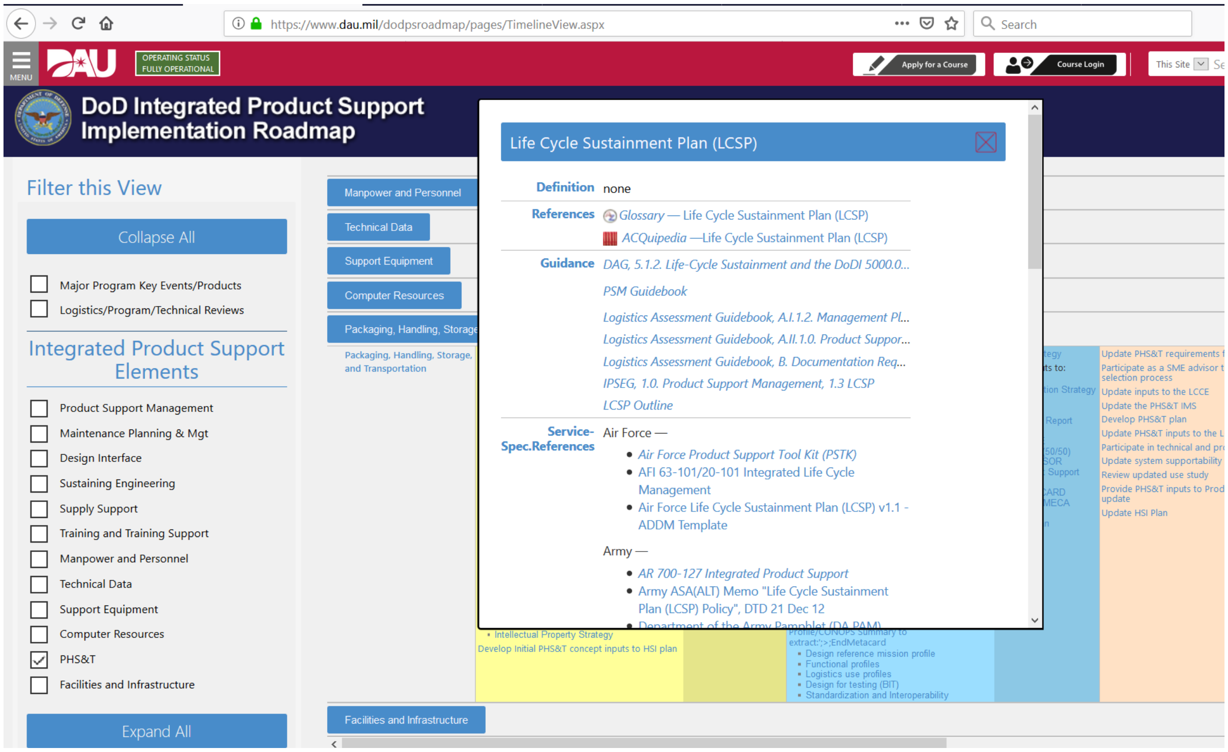


Figure 6-2, Screenshot of the DoD Integrated Product Support Implementation Roadmap Timeline View Homepage with the Maintenance Planning & Management IPS Element box checked. The User then clicked on the outcome "Life Cycle Sustainment Plan (LCSP)" from the listing of activities and outcomes for Maintenance Planning & Management. This data card provides further information for the User to search for further detailed information.

B. Data Item Description (DID) Deliverables

A Data Item Description (DID) is typically identified in a Contract Data Requirements List (CDRL), that defines the data required of a contractor. The document specifically defines the data content, format, and intended use of the data. DIDs are found on the DLA Assist Database.

Helpful Search Hint: All DID's start with the letters "DI-." Once your search results are shown, click on the column header "Document ID" to sort by alphabetical order. The "DI-" items will be easier to find. You can also insert "DI-" into the Document ID field. For the Status field, be sure to use the "Active" category from the drop-down list.

The below DIDs are a representative listing and is not inclusive of all Product Support Management related DIDs.

- DI-DRPR-81718, Preservation, Packaging, and Packing (PP&P) Drawing(s)
- DI-MISC-81499, Packaging Kit Contents List
- DI-PACK 80120, Preservation and Packing Data
- DI-PACK-80121, Special Packaging Instructions
- DI-PACK-80455, Packaging Plan

- DI-PACK-80456, Packaging Test Plan
- DI-PACK-80457, Packaging Test Report
- DI-PACK-80458, Packaging Cost Analysis
- DI-PACK-81059, Performance Oriented Packaging Test Report
- DI-PACK-81582, Packaging Development Data Report
- DI-RELI-80671, Handling Procedures for Electrostatic Discharge (ESD) Sensitive Items
- DI-QCIC-80891, Handling Procedures for Static Sensitive Devices Report
- DI-ILSS-80967, Spares Shipping Data Sheets
- DI-MGMT-80503, Report of Shipping (Item) and Packaging Discrepancy
- DI-PACK-80877, Transportation Data Report
- DI-MGMT-80554, Transportation Discrepancy Report
- DI-ILSS-80636, Transportation Delay Report

C. Proponency

Please note that DoD organizational changes may result in changes to Office designations and Proponency responsibilities that may not match the content in this Guidebook.

At the OSD level, the Office of the Assistant Secretary of Defense (OASD) for Sustainment serves as proponents for policy, guidance, and oversight of PHS&T activities. See the website for the Office of the Assistant Secretary of Defense for Sustainment for more information on the organizational structure.

The Defense Logistics Agency, reporting directly to the Office of the Assistant Secretary of Defense for Sustainment, offers:

- Document Services
- Environmental and Sustainable Programs
  - Disposal of Hazardous Waste
  - DLA Environmental Products & Services
  - Green Products Inquires
  - Hazardous Minimization
  - Regulated Materials Helpline
- Equipment Disposition
  - DDSR: Digital Disposal Services Representative, the one-stop location for doing business with DLA Disposition Services
  - Equipment Turn-In
    - Army Excess Equipment Turn-In Guidance
  - Re-utilization, Transfer and Donation Program
  - Sales

- Federal and International Cataloging
- Materials
  - Aviation Equipment
  - Building Materials and Equipment
  - DLA Map Catalog
  - Food
  - Fuel and Energy
  - Industrial Hardware
  - Industrial Plant Equipment
  - Land and Maritime Equipment
  - Maps
  - Medical
  - Strategic Materials
  - Uniforms
- Services
  - Forgings and Castings Program
  - Storage
  - Transportation

Defense Packaging Policy Group (DPPG)

Per the DoDM 4140.01, Volume 9, DoD Supply Chain Materiel Management Procedures: Materiel Programs, the DPPG is a permanent forum established to address packaging issues, identify potential solutions, and make recommendations concerning packaging policy, guidance, and standardization throughout the DoD. Special areas of interest include:

a. New, changed, or improved packaging equipment, methods, and concepts.
b. Engineering and data development.
c. Increased productivity and overall cost improvement and effectiveness.
d. Training.
e. International and domestic packaging and transportation requirements.
f. Environmental issues or mandates.
g. Military packaging standardization and simplification.
h. Packaging security requirements and techniques to reduce the likelihood of tampering or unauthorized access.

Each DoD Component/Service maintains PHS&T policy and guidance to address its respective requirements. Readers should contact their organizational points of contact for more information on Service-specific PHS&T requirements and resources.

D. U.S. Government Statute, Regulations, DoD Policy and Guidance

The below policy and guidance are recommended for references. Readers should check with their respective organizations for additional policy and guidance specific to their program and product support requirements.

Please note that due to the high rate of change occurring in policy and guidance, the letter designations found as part of a reference will be removed in this guide. Readers are encouraged to check the DoD reference source on a frequent basis to ensure they are using the current reference version.

- 49 CFR 173.2, Hazardous Materials Classes, and Index to Hazard Class Definitions
- DoD Directive 5000.01, The Defense Acquisition System
- DoDI 5000.02, Operation of the Adaptive Acquisition Framework
- Other policy located on the DoD AAF website and DoD Issuances website
- Defense Acquisition Guidebook (DAG), Chapter 4, Life Cycle Sustainment
- Code of Federal Regulations Title 49 Transportation (Parts 1 to 99)
- DoDD 5160.65, Single Manager for Conventional Ammunition (SMCA)
- DoDM 4140.01, DoD Supply Chain Materiel Management Procedures (11 volumes),
- DoDI 5158.06, Distribution Process Owner (DPO)
- DoDM 4140.27, Volume 1, DoD Shelf-Life Management Program: Program Administration,
- DoDM 4140.65, Issue, Use, and Disposal of Wood Packaging Material (WPM)
- DoDM 5200.01, Volume 3, DoD Information Security Program: Protection of Classified Information
- DoDM 6055.09 (Volumes 1-8), DoD Ammunition and Explosives Safety Standards, 29 February 2008
- AFMAN 24-204/TM 38-250/NAVSUP PUB 505/DLAI 4145.3, Preparing Hazardous Materials for Military Air Shipments
- DLAI 4145.11/TM 38-410/NAVSUP PUB 573/AFJMAN 23-209/MCO 4450.12A, Storage and Handling of Hazardous Materials, January 13, 1999
- DLAR 4145.41/AR 700-143/NAVSUPINST 4030.55D/AFMAN 24-210/MCO 4030.40C, Packaging of Hazardous Materials
- DLAR (JP) 4155.37 AR 702-18 NAVSUPINST 4410.56A AFMAN 23-232 (IP) MCO 4450.13B, July 28, 2015, Department of Defense (DoD) Shelf-Life Materiel Quality Control Storage Standards
- DTR 4500.9-R, Defense Transportation Regulation Individual Missions, Roles and Responsibilities
- Joint Publication 4-01, The Defense Transportation System (DTS)

- MIL-STD-1686, Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices).
- MIL-STD-129, Military Marking for Shipment and Storage
- MIL-STD-130, Identification Marking of U.S. Military Property
- MIL-STD-290 Packaging and Marking of Petroleum and Related Products
- MIL-STD-2073-1, DoD Standard Practice for Military Packaging
- Joint Instruction AR700-15/NAVSUPINST 4030.28, Packaging of Materiel

Additional DoD-level policy and guidance can be found at the ODASD(Logistics) Transportation Directorate Policy Vault and the Supply Directorate Policy Vault.

There are additional handbooks, manuals and other reference sources located below in the Best Practices section of this chapter.

E. Communities of Practice and Interest

The topic of design interface covers such a vast scope of equipment that there is no one community of practice. Typically, design interface communities focus on the supportability of a type of system, for example, ships and aircraft, or of a type of DoD mission.

The Preface of this IPS Elements Guidebook provides a listing of “golden references,” many of which provide libraries, research portals and other resources for finding additional information on specific topics of design interface.

Many OSD offices (listed under the Proponency section above) maintain a comprehensive website with links to DoD partner organizations, policy and guidance, plus many other resources. Readers are encouraged to check the relevant proponent website for additional information.

Readers should check with their respective organizations for the communities of practice that focus on the area of design interface most relevant to their interests.

The DAU community hub is a website that consolidates the links to approximately 50 communities of practice related to DoD acquisition practices. Many of these communities are important to the PHS&T IPS Element.

- Contracting
- Hazardous Materials Packaging & Transportation
- Life Cycle Logistics
- Munitions and Explosives Safety
- Performance Based Logistics (PBL)
- Production, Quality & Manufacturing
- Program Management

- Requirements Management
- Systems Engineering

Best Practices Sources

- Product Support Manager (PSM) Guidebook
- Performance Based Logistics (PBL) Guidebook
- Logistics Assessment Guidebook
- Product Support Implementation Roadmap
- DoD Shelf-Life Program
- Packaging of Hazardous Materials
- Intermodal Association of North America
- NAVSUP Website
- University of Texas at Austin Center for Transportation Research
- Transportation Institute
- Warehousing Education & Research Council (WERC)

F. Training Resources

DAU Courseware

A complete list of DAU training resources can be found in the DAU iCatalog. Courses are classified as Training Courses (Regular (certification and assignment specific) training courses), Continuous Learning, and Targeted Training (Alternate means to meet training requirements). PHS&T topics are primarily covered under the Life Cycle Logistics courses.

Below are selected courses by PHS&T functional area.

- LOG 101 Acquisition Logistics Fundamentals
- LOG 102 Fundamentals of System Sustainment Management
- LOG 206 Intermediate Systems Sustainment Management
- CLE 040 IUID Marking
- CLL 013 DoD Packaging
- CLL 020 Independent Logistics Assessments (ILA)
- CLL 120 The DoD Shelf-Life Program
- CLL 045 Designing for Transportability
- CLM 044 Radio Frequency Identification (RFID)
- CLM 200 Item Unique Identification (IUID)
- CLM 201 Serialized Item Management (SIM)
- WSL 002 Provisioning Management

Defense Logistics Agency’s website for Packaging lists opportunities for training resources to assist in acquiring (resident, on-site, and correspondence) Military Packaging, Transportation, and Environmental training. The below web links are taken from the DLA website.

- Palletization
- Requirements for Wood Packing Material
- Importance of Packaging and Marking Supporting OCONUS Shipments
- Military Packaging Tips for New Contractors
- MIL-STD-129 Issues - Important Notice for DoD Contractors
- Shipping of Hazardous Materials - Performance Oriented Packaging (POP) Information
- Medical Items - DLA Troop Support - Managed Materiel

DAU ACQuipedia Articles

ACQuipedia serves as an online encyclopedia of common defense acquisition topics. Each topic is identified as an article. Each article contains a definition, a brief narrative that provides context, and includes links to the most pertinent policy, guidance, tools, practices, and training which further augment understanding and expand depth.

ACQuipedia was developed as a collaborative project to create content around Defense Acquisition-related topics. Articles (topics) will be maintained as a collaborative effort of subject matter experts across DAU. Future growth may expand the collaboration of subject matter experts beyond DAU.

ACQuipedia provides the acquisition workforce with quick access to information in a succinct and digestible format. Article content aggregates the most relevant references and learning assets to narrowly focus users and quickly provide high value information.
Below is a listing of linked ACQuipedia articles relevant to PHS&T. The reader is encouraged to visit the homepage to see additional articles.

- Cataloging
- Independent Logistics Assessment (ILA)
- Item Unique Identification (IUID)
- Integrated Product Support (IPS) Elements
- Integrated Product Support (IPS) Element - Packaging, Handling, Storage, and Transportation (PHS&T)
- Integrated Product Support (IPS) Element - Supply Support
- Inventory Management
- Primary Inventory Control Activity (PICA) and Secondary Inventory Control Activity (SICA)
- Product Support Package
- Reset of Military Equipment
- RFID - Radio Frequency Identification
- RFID - Tagging Principles

- Shelf-life
- Supply Chain Management (SCM)
- Supply Classes
- Total Package Fielding

Technical Data

Objective

Identify, plan, validate, resource, and implement management actions to develop and acquire information to:

- Operate, maintain, and train on the equipment to maximize its effectiveness and availability;
- Effectively catalog and acquire spare/repair parts, support equipment, and all classes of supply;
- Define the configuration baseline of the system (hardware and software) to effectively support the Warfighter with the best capability at the time it is needed.

Description

Technical Data represents recorded information of a scientific or technical nature, regardless of form or character (such as equipment technical manuals and engineering drawings), engineering data, specifications, standards, and Data Item Descriptions (DID).

Technical Manuals (TM), including Interactive Electronic Technical Manuals (IETM) and engineering drawings, are the most expensive and probably the most important data acquisitions made in support of a system. TMs and IETMs provide the instructions for operation and maintenance of a system. IETMs also provide integrated training and diagnostic fault isolation procedures.

Technical data addresses data rights and data delivery as well as use of any proprietary data as part of this element. A data management system established within the IDE can allow every activity involved with the program to cost-effectively create, store, access, manipulate, and exchange digital data.

Technical data includes, at minimum, the data management needs of the SE process, modeling and simulation activities, test and evaluation strategy, support strategy, and other periodic reporting requirements. It also includes as-maintained bills of material and system configuration by individual system identification code or “tail number.”

Overview

Technical data are recorded forms of information of a scientific or technical nature pertaining to products sold to the government. Product specifications, engineering drawings, and operating or maintenance manuals are examples of technical data. The term does not include computer software or financial, administrative, cost, pricing, or other management data.

Technical Data:

- Describes product, interfaces, and decisions made;

- Is traceable, responsive to changes, and consistent with CM requirements;
- Is prepared and stored digitally;
- Involves deciding what data is needed, who shall control it, and when.

There are three recognized primary categories of data:

- Management data,
- Computer software,
- Financial information.

Management Data is data related to planning, organizing, and managing the project.

Computer software documentation is a part of technical data management and is differentiated from the data category of "Computer Software." Computer software documentation refers to owner manuals, user manuals, installation instructions, operating instructions, and other similar documents, regardless of storage medium, that explain the capabilities of the computer software or provide instructions for using the software.

Financial management and contract administration include contract numbers, payment due dates, contract payment terms, employee travel expenses, and contractor revenue.

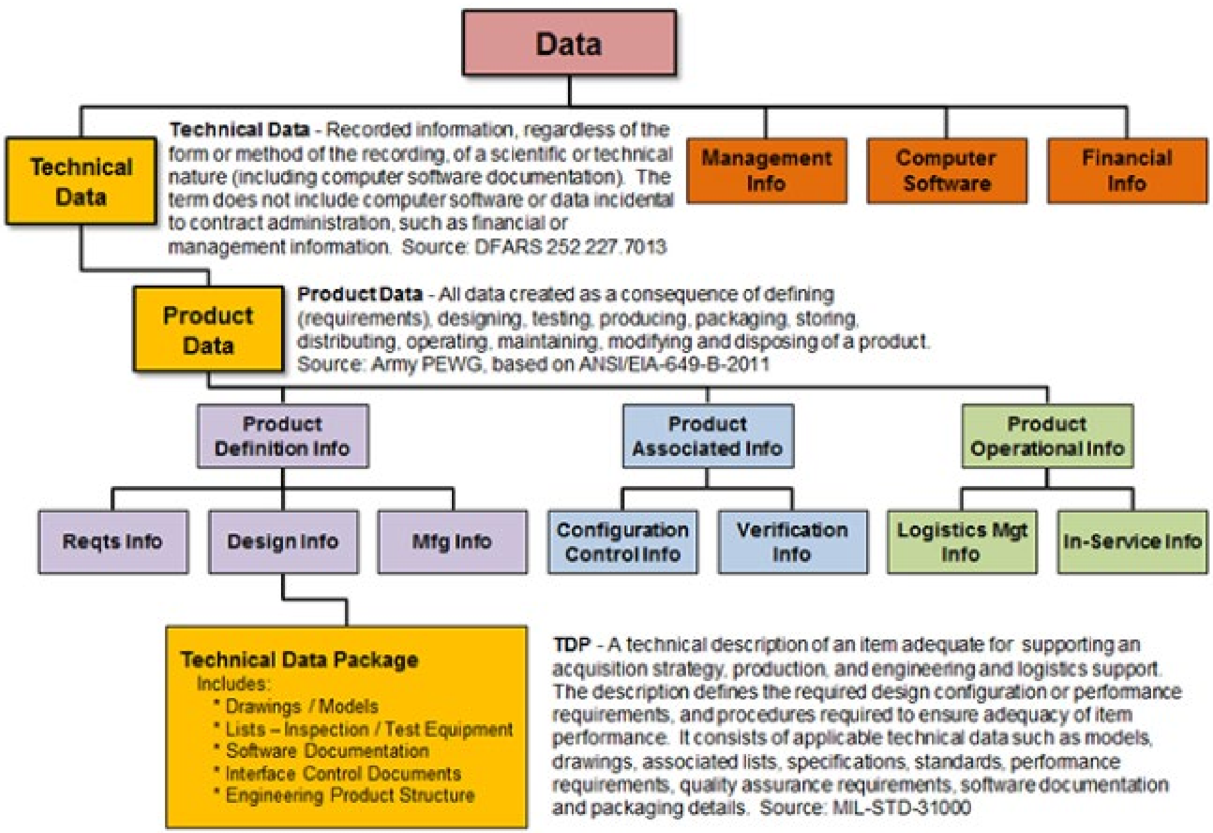


Figure 7-1 How data is organizationally structured.

Product Data includes these three sub-categories:
1. Product Definition information - information that defines the product's requirements documents the product's design and manufacturing. This is the authoritative source for configuration definition and control. Examples include drawings, 3-D CAD models, and trade studies.
2. Product Operational information - information used to operate, maintain, and dispose of the product. Examples include records of maintenance actions, technical manuals, and transportation information, and depot overhaul information.
3. Product Associated information - other product data such as test results, software or binary code embedded on memory chips, and proposed configuration changes that do not fit clearly into the other categories. This information is in the form of a living document that records the modifications, upgrades, and changes over the lifecycle.

The technical data product support element includes the processes of applying policies, systems and procedures for identification and control of data requirements; for the timely and economical acquisition of such data; for assuring the adequacy of data for its intended use; for the distribution or communication of the data to the point of use; and for use analysis.

Technical data activities document and maintain the database reflecting system life cycle decisions, methods, feedback, metrics, and configuration control. It directly supports the configuration status accounting process. Technical data processes govern and control the selection, generation, preparation, acquisition, and use of data imposed on contractors.

Per DoD 5010.12-M, Procedures for the Acquisition and Management of Technical Data, data acquisition and management is the process of applying policies, systems, and procedures for:

- Identification and control of data requirements
- Timely and economic development of data
- Ensuring the adequacy of such data for full compliance with the contract and for its intended use. This includes, where necessary, early application of contractual remedies needed to correct defective data products.
- Distribution of the data to the point of use
- Analysis of the data's suitability for intended use

Per the Defense Acquisition Guidebook (DAG), CH 3-4.1.7, the Technical Data Management process provides a framework to acquire, manage, maintain, and ensure access to the technical data and computer software required to manage and support a system throughout the acquisition life cycle (see DAG CH 3–4.3.24. System Security Engineering for information regarding protection of critical program information). Key Technical Data Management considerations include understanding and protecting Government intellectual property and data rights, achieving competition goals, maximizing options for product support, and enabling performance of downstream life-cycle functions.

Why Technical Data Is Important

DoDI 5000.02, Operation of the Adaptive Acquisition Framework, states that Product support managers will make use of data-driven decision making tools with appropriate predictive analysis capabilities to improve systems availability and reduce costs; Program Managers will consider the procurement of data deliverables and associated license rights needed to support competitive acquisition and life-cycle sustainment strategies.

If affordable, ownership of full data rights is beneficial. But the Product Support Manager must consider the spectrum of alternatives available for data access, which can include ownership, option to buy ownership, leasing agreements, or access by way of a public-private partnership. There are choices that exist between the acquire or not-acquire decision.

Per the Defense Acquisition Guidebook (DAG), CH 3-4.1.7, acquiring the necessary data and data rights, in accordance with Military Standard (MIL-STD)-31000, for acquisition, upgrades, and management of technical data provide:

- Information necessary to understand and evaluate system designs throughout the life cycle
- Ability to operate and sustain weapon systems under a variety of changing technical, operational, and programmatic environments
- Ability to re-compete item acquisition, upgrades, and sustainment activities in the interest of achieving cost savings; the lack of technical data and/or data rights often makes it difficult or impossible to award contracts to anyone other than the original manufacturer, thereby taking away much or all of the Government's ability to reduce total ownership costs (TOC).

Technical data is the "knowledge products" of the acquisition process, as well as the sustainment process. It is the basis for most, if not all acquisition, design, development, production, operation, support, and maintenance decision-making. Being able to access the right data at the right time to make the right decisions does not happen by chance. Good data management also does not happen as a result of ordering excessive data, just in case. Rather, effective technical data strategy implementation is the product of an effective data management process.

Product Support Manager Activities

7.1. Engineering data maintenance

Maintenance of engineering data includes assurance of the Information System that holds the data, Authorized Data Sources (ADS), and the quality of the engineering data itself.

Per the Defense Acquisition Guidebook (DAG), Chapter 6, an information system is a discrete set of information resources organized for the collection, processing, maintenance, use, sharing, dissemination, or disposition of information.

Per the DoDI 8320.07, Implementing the Sharing of Data, Information, and Information Technology (IT) Services in the Department of Defense, reliable, accessible Authorized Data Sources (ADS) are critical to enabling informed decisions based on trustworthy data and information. A key step in ADS management includes the definition, identification, maintenance, and validation of ADSs, and specific data needs collected from data producers, data providers, and data consumers.

Per DoD 5010.12-M, Procedures for the Acquisition and Management of Technical Data, the contractor is responsible for establishing and maintaining effective procedures for implementing and maintaining quality control of data consistent with the complexity of the data requirements and the provisions of the contract. The Government is responsible for ensuring that the contractor complies with contractual QA and warranty requirements. As part of the acquisition strategy, the careful use of warranties of technical data under the provisions of the DFARS, Subparts 227.405.72 and 246.708 (reference (b)), offers an additional tool to assist in assuring delivery of quality technical data and in correcting defective data products.

Markings

Data markings are used to identify data ownership, use, and distribution restrictions. There are five types of data related markings acknowledged by the Government: Distribution Statement, Export Control, Data Rights, Copyright, and security classification.

- Distribution statements are mandated by DoD Instruction 5230.24, “Distribution Statements on Technical Documents” and specify what “authorized audience” may see the data without additional authorization.
- DoD Instruction 5230.24 Enclosures 4 and 5 provide a complete discussion of the relationship between distribution statements and data rights markings. One of the reasons for selecting the appropriate distribution statement for a data item is the nature of its Government data rights.
- 22 U.S.C. § 2778 of the Arms Export Control Act describes the authority to limit export of data to foreign governments or industries. DoD Directive 5230.25, “Withholding of Unclassified Technical Data” describes the process to identify “all unclassified technical data with military or space application in the possession of, or under the control of, a DoD Component that may not be exported lawfully without an approval, authorization, or license...” Data identified as such must be marked as “export controlled” in accordance with DoDI 5230.24, “Distribution Statements on Technical Documents.”
- Data rights markings are required by the Government to identify the data rights entitlements for third party owned data associated with noncommercial products. There

are no marking requirements for Technical Data associated with commercial items or commercial Computer Software.

- This marking must contain three elements: the copyright symbol or abbreviation, the year of first publication of the work, and the name of the copyright owner.
- DoD Manual 5200.01 is a reference on this topic explains the proper markings for classified information.

Sharing of Data

Per the DoDI 8320.07, Implementing the Sharing of Data, Information, and Information Technology (IT) Services in the Department of Defense, the DoD will effectively improve information exchange across the DoD and with its mission partners to defend the United States and enhance global stability. Key enablers include, but are not limited to, concepts, processes, governance forums, standards, models, and shared vocabularies.

Software Documentation

Per DAU LOG 215, Technical Data Management, computer software is comprised of:

- Computer programs or a series of instructions, rules, routines, or statements, regardless of the media in which recorded, that allow or cause a computer to perform a specific operation or series of operations; and
- Recorded information comprising source code listings, design details, algorithms, processes, flow charts, formulas, and related material that would enable the computer program to be produced, created, or compiled.

Computer software documentation is a part of technical data management and is differentiated from the data category of "Computer Software." Computer software documentation refers to owner manuals, user manuals, installation instructions, operating instructions, and other similar documents, regardless of storage medium, that explain the capabilities of the computer software or provide instructions for using the software.

The reader should also review the Information Technology (IT) Systems Continuous Support IPS Element chapter in this guidebook.

Logistics Product Data

Per DAU LOG 215, Technical Data Management, logistics product data comprises the support and support-related engineering and logistics data acquired from contractors and generated as a result of the product support analysis activities —conducted during the design, development, and initial fielding of a system or end item —that the requiring authority uses to develop their internal materiel management processes. This includes data for maintenance planning, logistics design requirements, reliability and maintainability, system safety, maintenance engineering, support and test equipment, training and training devices, manpower and skills, facilities, transportation, supply support, parts packaging, initial provisioning, cataloging, item management, and in-service feedback (e.g., Failure Reporting, Analysis, and Corrective Action System [FRACAS]).

Interoperability Architectures for Technical Data Maintenance
Per DAU LOG 215, Technical Data Management, interoperability is the ability of systems, units, or forces to provide data, information, materiel, and service to, and accept the same from, other systems, units, or forces and to use the data, information, materiel, and services so exchanged to enable them to operate effectively together.

Information Technology (IT) and National Security Systems (NSS) interoperability characteristics include:

- Technical exchange of information
- End-to-end operational effectiveness as required to accomplish the mission

Interoperability is more than just information exchange. It includes systems, processes, procedures, organizations, and missions over the life cycle and must be balanced with cybersecurity (formerly referred to as Information Assurance [IA]).

When identifying the characteristics of interoperability architectures, you should address a tool's capabilities rather than its specific form and definitions. To be classified as an interoperable architecture, one or more of the following characteristics must be met:

- Transmits information to, receives information from, routes information among, or interchanges among other equipment, software, and services
- Provides:
    - Retention
    - Organization
    - Visualization
    - Information assurance
    - Disposition of data, information, and/or knowledge received from or transmitted to other:
        - Equipment and/or Software
        - Services
- Processes data or information for use by other equipment, software, or services
- Design is tool independent so technology refresh or removal of vendor support can be met with replacement of application with minimal time and cost

There is a Key Performance Parameter (KPP) for interoperability architecture achievement. All DoD information technology major programs require a Net-Ready (NR) KPP that specifies measurable and testable interoperability requirements.

The reader should also review the Design Interface IPS Element chapter, section 2.1, in this guidebook.

7.2. Specifications determination

A Specification (often informally referred to as a spec) refers to an explicit set of requirements to be satisfied by a material, design, product, or service. Should a material, product, or service fail to meet one or more of the applicable specifications, it may be referred to as being out of specification. A specification is a type of technical standard. A technical specification may be developed by various kinds of organizations, public and private. Example organization types include a corporation, a consortium (a small group of corporations), a trade association (an industry-wide group of corporations), etc.

Military Specification (MIL-SPEC)

A MIL-SPEC is a document that describes the essential technical requirements for purchased material that is military unique or substantially modified commercial items. Sometimes the term specification is used in connection with a data sheet (or spec sheet). A data sheet is usually used for technical communication to describe technical characteristics of an item or product. It can be published by a manufacturer to help people choose products or to help use the products. A data sheet is not a technical specification. MIL-STD 961: Defense and Program-Unique Specifications Format and Content, establishes format and content requirements for defense specifications and program-unique specifications prepared either by/for DoD activities.

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.

System Performance Specifications

System performance specifications state the system level functional and performance requirements, interfaces, adaptation requirements, security and privacy requirements, computer resource requirements, design constraints (including software architecture, data standards, and programming language), software support and precedence requirements, and developmental test requirements for a given system.

Detail Specification

Detail specifications specify requirements in terms of material to be used; how a requirement is to be achieved; and how a product is to be assembled, integrated, fabricated, or constructed. Applicable to development of contractor final design drawings as well as items being built, coded, purchased, or reused.

7.3. Standards management

A defense standard is 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, Defense Standards Format and Content, covers the content and format for defense standards.

The reader should also review the Design Interface IPS Element chapter, Section 2.1, in this guidebook.

Interface Standards
DoD interface standards specify the physical, functional, or military operational environment interface characteristics of systems, subsystems, equipment, assemblies, components, items, or parts to permit interchangeability, interconnection, interoperability, compatibility, or communications. Non-Government standards should be used to the extent possible to specify interface requirements. DoD interface standards should only be developed to specify military-unique interface requirements. DoD interface standards may be cited as solicitation requirements without need for a waiver by the Milestone Decision Authority.

Design Criteria Standards
DoD design criteria standards are developed to specify military-unique design or functional criteria that must be adhered to in the development of systems, subsystems, equipment, assemblies, components, items, or parts. These design criteria are not primarily related to requirements that affect interchangeability, interoperability, interconnection, compatibility, or communications. Adherence to these design criteria standards, however, will affect the manufacturing of a product.

Test Method Standards
The purpose of the test method standard, MIL-STD-1916, 1 April 1996, DoD Test Method Standard "DoD Preferred Methods for Acceptance of Product," is to encourage defense contractors and other commercial organizations supplying goods and services to the U.S. Government to submit efficient and effective process control (prevention) procedures in place of prescribed sampling requirements. The goal is to support the movement away from an AQL-based inspection (detection) strategy to implementation of an effective prevention-based strategy including a comprehensive quality system, continuous improvement, and a partnership with the Government.

DoD Standard Practices
DoD standard practices are developed when it is necessary to specify procedures on how to conduct non-manufacturing functions. Standard practices should only be developed for functions that, at least some of the time, are obtained via contract from commercial firms. Procedures for functions performed only by DoD personnel should be covered by such documents as regulations, directives, instructions, technical manuals, or standard operating procedures. DoD standard practices may be cited as solicitation requirements without need for a waiver by the Milestone Decision Authority.

Manufacturing Process Standards
A manufacturing process standard states the desired outcome of manufacturing processes or specifies procedures or criteria on how to perform manufacturing processes. The DoD discourages the development of manufacturing process standards. A DoD manufacturing process standard requires the Milestone Decision Authority's waiver to be cited as a solicitation requirement.

Non-Government Standards
Nationally and internationally recognized technical, professional, and industry associations and societies (hereafter referred to as "non-Government standards bodies (NGSB)") prepare standards, many having potential application or impact in the DoD. Section 12(d) of Public Law 104-113 requires Federal agencies to use NGSs and participate in their development to meet agency needs and objectives, when it is consistent with the agency's mission, priorities, and budget resources. OMB Circular A-119 provides government-wide guidance for implementing the public law. The SD-9 provides guidance information on DoD participation in the development and use of NGSs. From DoDM 4120.24 Defense Standardization Program Procedures, Enclosure 9, paragraph 4: DoD uses adopted and unadopted NGSs directly as acquisition documents, as references in other documents, or as design or reference guides. While NGSs that have not been adopted may be used, action to adopt these documents is encouraged. Use of an NGS in the DoD suggests it is technically adequate to meet the needs of the adopting activity, custodians, and review activities, and coordination of the NGS may not be necessary. Where only a small portion of an NGS is needed, it may be more efficient to directly copy the pertinent portion into the government document after permission is obtained.

Product Life Cycle Support (PLCS) ISO 10303-239
STEP, the **St**andard for the **E**xchange of **P**roduct Model Data, is a comprehensive ISO standard (ISO 10303) that describes how to represent and exchange digital product information.

ISO 10303-239:2012, Industrial automation systems and integration – Product data representation and exchange – Part 239: Application protocol: Product life cycle support, specifies the application protocol for Product life cycle support. The following is a partial listing of the scope of ISO 10303-239:2012:
- Information for defining a complex product and its support solution,
- Iinformation required to maintain a complex product,
- Information required for through life configuration change management of a product and its support solution.

Commercial Standards
Per MIL-STD-962, Defense Standards Format and Content, a commercial standard typically contains accepted voluntary benchmarks of performance and quality by the relevant industry. A DoD standard shall be prepared to describe essential technical requirements for engineering or technical criteria, methods, processes, or practices. To the greatest extent possible, standards shall be written so that commercial practices and processes may be used to meet the

requirement, and requirements should be stated in terms of desired outcomes as opposed to detailed procedures. Trade names, copyrighted names, proprietary names, manufacturer's part numbers or drawing numbers, or any other designation that would require the use of a product or process of one company shall not be used unless the item or process cannot be adequately described because of technical unknowns. In such instances, one, and if possible, several commercial alternatives shall be included, followed by the words "or equal" and a description of required salient features or characteristics to try to ensure wider competition.

7.4. Data Item Descriptions (DID) management

A completed form that defines the data required of a contractor. DIDs specifically define the data content, preparation instructions, format, and intended use. MIL-STD-963, Data Item Descriptions, covers the content and format for DIDs. See Section B below in this chapter for a listing of DIDs related to technical data and also more information on the DoD Assist Database for researching DIDs. Management of DIDs is also described in DoD 5010.12-M, Procedures for the Acquisition and Management of Technical Data.

DIDs are found on the DoD Assist Database. Helpful Search Hint: All DID's start with the letters "DI-." Once your search results are shown, click on the column header "Document ID" to sort by alphabetical order. The "DI-" items will be easier to find. You can also insert "DI-" into the Document ID field. For the Status field, be sure to use the "Active" category from the drop-down list.

7.5. Technical standards development and management

MIL-STD 962D, Defense Standards Format and Content, covers the format and content requirements for DoD standards, which include interface standards, standard practices, design criteria standards, test method standards, and manufacturing process standards. DoD Handbooks are covered under MIL-STD-967, Defense Handbooks Format and Content.

The program manager must balance the decision to standardize against specific mission requirements, technology growth, and cost effectiveness. Under the DoD's performance-based acquisition policies, it is primarily the contractor's responsibility to recommend the use of standard materials, parts, components, and other items needed to meet performance requirements and satisfy other program elements, such as parts management and logistics support. However, interoperability, compatibility, and integration are key standardization goals that must be satisfactorily addressed for all acquisitions. These goals shall be specified and validated during the requirements generation process and throughout the acquisition life cycle.

Technical Data Requirements

Per DoD 5010.12-M, Procedures for the Acquisition and Management of Technical Data, data requirements shall be established based on the intended use of the data with consideration given to the immediate planned and probable future use of the system, materiel, or service to which the data relates. Care must be taken to ensure that appropriate data requirements are established. Too much data may be costly and useless, while insufficient data can have a negative impact on future production, operations, maintenance, and logistics support of equipment.

7.6. Embedded Technical Data Systems/Embedded Information Technology

Per the Defense Acquisition Guidebook (DAG), Chapter 6, embedded information technology is described as computer resources, both hardware and software, that are an integral part of a weapon or weapons system; used for highly sensitive classified programs (as determined by the Secretary of Defense); used for other highly sensitive IT programs; or determined by the Defense Acquisition Executive (DAE) or designee to be better overseen as a non-AIS program (e.g., a program with a low ratio of Research, Development Test, & Evaluation (RDT&E) funding to total program acquisition costs or that requires significant hardware development). This form of IT acquisition is usually better managed as a subsystem of the larger weapon system. The embedded IT subsystem Program Manager (PM) usually reports to the weapon system PM and in these circumstances oversight of embedded IT programs or subprograms is not distinct from the parent weapon system.

7.7. Technical manuals (TM) including Interactive Electronic Technical Manuals (IETM) management

A technical manual contains instructions for the installation, operation, maintenance, and support of weapon systems, weapon system components, and support equipment. They typically include operational and maintenance instructions, parts list, and related technical information or procedures exclusive of administrative procedures.

- **Paper- Based Technical Manual**. The display of technical information in a static printed form, typically paper.
- **Electronic Technical Manual (ETM**). An ETM is the electronic display of technical information instead of the static printed form (e.g., paper).
- **Interactive Electronic Technical Manual**. An IETM is an ETM, where the user can provide the displaying system information during display which the displaying system uses to interact with the user.
- **Commercial Off the Shelf Technical Manual (COTS)**. An existing commercially available technical publication that is not developed with Government funding. COTS TM data may be proprietary and/or contain copyright material.
- **Technical Order (TO).** TOs include all manuals developed or acquired for organic operation, maintenance, inspection, modification, or management of centrally acquired and managed Air Force systems and end items. This includes manuals for paper and electronic data delivery developed IAW Technical Manual Specifications and Standards (TMSS), non-embedded personal computer software which automates the function directed by a TO, contractor-developed manuals adopted for Air Force use, and approved Commercial Off-The-Shelf (COTS) manuals.
- **Software Documentation**. Software documentation is written text that accompanies computer software. It either explains how it operates or how to use it or may mean

different things to people in different roles. Like other forms of technical documentation, good software documentation benefits from an organized process of development. Software documentation includes user, installation, administration, and design documentation. It also includes guidelines on how to install and maintain the software in a way that provides security.

7.7.1. S1000D Implementation

S1000D is an international specification for the procurement and production of interactive electronic technical publications. It is an XML specification for preparing, managing, and using equipment maintenance and operations information. It was initially developed by ASD for use with military aircraft. The specification has since been modified for use with land, sea, and commercial equipment. S1000D is part of the S-Series of ILS specifications.

S1000D is maintained by the S1000D Steering Committee, which includes members from ASD, the United States' Aerospace Industries Association (AIA), and the Air Transport Association (ATA), along with national industry and defense representatives from most of the countries currently using the specification.

The use of a common structure permits the use of generic viewing tools which are not specific to a software product. The DoD Services are selectively adopting S1000D through the creation of common business rules that can be tailored to a specific program.

The Common Source Database (CSDB) as “an information store and management tool for all objects required to produce the technical publications within projects.” In practice that means that it is the repository for all data modules and publication modules plus any graphics or other multimedia used. It must also contain supporting management files such as Data Dispatch Notes (DDN) and Data Management Lists (DML). The specification explicitly does not define how a CSDB should be implemented.

MIL-STD 3031, Army Business Rules for S1000D: International Specification for Technical Publications Utilizing a Common Source Data Base, establishes the business rules for technical content, style, format, and functionality requirements for technical publications prepared using S1000D.

7.8. Engineering drawings management

Engineering drawings disclose (directly or by reference), by mean of graphic or textual presentations, or combinations of both, the physical and functional requirements of an item. Drawings document the level of design maturity achieved and are used for future development; as well as supporting quality assurance functions, maintaining configuration, and procurement of spare parts and systems. Engineering drawings are the major source of technical information for logistics support throughout a system's life cycle.

7.9. Data rights management
Data Rights is a shorthand way to refer to the Government's license rights in two major categories of valuable intellectual property:

1. Technical Data includes any recorded information of a scientific or technical nature (e.g., product design or maintenance data, computer databases, and computer software documentation).
2. Computer Software includes executable code, source code, code listings, design details, processes, flow charts, and related material.
   Only under very unique circumstances does the Government acquire title to or ownership of technical data or computer software developed under DoD contracts – even if the Government funded 100% of the development. Instead, the Government acquires a license to use, release, or disclose that technical data or computer software to persons who are not Government employees. Therefore, the DoD often negotiates over license rights and not ownership of technical data or computer software to be delivered under a contract.

Data Rights, Identification and Assertion of use, release, or disclosure restrictions, DFARS 252.227-7017
The Assertion List is an early identification of the noncommercial technical data and noncommercial computer software to be delivered to the Government under the contract with restrictions on use, release, or disclosure.

7.10. Data delivery
Per DoD 5010.12-M, Procedures for the Acquisition and Management of Technical Data, the DFARS requires the use of DD Form 1423 in solicitations when the contract will require delivery of data. The DD Form 1423, when made a part of the solicitation, includes every known and anticipated data requirement. Offerors are asked to provide a price estimate for each technical data requirement. If the price estimates appear unreasonable, the offeror may not understand the requirement. After a solicitation has been released, the source selection procedures in effect for a particular procurement must be followed strictly to protect the integrity of the procurement process. The contractor should provide and maintain a quality system that will ensure all data submitted to the Government for acceptance is technically correct and confirms to contract requirements.

Data Guidance Conference
Per DoD 5010.12-M, Procedures for the Acquisition and Management of Technical Data, before the contractor begins developing data; i.e., usually within 60-90 days after contract, a data guidance conference should be held. These milestones will normally allow significant time for the contractor to identify the personnel that will be responsible for preparing and submitting the data. The data guidance conference is a joint Government-contractor review of the contractual data requirements to ensure that the contractor understands his contractual obligations, and to review the contractor's approach to satisfying those obligations.

Contract Data Requirements List (CDRL)

Per DoD 5010.12-M, Procedures for the Acquisition and Management of Technical Data, the CDRL provides a contractual method to direct the contractor to prepare and deliver data that meets specific approval and acceptance criteria. The Contract Data Requirements List (CDRL) is a list of authorized data requirements for a specific procurement that forms a part of the contract. It is comprised of either a single DD Form 1423, or a series of DD Forms 1423 (individual CDRL forms) containing data requirements and delivery information. The CDRL is the standard format for identifying potential data requirements in a solicitation, and deliverable data requirements in a contract. Subpart 215.470 of the DFARS requires the use of the CDRL in solicitations when the contract will require delivery of data. CDRLs should be linked directly to SOW tasks and managed by the program office data manager.

Engineering Data for Provisioning (EDFP)

Engineering Data for Provisioning (EDFP) is the engineering data used in the initial provisioning of support resources. This technical data provides definitive identification of dimensional, materiel, mechanical, electrical, or other characteristics adequate for provisioning of the support items of the end item(s) on contract. EDFP consists of data needed to indicate the physical characteristics, location, and function of the item. EDFP may also include government or industry specifications or standards, engineering drawings, production or commercial drawings and associated lists, commercial catalogs, and sketches or photographs with descriptive characteristics.

Technical Data Package

A Technical Data Package (TDP) is a technical description of an item adequate for supporting an acquisition strategy, production, and engineering and logistics support. The TDP defines the required design configuration or performance requirements, and procedures required to ensure adequacy of item performance. The TDP consists of applicable technical data such as drawings, models, associated lists, interface control documents, specifications, standards, performance requirements, quality assurance provisions, software documentation, and packaging details.

TDPs continue to be used throughout the system’s entire life cycle to support engineering change proposals, modernization, and technology refresh. They typically contain:

- Engineering drawings
- Associated lists
- Specifications that define
- Function, performance, interfaces
- Physical geometry, other constraints
- Process descriptions
- Material composition
- Class I changes, deviations & waivers approved but not yet incorporated

- Safety requirements
- Preservation and packaging requirements
- Test requirements data and quality provisions
- Preventative maintenance system/Maintenance Requirements Card
- Environmental stress screening requirements
- Requirements to interchangeability, form, fit, and function information

Data Sheets
A data sheet is usually used for technical communication to describe technical characteristics of an item or product. it is not a technical specification. Product data sheets often contain technical data that define engineering or scientific parameters or characteristics of the product. A datasheet, data sheet, or spec sheet summarizes the performance and other technical characteristics of a product, machine, component (e.g., an electronic component), material, a subsystem (e.g., a power supply) or software in sufficient detail to be used by a design engineer to integrate the component into a system. Typically, a datasheet is created by the manufacturer and begins with an introductory page describing the rest of the document, followed by listings of specific characteristics, with further information on the connectivity of the devices. For example, a Material Safety Data Sheet, or MSDS, is a technical data sheet summarizing information about material identification; hazardous ingredients; health, physical, and fire hazards; first aid; chemical reactivity and incompatibility; spill, leak, and disposal procedures; and protective measures required for safe handling and storage. MSDS are required by agencies such as OSHA in its Hazard Communication Standard, 29 C.F.R. 1910.1200.

Distribution Statements
DoDI 5230.24, Distribution Statements on Technical Documents, provides procedures for marking and managing technical documents, including research, development, engineering, test, sustainment, and logistics information, to denote the extent to which they are available for secondary distribution, release, and dissemination without additional approvals or authorizations. All newly created, revised, or previously unmarked classified and unclassified DoD technical documents shall be assigned Distribution Statement A, B, C, D, E, or F as described in Enclosure 4 of this Instruction.

Classified Data
DoDM 5200.02, DoD Information Security Program (4 Volumes), provides information to implement policy, assign responsibilities, and provide procedures for the designation, marking, protection, and dissemination of controlled unclassified information (CUI) and classified information, including information categorized as collateral, sensitive compartmented information (SCI), and Special Access Program (SAP). Classified data is information that has been determined to require protection against unauthorized disclosure and is marked to indicate its classified (protected) status when in documentary form.

Data Security and Protection

Per the DAG, Chapter 1–4.2.21.3 Data Protection, Program Managers of DoD IT systems (including those supported through contracts with external sources) that collect, maintain, use, or disseminate data are to protect against disclosure to non-approved sources.

7.11. Proprietary data management

Per DoDI 5010.44, "Intellectual Property (IP) Acquisition and Licensing," October 16, 2019, Weapon and information systems acquired by DoD in support of the warfighter are, and will be, increasingly dependent on technology for its operation, maintenance, modernization, and sustainment. Acquiring and licensing the appropriate IP is vital for ensuring the systems will remain functional, sustainable, upgradable, and affordable. Because balancing the interests of the U.S. Government and industry in IP can be difficult, early, and effective understanding, planning, and communications between the U.S. Government and industry is critical, as is ensuring delivery, acceptance, and management of the necessary IP deliverables (e.g., technical data and computer software), with appropriate license rights. The DoD requires fair treatment of IP owners, and seeks to create conditions that encourage technologically advanced solutions to meet DoD needs.

Intellectual Property (IP)

Due to the intangible nature of Intellectual Property, the value of any IP is limited to what the courts and legislatures are willing to protect against unauthorized use. In the United States, the parameters of what is—or is not—protected as IP are defined through an extensive collection of statutes, court opinions, legal rules, regulations, and procedures. Generally speaking, IP law is divided into categories according to the form of the human intellect product and the exclusive rights and remedies afforded the producers of that product. A DoD recommended guidebook is "Intellectual Property: Navigating Through Commercial Waters."

Patents

A patent is a monopoly over a unique, non-obvious process, mechanical device, article of manufacture, composition of matter, etc. In the U.S. patents are issued by the Patent and Trademark Office (PTO) and are generally enforceable from date of issuance through 20 years from the filing date.

Copyrights

A copyright is an exclusive right to control the use, reproduction, display, performance, or creation of "derivative works." Copyright applies to things like literary works, pictorial, graphic or sculptural works, sound recordings, musical compositions, and architectural drawings, as well as "performance" art like dances, choreography, and pantomimes.

Trademarks

A trademark is a distinctive name (Pepsi), mark (Nike Swoosh), or motto ("It's Miller time!"). A registered trademark is designated by the ® symbol; an unregistered trademark is indicated by the ™ symbol. The government generally has no interest in obtaining trademark rights.

Trade Secrets
A trade secret is proprietary information that provides the owner a commercial or technical advantage. Examples include customer lists, company financial information, cost and pricing data, contract bid information, algorithms, source code, and product recipes (Coca-Cola).

Public Domain
"Public domain" describes intellectual property that is freely available to everyone. Proof that something is already in the public domain is an absolute defense against the assertion of any exclusive IP right such as a patent or copyright.

7.12. Data validation
Per DoD 5010.12-M, Procedures for the Acquisition and Management of Technical Data, data validation is the process by which the contractor (or other activity as directed by the DoD Component procuring activity) tests technical documents for accuracy and adequacy, comprehensibility, and usability. Validation is conducted at the contractor's facility or at an operational site and involves the hands-on, unless otherwise agreed on by the DoD Component, performance of operating and maintenance procedures including checkout, calibration, alignment, and scheduled removal and installation instructions.

Data Rights Validation.
Per DoD 5010.12-M, Procedures for the Acquisition and Management of Technical Data, data rights validation is the process by which the Government assures itself of the legitimacy of the asserted restrictions of the Government's right to use, release or disclose technical data. The official definition of this validation process is addressed in Section 2321 of title 10, United States Code (reference (e)).

Data Assurance and Quality Controls
Per DoD 5010.12-M, Procedures for the Acquisition and Management of Technical Data, the contractor is responsible for establishing and maintaining effective procedures for implementing and maintaining quality control of data consistent with the complexity of the data requirements and the provisions of the contract. The contractor should complete the "Certification of Technical Data Conformity" when the DFARS, Subpart 252.227-7036 (reference (b)), is required by contract and identify, by name and title, each individual authorized by the contractor to certify in writing that the technical data is complete, accurate, and complies with all requirements of the contract. The authorized individual should be familiar with the contractor's technical data conformity procedures and their application to the technical data to be certified and delivered.

Data Verification
Per DoD 5010.12-M, Procedures for the Acquisition and Management of Technical Data, data validation is the process by which technical data are tested and proved under DoD Component control to be technically accurate and complete, comprehensible, and usable for operation and maintenance of equipment or systems procured for operational units. Verification is conducted by using personnel with skill levels equivalent to those of the people who will be required to

maintain the equipment or system in the operational environment. Verification consists of the actual performance of operating and maintenance procedures and associated checklists, including checkout, calibration, alignment, and scheduled removal and installation procedures.

7.13. Data storage and backup

Data Storage

According to the Office of the Chief Information Officer (CIO), computing infrastructure must be able to provide secure, dynamic, computing platform-agnostic and location-independent data storage.

In the DoD, Core Data Centers will serve as the primary mechanism by which computing and data storage services will be made available to DoD and other authorized users. CDCs will support newer service delivery models such as cloud computing as well as legacy delivery models and do so for both Enterprise Services and Applications and approved Component Services and Applications for all mission areas.

Joint Information Environment (JIE)

Per the Defense Acquisition Guidebook (DAG) CH 6–3.9.1, Joint Information Environment, the DoD, through the CIO's Strategy for Implementing the Joint Information Environment (JIE) is transitioning to a single, joint, secure, reliable, and agile command, control, communications, and computing (C4) enterprise information environment.

The JIE is a construct that facilitates the convergence of the DoD's multiple networks into one common and shared global network. The intent is to provide enterprise services such as email, Internet/Web access, common software applications, and cloud computing. Primary objectives behind this transition are increased operational efficiency, enhanced network security and cost savings through reduced infrastructure and manpower. Capabilities required across DoD to enable information sharing, collaboration and interoperability will be provisioned as enterprise services. Email, Web access, mass data storage and data analytics for decision support will be provided to any access point.

Cloud Computing

Per the Defense Acquisition Guidebook (DAG) CH 6-3.9.2, Cloud Computing, commercial cloud vendors provide commercial virtual data storage and computing capabilities which are typically more efficient and innovative solutions when compared to traditional approaches; consequently, cloud should be considered and employed when found to be cost effective and secure. Cloud is a service and is delivered by Cloud Service Providers (CSP) who provide a set of capabilities referred to as cloud service offerings (CSO).

A formal definition of Cloud is provided in the National Institute of Standards and Technology (NIST) in their special publication (SP) 800-145, which states: "Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction." SP 800-145 al describes three "service models," four "deployment models," and five "essential characteristics" a Service should exhibit in order to be considered a cloud service.

Readers should review the Information Technology (IT) Systems Continuous Support IPS Element chapter of this guidebook for more information.

Backup/Archiving
An archive is a collection of historical records that are kept for long-term retention and used for future reference. Typically, archives contain data not actively used and have been removed from its original location. A backup is a copy of data created to restore data in case of damage or loss. The original data is not deleted after a backup is made. Examples of backups include a nightly backup of all files on your laptop or desktop or photos on your iPhone being copied to iCloud in case you drop your phone. An archive might have a backup file.

Records at the National Archives: Of all documents and materials created in the course of business conducted by the United States Federal government, only 1%-3% are so important for legal or historical reasons that they are kept forever. Those valuable records are preserved in the National Archives and are available to the public.

Per DAU LOG 215, Technical Data Management, over time, data will periodically need to be migrated to current software applications and hardware formats for continued currency and availability**.**

Example 1. Imagine if you, as the PSM, are required to download valuable historical maintenance records that have been stored on, now obsolete, 3.5-inch floppy disks, or punched tape. Where would you find the equipment to download the technical data and the software to be able to read the, also now obsolete, data structures? At the time of storage, this was the latest computer technology for retrieval.

Example 2. Microfiche machines still exist in some libraries. The librarian must keep these unwieldy machines so patrons can access and read microfiche files. The librarian can only dispose of the original viewing apparatus when those files are converted to a more current format. Hardware systems also need to be kept past the normal active life cycle in order to access data.

The PM and PSM must include as part of the Acquisition Strategy and the IP Strategy (that is summarized in the Acquisition Strategy document):

- Requirements for:
    - Periodic analysis of the adequacy of the data rights licenses for future data accessibility, storage media suitability, and potential obsolescence of the underlying technology (at least every third year, but not greater than five years); and

    - Program adjustment to ensure that any risks related to long term data rights, data access and suitability of the underlying technology are mitigated
- Requisite funding to achieve technical data storage, backup, and archiving requirements

Disposal
Technical data and its information technology/software infrastructure disposal have significant security implications for both classified and unclassified information. Technical data resides in both electronic and non-electronic formats and is found in all DoD products and services.

DoDI 8500.01, Cybersecurity, establishes a DoD cybersecurity program to protect and defend DoD information and information technology (IT). Each of the DoD Components provides policy and guidance on the life cycle management of data records. Readers should check with their organizations for specific policy and guidance related to disposal of technical data (both electronic and non-electronic) and any associated information technology/software containing infrastructure.

A. Technical Data Major Activities by Acquisition Phase

Activities of the Technical Data IPS Element
Each activity of the Technical Data IPS Element, as listed in the PSM Guidebook Appendix A, is under the responsibility of the Program Manager, the Product Support Manager, and the lead stakeholder from other areas as applicable, i.e., configuration management, engineering, environment, manufacturing, etc. Relevant proponent DoD offices are listed in this chapter below in Section C, Proponency.

Input to the LCSP/Product Support Strategy
Detailed guidance on development of the Life Cycle Sustainment Plan (LCSP)/Product Support Strategy states that “The purpose of this annotated outline is to improve sustainment planning for Department of Defense (DoD) weapon systems. This may be achieved when programs make design decisions that achieve operational performance requirements and reduce demand for sustainment.”

While information from Technical Data activities will impact many areas of the LCSP/Product Support Strategy, the below LCSP sections specifically address PHS&T:
3.1 Sustainment Strategy Considerations
3.2 Sustainment Relationships
3.3 Product Support Arrangements
7.1 O&S Cost
8.1.2 Product Support Team
9.0 Supportability Analysis

As Technical Data activities continue through the life cycle, their impacts will both directly and indirectly impact the system's KPP, KSA and APA parameters. The PSM and LCL should start these activities early in the system lifecycle for greatest impact.

Relationship of Technical Data Management to Product Support Strategies
Per DAU LOG 215, Technical Data Management, the Technical Data Management Intellectual Property (IP) Strategy relates directly to the development of the PBL Product Support Strategy. The topics discussed in the IP Strategy should align to the Product Support Strategy. The IP Strategy is included in the system's Acquisition Strategy (AS) during acquisition phases, but it becomes a part of the LCSP/Product Support Strategy during a system's Operations and Support acquisition phase.

Impacts of Technical Data Management on System Sustainment KPP/KSA Parameters
Per DAU LOG 215, Technical Data Management, the following types of technical data support the achievement of the Warfighter requirements (i.e., KPPs and KSAs).

- The Sustainment KPPs and KSAs all require most of the different types of technical data for implementation
- Planning and coordination among all members of the Product Support Management IPT are required to ensure the required technical data is available
- The specific requirements for technical data, e.g., funding, sourcing, and specific data fields within each type, will be unique to each program.

Types of Technical Data
• **Data Requirements**
• **Logistics Product Data**
• **Technical Manuals**
• **Specifications and Standards**
• **Intellectual Property (Data Rights)**
• **Technical Data Package (TDP)**
• **Engineering Design Info (not included in TDP)**
• **Configuration Control Data**
• **Quality Control Data**

• **Manufacturing Data**
• **IPS Element Processes for Technical Data**
• **In-service Operational Information**

Table 7.1 Types of technical data which support the achievement of Warfighter requirements.

For more information about the Key Performance Parameters and Key System Attributes, the reader should review the Product Support Management IPS Element chapter in this guidebook.

Relationship to Configuration Management
Per DAU LOG 215, Technical Data Management, specific relationships between Configuration Management and Technical Data Management are established so that the Configuration Management strategy can be implemented successfully:

- Relationship #1
  Technical data interoperability has become critical to implementation of a Configuration Management strategy. Information exchanging media has transitioned from mostly paper-based to predominantly digital. Information technology concepts and standards for data access, data transfer, and data sharing are increasing the opportunities for Government and industry to productively integrate information from distributed sources.

  Both Government and industry are evolving infrastructures that support information interoperability. This is leading toward the conceptual notion of a true virtual enterprise that will include the entire Configuration Management information necessary for the life cycle support and maintenance of equipment and software. Both Government and contractor will be able to input and/or access product information via their own diversified automated information systems.

- Relationship #2
  Data format standardization allows for interoperability between dissimilar Configuration Management systems. Each supplier will use a different Configuration Management tool.

  The level of interoperability between dissimilar Configuration Management tool systems is determined by agreement and cooperation between organizations. Data standardization, such as using Extensible Markup Language (XML), facilitates data sharing and exchange among different systems.

SAE GEIA STD-836 provides a set of standard definitions and business objects that can be used by XML frameworks in interfacing the content elements among one or more systems or databases. To be most effective, the capabilities of the process, tools, or systems, should embody the Configuration Management principles in SAE EIA-STD-649B in conjunction with the business objects and data element definitions in SAE GEIA-836.

- Relationship #3
  The use of specifications and standards in acquisition practices, critical to the implementation of Configuration Management, relies on performance requirements and industry processes and practices. Acquisition practices, including the manner in which Configuration Management is specified in a contract and the process of monitoring contractor application are evolving. The change in acquisition approach initiated in the acquisition reforms introduced in June 1994, resulted in the following conceptual changes:
  1. The Government asks the contractor how he intends to apply his standard management practices to a given program and evaluate those practices against industry standards.
  2. Limiting the focus of Government configuration control to performance requirements rather than the details of the design solution in most instances
  3. Basing Government oversight of contractor practice on adequacy of process rather than on inspection of product.

Modular Open Systems Requirements (MOSA)
Per DAU LOG 215, Technical Data Management, acquisitions using Open Systems Architectures (OSA) should yield modular, interoperable systems allowing components to be added, modified, replaced, removed and/or supported by different vendors throughout the life cycle in order to drive opportunities for enhanced competition and innovation.

One way of measuring the 'openness' of a system is how readily a system component can be replaced with one developed by a different vendor, with no loss in overall system effectiveness.

There are a variety of tools, devices, and resources available to the PM when planning for and conducting the acquisition of a Data Management system using OSA guidelines. The proper use of these resources is an important element of the acquisition process and will reduce the overall risk to the DoD by ensuring that all necessary OSA aspects of the procurement are covered.

The reader should check with their respective organizations for relevant MOSA related policy and guidance. Readers should also review the Design Interface IPS Element chapter, section 2.13, in this guidebook.

Risks related to Technical Data management
Per DAU LOG 215, Technical Data Management, Module 3, describes six major risks associated with technical data management:

- Acquisition of technical data for competitive contracting
- Affordability
- Technical data access
- Technical data maintenance cost
- Technical data storage cost
- Technical data format obsolescence.

See the DoD 5010.12-M, Procedures for the Acquisition and Management of Technical Data for more information on acquisition risks related to technical data.

There are risks when not acquiring technical data:

- The impacts to the viable production and sustainment alternatives
- The Life Cycle Cost impact associated with noncompetitive alternatives that result from the failure or decision to not acquire the program's technical data and to secure the Government's rights in that technical data
- Areas of risk to be assessed include:
    - Limited production sources
    - Increased re-procurement costs
    - Limited logistics support options
    - Increased logistics support costs
    - Inability to adequately address parts obsolescence issues and Environment, Safety, and Occupational Health (ESOH) regulatory requirements
    - Inability to organically or competitively handle acquisition program's reset or recap initiatives

When Is Technical Data Delivered and Managed in the Lifecycle?
The activities within the Technical Data IPS Element are best visualized in the DoD Product Support Implementation Roadmap Tool. This tool allows the User to check the box highlighting information specifically linked to the Technical Data Integrated Product Support Element.

Once the Technical Data IPS Element box is checked, the timeline expands to show the detailed activities and respective outputs for each activity by phase, as show in a partial illustration in Figure 7-2 below.

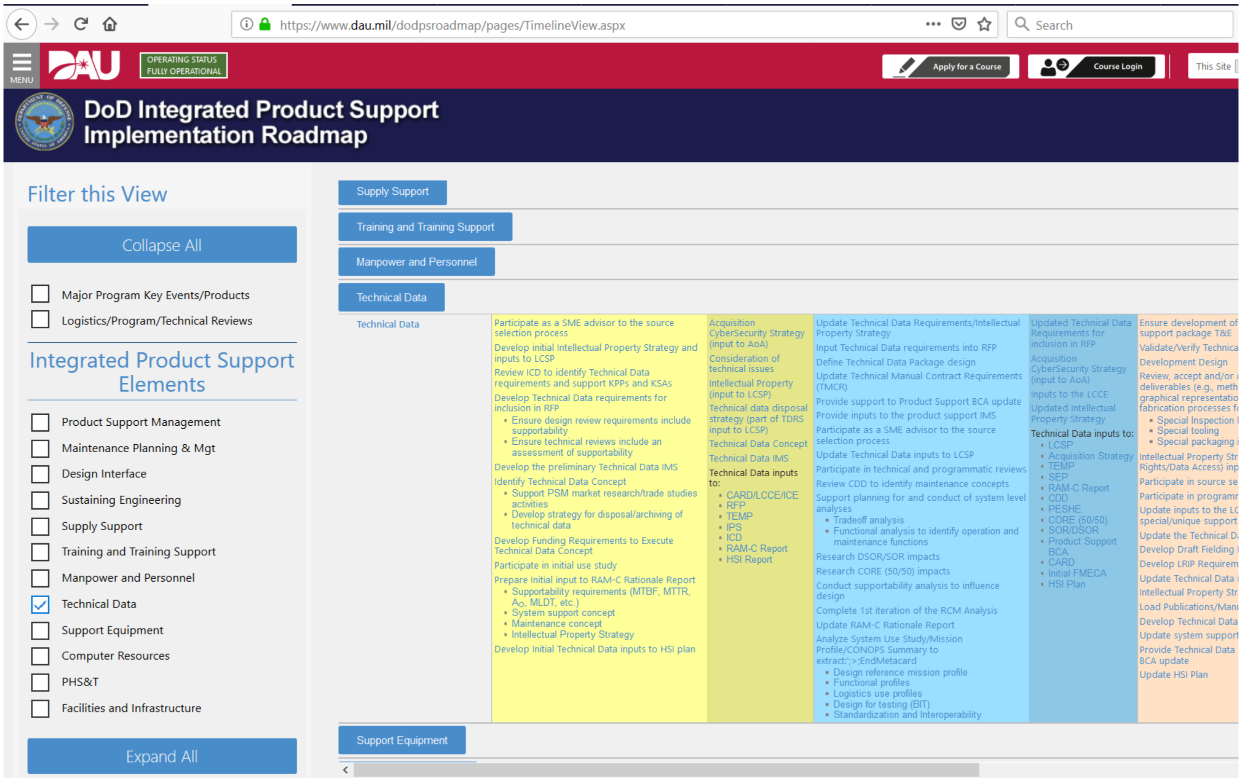


Figure 7-2, Screenshot of the DoD Integrated Product Support Implementation Roadmap Timeline View Homepage with the Technical Data IPS Element box checked. Notice the Technical Data activities and respective outputs are visible for each life cycle acquisition phase.

Each activity and output is then hyperlinked to a pop-up window that displays specific data related to that respective activity as shown in the screenshot below in Figure 7-3. The specific data is in-turn hyperlinked to allow the user to subsequently search for detailed information regarding any specific activity.

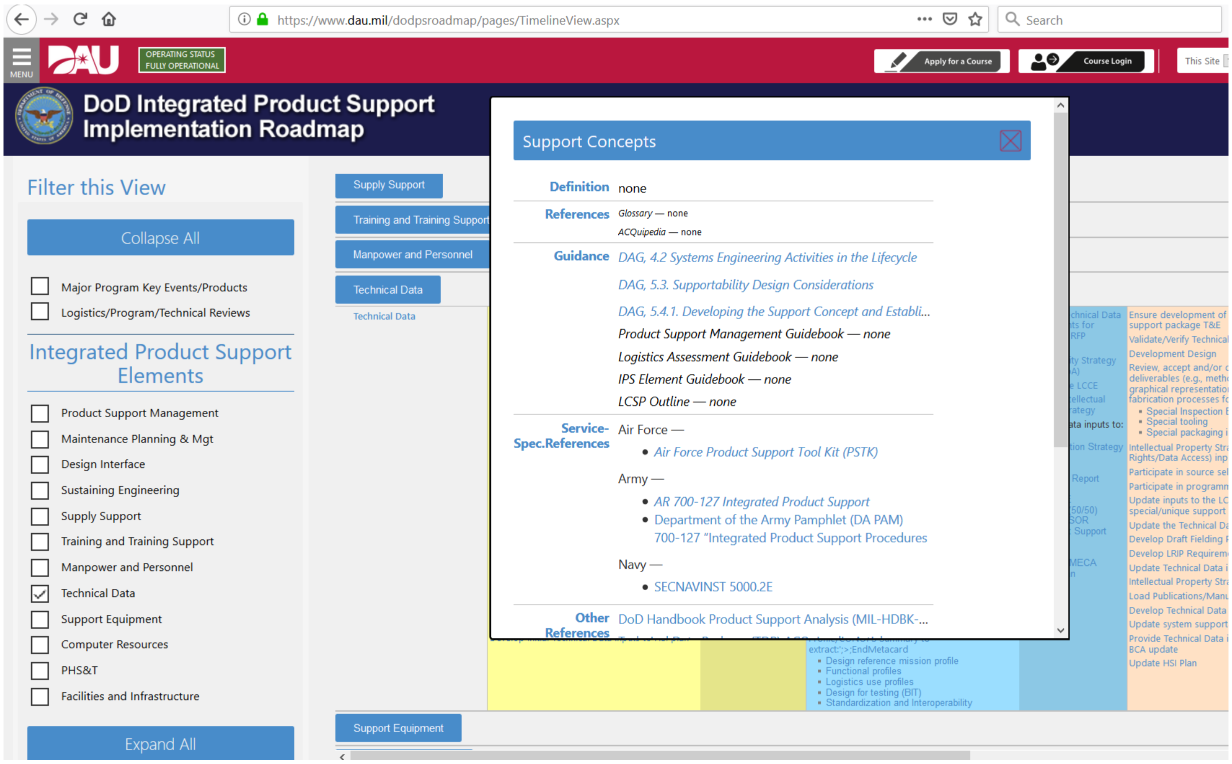


Figure 7-3, Screenshot of the DoD Integrated Product Support Implementation Roadmap Timeline View Homepage with the Technical Data IPS Element box checked. The User then clicked on the outcome "Life Cycle Sustainment Plan (LCSP)" from the listing of activities and outcomes for Technical Data. This data card provides further information for the User to search for further detailed information.

Per the Defense Acquisition Guidebook (DAG), CH 3-4.1.7, the Program Manager (PM) and Systems Engineer, in conjunction with the Product Support Manager, should ensure that life-cycle requirements for weapon system-related data products and data rights are identified early and appropriate contract provisions are put in place to enable deliveries of these products.

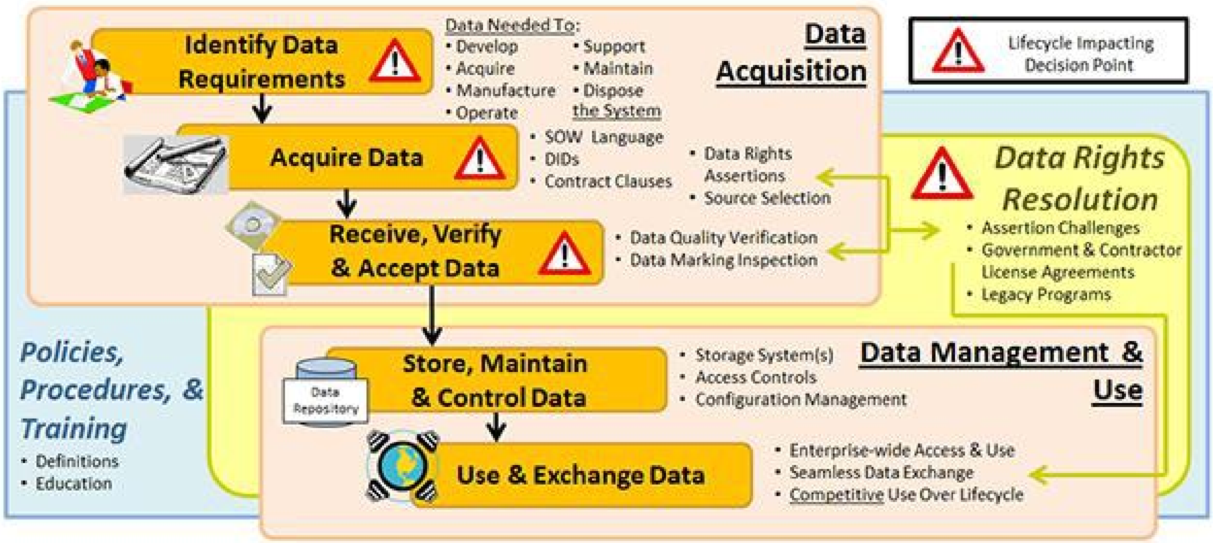


Figure 7-4 above shows the activities associated with Technical Data Management. The five main tasks are further described in the following text.

Identify Data Requirements

- Formulate the program's Intellectual Property (IP) Strategy and technical data management approach, with an emphasis on technical and product data needed to provide support throughout the acquisition life cycle. (See CH 1–4.2.18. for more information about Data Rights).
- Ensure that data requirements are documented in the IP Strategy; summarized in the Acquisition Strategy (AS) and presented with the Life-Cycle Sustainment Plan (LCSP)/Product Support Strategy (LCSP) during the Operations and Support Phase; and submitted at each milestone before award of the contract for the next life-cycle phase.
- Based on the technical baseline, identify assemblies, subassemblies, and parts that are candidates for Government ownership of data rights. Include this information in AoAs, trade studies and as input to RFPs.
- Consider not only the immediate, short-term costs of acquiring the needed technical data and data rights but also the long-term cost savings resulting from the ability to compete production and logistics support activities and reduce TOC. Understand that the Government can possess either Government Purpose or Unlimited Rights to use many types of technical data and data rights, at no additional cost, based on the type of technical data and the source of funding used to generate the data (see DoD Open Systems Architecture Contract Guidebook for Program Managers for more information about data rights).
- Consider any requirements to acquire rights to production and sustainment tooling and facilities, including processes required to use this equipment. Where the government

has acquired rights to specific parts, these rights do not necessarily also convey rights to the equipment or processes used to produce the parts.

Acquire Data

- Use explicit contract Statement of Work (SOW) tasks to require the developer to perform the work that generates the required data. The content, format and quality requirements should be specified in the contract.
- Use current, approved Data Item Descriptions (DID) and Contract Data Requirements Lists (CDRL) in each contract to order the delivery of the required technical data and computer software.
- Consider obtaining data through an open business model with emphasis on having open, modular system architectures that can be supported through multiple competitive alternatives. The model may include modular open systems approaches as a part of the design methodology supported by an IP strategy, which may be implemented over the life cycle of a product. (See CH 3–2.4.1. Modular Open Systems Approach.)

Receive, Verify and Accept Data

- Ensure verification of content, format, and quality of all required product-related data received from originators.
- Inspect contractually ordered data deliverables to ensure markings are in accordance with the relevant data rights agreements and DFARS clauses and contain appropriate distribution statements and/or export control statements.

Caution: Acceptance of delivered data not marked consistent with the contract can result in the Government "losing" legitimate rights to technical data and can incur significant legal liability on the Government and the individual Government employees. Regaining those rights generally requires costly and time-consuming legal actions.

Store, Maintain and Control Data

- Budget for and fund the maintenance and upkeep of product data throughout the life cycle.
- An Integrated Data Environment (IDE) or Product Life-cycle Management (PLM) system allows every activity involved with the program to create, store, access, manipulate and exchange digital data.
- To the greatest extent practical, programs should use existing IDE/PLM infrastructure such as repositories operated by Commodity Commands and other organizations. (Program-unique IDEs are discouraged because of the high infrastructure cost; furthermore, multiple IDEs inhibit access, sharing and reuse of data across programs.)

- Ensure all changes to the data are made in a timely manner and are documented in the program IDE or PLM system.

Use and Exchange Data
Plan for and establish methods for access and reuse of product data by all personnel and organizations that perform life-cycle support activities.
In support of the Government's requirement for a Technical Data Package (TDP), the PM should also consider all product-related data (e.g., technical manuals, repair instructions and design/analysis data) to:

- Allow logistics support activities.
- Better enable sustainment engineering.
- Apply, implement, and manage product upgrades.

Contractually deliverable data should be identified and ordered at the specific "data product" level, (e.g., two-dimensional drawings, three-dimensional Computer-Aided Design (CAD) models, technical manuals, etc.). Figure 41 provides a notional representation of different types of product-related data.

B. Data Item Description (DID) Deliverables

A Data Item Description (DID) is a completed document, typically identified in a Contract Data Requirements List (CDRL), that defines the data required of a contractor. The document specifically defines the data content, format, and intended use of the data. DIDs are found on the DLA Assist Database.

Helpful Search Hint: All DID's start with the letters "DI-." Once your search results are shown, click on the column header "Document ID" to sort by alphabetical order. The "DI-" items will be easier to find. You can also insert "DI-" into the Document ID field. For the Status field, be sure to use the "Active" category from the drop-down list.

The below is a representative listing and is not inclusive of all Technical Data related DIDs.

- DI-CMAN-80639, Engineering Change Proposals (ECP)"
- DI-CMAN-80776, Technical Data Package"
- DI-EGDS-80918, Technical Data Package Index
- DI-FNCL-80166, Program Cost and Technical Data Reports
- DI-GDRQ-80650, Design Data and Calculations
- DI-ILSS-80812, Logistics Technical Data User Profile
- DI-MISC-80734, Technical Data Assessment
- DI-MISC-80750, Technical Data Package Review Report
- DI-QCIC-81013, Technical Data Package Validation Report
- DI-SAFT-80103, Engineering Change Proposal System Safety Report (ECPSSR)
- DI-SESS-81000, Product Drawings/Models and Associated Lists

- DI-SESS-81002, Developmental Design Drawings/Models and Associated Lists
- DI-SESS-81011, Drawing Number Assignment Report
- DI-SESS-81309, Internal Contractor Technical Data Report
- DI-TMSS-80527, Commercial TMs/Data

C. Proponency

Please note that DoD organizational changes may result in changes to Office designations and Proponency responsibilities that may not match the content in this Guidebook.

At the OSD level, the following offices may serve as proponents for issues related to Technical Data:

Acquisition and Management of Technical Data

The Office of the Under Secretary of Defense for Acquisition and Sustainment is proponent for the acquisition and management of technical data within the Department of Defense. This includes data both in paper and digital format and data to which the Department of Defense has access via contractor-provided services.

Proponency of specific topical areas include:

Standards and Specifications

The DoD's Defense Standardization Program identifies, influences, develops, manages, and provides access to standardization processes, products, and services for Warfighters, the acquisition community, and the logistics community to promote interoperability, reduce total ownership costs and sustain readiness.

Technical Manuals and the Custodian Office

Proponency for DoD Technical Manual regulations is maintained jointly with Army, Navy and Air Force Custodian offices:
Army Custodian: USAMC, LOGSA, Logistics and Engineering Center
Navy Custodian: Naval Surface Warfare Center Indian Head Explosive Ordnance Disposal
Air Force Custodian: Air Force Material Command/A4F Engineering Data

Depending on the type of manual and the scope or topic of the manual's contents, the Custodian Office may be different than listed above. Readers are encouraged to check with their respective organizations and the documents listed in the DoD Assist Database for specific information on technical manual Proponency and Custodianship.

The Custodian is responsible for compiling comments from all review activities during the coordination of standardization documents and providing a single set of distilled comments to the preparing activity. The custodian function in the Defense Standardization Program helps to prevent receipt of duplicative comments by the preparing activity and provides a single contact point for resolution of essential comments.

A Custodian's responsibilities include:

- Representing the Department on technical issues involving a standardization document or study;
- Assisting the Preparing Activity in identifying Review Activities in the Department;
- Resolving and consolidating Review Activity comments in their Department and presenting a unified position on a standardization document to the Preparing Activity; and
- Working with the Preparing Activity to resolve their Department's essential comments.

Engineering Drawings

ASME-Y14.100, Engineering Drawing and Related Documentation Practices, was adopted on 30 January 1998 for use by the Department of Defense. DoD Custodian offices include the Army, Navy, Air Force and Defense Logistics Agency (DLA):

- Lead Standardization Activity: US Army Research Development & Engineering Command, Armament Research Development & Engineering Center
- Adopting Activity: US Army Research Development & Engineer Command, Armament Research Development & Engineering Center
- Army Custodian: US Army Research Development & Engineering Command, Armament Research Development & Engineering Center
- Navy Custodian: Navy Supply Systems Command
- Air Force Custodian: Air Force Material Command/A4F Engineering Data
- DLA Custodian: Defense Logistics Agency

Data Rights Management/Intellectual Property

The Defense Information Systems Agency (DISA) provides an informational website on data rights management and intellectual property. The mission of DISA is to conduct DoD Information Network (DoDIN) operations for the joint warfighter to enable lethality across all warfighting domains in defense of our Nation.

The Defense Federal Acquisition Regulation Supplement (DFARS) contains requirements of law, DoD-wide policies, delegations of FAR authorities, deviations from FAR requirements, and policies/procedures. Information on technical data rights is found in Subpart 227.71--Rights In Technical Data. The Office for Defense Pricing and Contracting oversees the Defense Acquisition Regulations System.

Data Storage and Archiving

Headed by the OSD Records Administrator (Chief, WHS, RPDD), the OSD Records and Information Management (RIM) Program is responsible for oversight, implementation of the Federal Records Act within the Offices of the Secretary of Defense and the WHS supported Defense Agencies and Field Activities.

The Office of the DoD CIO provides policy and guidance for the DoD Information Enterprise Architecture that prescribes the required characteristics for the set of highly capable, highly resilient and standardized Enterprise data centers that will form the backbone of the Joint Information Environment (JIE)computing infrastructure now being implemented. Core Data Centers will enable a significant reduction in the total number of DoD data centers by serving as consolidation points for computing and storage services currently hosted across hundreds of Component facilities.

D. U.S. Government Statute, Regulations, DoD Policy and Guidance

The below policy and guidance are suggested as a core set of references. Note that this list does not contain policy and guidance from the DoD Components/Services. Readers should check with their respective organizations for additional policy and guidance specific to their program and product support requirements.

Please note that due to the high rate of change occurring in policy and guidance, the letter designations found as part of a reference will be removed in this guide. Readers are encouraged to check the DoD reference source on a frequent basis to ensure they are using the current reference version.

- DoD Directive 5000.01, The Defense Acquisition System
- DoDI 5000.02, Operation of the Adaptive Acquisition Framework
- Other policy located on the DoD AAF website and DoD Issuances website
- DoD 5010.12-M, Procedures for The Acquisition and Management of Technical Data
- Defense Acquisition Guidebook (DAG) Chapter 4, Life Cycle Sustainment, and Chapter 3, Systems Engineering
- DoDI 5000.75, Business Systems Requirements and Acquisition
- DoDI 8320.02, December 2, 2004, Data Sharing in a Net-Centric Department of Defense
- MIL-STD-963, Data Item Descriptions
- MIL-STD-3008, Interactive Equipment Technical Manuals (IETM) Technical Data Requirements to Support the Global Combat Support System-Army (GCSS-A)
- MIL-DTL-31000, Technical Data Packages
- 10 U.S.C. §2337 Life Cycle Management and Product Support
- 10 U.S.C. §2437 Development of Major Defense Acquisition Programs: Sustainment of System to be Replaced
- 10 U.S.C. 2441 Sustainment Reviews
- 10 U.S.C. §2460 Definition of Depot-Level Maintenance and Repair
- 10 U.S.C. §2464 Core Logistics Capabilities (“Core”)
- 10 U.S.C. §2466 Limitations on the Performance of Depot-Level Maintenance of Materiel (“50-50 Rule”)

- 10 U.S.C. §2469 Contracts to Perform Workloads Previously Performed by Depot-Level Activities of the DoD: Requirement of Competition ("$3M Rule")
- 10 U.S.C. §2474 Centers of Industrial and Technical Excellence: Designation; Public-Private Partnerships ("CITEs")
- DFARS SUBPART 227.71--RIGHTS IN TECHNICAL DATA

- Army Data and Data Right (D&DR) Guide
- Army Regulation 25-1 Army Information Technology
- Dept of the Army Pamphlet 25-1-1 Army Information Technology Implementation Instructions
- Air Force Product Data Acquisition (PDAQ) guidance
- Air Force Technical Data and Computer Software Rights Handbook

There are additional handbooks, manuals and other reference sources located below in the **Best Practices** section of this chapter.

E. Communities of Practice and Interest

The Preface of this IPS Elements Guidebook provides a listing of "golden references," many of which provide libraries, research portals and other resources for finding additional information on specific topics of design interface.

Many OSD offices (listed under the Proponency section above) maintain a comprehensive website with links to DoD partner organizations, policy, and guidance, plus many other resources. Readers are encouraged to check the relevant proponent website for additional information.

Readers should check with their respective organizations for the communities of practice that focus on the area of technical data most relevant to their interests.

The DAU community hub is a website that consolidates the links to approximately 50 communities of practice related to DoD acquisition practices. Many of these communities are important to the Technical Data IPS Element.

- Aircraft Operations
- Commercial Off the Shelf Products and Commercial Services
- Data Management
- Information Technology/Software
- Life Cycle Logistics
- Modular Open Systems Approaches
- Performance Based Logistics (PBL)
- Risk Management
- Systems Engineering

- Test & Evaluation

Best Practices Sources

- PSM Guidebook
- IPS Element Guidebook (Chapter 7)
- Acquiring and Enforcing the Government's Rights in Technical Data and Computer Software Under Department of Defense Contracts: A Practical Handbook for Acquisition Professionals
- Product Support Business Case Analysis (BCA) Guidebook
- Configuration Data Managers Database-Open Architecture (CDMD-OA)
- Defense AT&L Magazine Article "The Myth of Data Rights" (Nov-Dec 2015)
- Department of the Navy Technical Data Management Information System (TDMIS)
- DoD Open Systems Architecture Contract Guidebook for Program Managers
- JCIDS Manual
- Logistics Assessment (LA) Guidebook - Appendix A: Integrated Product Support, Product Support Management Criteria, Section 1.0
- Life Cycle Sustainment Plan
- MARCORSYSCOM SOW/CDRL Tracking Tool Website
- MIL-HDBK-61A Configuration Management
- MIL-HDBK-245 Handbook for Preparation of a SOW
- MIL-STD-40051-1A Preparation of Digital Technical Information for Interactive Electronic Technical Manuals (IETM)
- MIL-STD-40051-2A Preparation of Digital Technical Information for Page-Based Technical Manuals (TM)
- Naval Air Technical Data & Engineering Center (NATEC)
- Naval Open Architecture Contract Guidebook for Program Managers
- Open System Architecture (OSA)/Data Rights Business Case Guide and Templates
- Product Support Implementation Roadmap
- Product Support Strategy Development Tool (formerly PSM Toolkit)
- Product Support Analytical Tools Database
- S1000D International Specification for Technical Publications Using a Common Source Database
- SAE GEIA-STD-649B Configuration Management
- SAE GEIA859A Data Management

Acquisition Streamlining and Standardization Information System (ASSIST) Quick Search is a public website that lets users search for defense and federal specifications and standards, military handbooks, commercial item descriptions, data item descriptions, MS detail drawings, Qualified Product Lists (QPL), and related technical documents prepared in accordance with the policies and procedures of the Defense Standardization Program (DSP). In most cases, users may download documents that have been cleared for public release.

F. Training Resources

DAU Courseware
A complete list of DAU training resources can be found in the DAU iCatalog. Courses are classified as Training Courses (Regular (certification and assignment specific) training courses), Continuous Learning, and Targeted Training (Alternate means to meet training requirements).

The below list of DAU courses are relevant to the Technical Data IPS Element:

- LOG 215, Technical Data Management. LOG 215 is the DAU course that provides comprehensive learning on all aspects of DoD technical data related topics. Below is a listing of modules within the LOG 215 course:
    - Introduction to Technical Data Management
    - Technical Data and Integrated Product Support Elements
    - Development of a Technical Data Management Plan
    - Identifying Program Technical Data Requirements
    - Assessment of Performance Based Life Cycle Product Support
    - Technical Specifications and Standards
    - Technical Data Package Development and Management
    - Technical Publications, Fielding and Management
    - Logistics Product Data
    - Product Life Cycle Management
    - Course Summary
- CLE 036 Engineering Change Proposals for Engineers
- CLE 040 IUID Marking
- LOG 101 Acquisition Logistics Fundamentals
- LOG 102 Systems Sustainment Management Fundamentals
- SPS 106 Database Maintenance
- CLB 030 Data Collection and Sources
- CLE 008 Six Sigma: Concepts and Processes
- CLM 071 Introduction to Data Management
- CLM 072 Data Management Strategy Development
- CLM 073 Data Management Planning System
- CLM 074 Tech Data & Computer Software Rights
- CLM 075 Data Acquisition
- CLM 076 Data Markings
- CLM 077 Data Management Protection and Storage

- CLE 012 DoD Open Systems Architecture
- CLE 068 Intellectual Property & Data Rights

DAU ACQuipedia Articles
ACQuipedia serves as an online encyclopedia of common defense acquisition topics. Each topic is identified as an article. Each article contains a definition, a brief narrative that provides context, and includes links to the most pertinent policy, guidance, tools, practices, and training which further augment understanding and expand depth.

ACQuipedia was developed as a collaborative project to create content around Defense Acquisition-related topics. Articles (topics) will be maintained as a collaborative effort of subject matter experts across the Defense Acquisition University (DAU). Future growth may expand the collaboration of subject matter experts beyond DAU.

ACQuipedia provides the acquisition workforce with quick access to information in a succinct and digestible format. Article content aggregates the most relevant references and learning assets to narrowly focus users and quickly provide high value information.

Below is a listing of linked ACQuipedia articles relevant to Technical Data. The reader is encouraged to visit the homepage to see additional articles.

- Architecture Data
- Configuration Management
- Data Rights
- Data Rights, Identification and Assertion of use, release, or disclosure restrictions, DFARS 252.227-7017
- Defense Logistics Agency (DLA)
- Government-Industry Data Exchange Program (GIDEP)
- Integrated Product Support (IPS) Elements
- Integrated Product Support (IPS) Element - Technical Data
- Intellectual Property
- Intellectual Property Strategy (formerly Data Management Strategy/Technical Data Rights Strategy)
- Item Unique Identification (IUID)
- Key Performance Parameters (KPP)
- Key Systems Attribute (KSA)
- Life Cycle Cost (LCC)
- Life Cycle Sustainment Outcome Metrics
- Life Cycle Sustainment Plan (LCSP)
- Logistics Footprint
- Logistics Product Data

- Logistics Response Time (LRT)
- Maintenance Concept
- Maintenance Plan
- Maintenance Task Analysis (MTA)
- Materiel Availability
- Mean Downtime (MDT)
- Mean Time Between Failure (MTBF)
- Modification Management
- O&S Cost Estimating for the PSM
- Obsolescence Management
- Operating and Support (O&S) Cost Key System Attribute (KSA)
- Operating and Support Costs (O&S)
- Parts Management
- Performance Based Logistics (PBL) Implementation
- Performance Based Logistics (PBL) Management
- Performance Based Logistics (PBL) Metrics - Overview
- Performance Based Logistics (PBL) Metrics – Techniques & Tools for Optimizing Operating & Support (O&S) Cost & System Readiness
- Performance Based Logistics (PBL) Metrics - Thresholds vs. Objectives
- Performance Based Logistics (PBL) Overview
- Post IOC Supportability
- Product Life-Cycle Management (PLM) Integrated Data/Decision Environment (IDE)
- Product Support Analysis (MIL-HDBK-502A)
- Product Support and Logistics Contract Data Requirements List (CDRL) and Data Item Descriptions (DID)
- Product Support Package
- Provisioning
- Quality Assurance Surveillance Plan (QASP)
- Reliability Growth
- Reliability Key System Attribute (KSA)
- Reset of Military Equipment
- RFID - Radio Frequency Identification
- Risk Assessment
- Software Sustainment
- Specifications and Standards
- Stock and Part Numbers
- Suitability

- Supply Chain Management (SCM)
- Supply Chain Risk Management (SCRM) - Overview
- Sustainment Key Performance Parameter (KPP)
- System Performance Specification
- Systems Engineering Plan (SEP)
- Systems Engineering Process
- Technical Baselines
- Technical Data Package (TDP)
- Technical Manuals
- Technical Performance Measurement (TPM)
- Value Engineering (VE) and Value Engineering Change Proposals (VECP)

Support Equipment

Objective

Identify, plan, resource and implement management actions to acquire and support the equipment (mobile or fixed) required to sustain the operation and maintenance of the system to ensure that the system is available to the Warfighter when it is needed at the lowest Total Ownership Cost (TOC).

Description

Support equipment consists of all equipment (mobile or fixed) required to support the operation and maintenance of a system. This includes but is not limited to ground handling and maintenance equipment, trucks, air conditioners, generators, tools, metrology and calibration equipment, and manual and automatic test equipment. During the acquisition of systems, PMs are expected to decrease the proliferation of support equipment into the inventory by minimizing the development of new support equipment and giving more attention to the use of existing Government or commercial equipment.

Overview

Items that are required to support the operation or maintenance of a system are called support equipment. Support Equipment can be mobile or fixed but is not an integral part of the system. However, support equipment is not only for maintenance. Material handling equipment is used in storage facilities and computers are necessary for support personnel to perform their jobs.

Support equipment categories include:

- Ground support equipment
- Materials handling equipment
- Tool kits and tool sets
- Metrology and calibration devices
- Automated test systems (includes TMDE, ATE, TPS, General Purpose Electronic Test Equipment, Special Purpose Electronic Test Equipment)
- Support equipment for on-equipment maintenance and off-equipment maintenance
- Special inspection equipment and depot maintenance plant equipment
- Industrial plant equipment
- Ammunition support equipment
- Medical/life support equipment
- Support equipment for the individual, i.e., soldier, pilot, special operations.

Support and test equipment can be segmented into “common” and “peculiar” categories. Common Support Equipment (CSE) includes items that are currently in the DoD inventory and are applicable to multiple systems. Because CSE is already in the DoD inventory, its technical documentation, support requirements, provisioning records and maintenance requirements are cataloged as part of the federal logistics information system.

Peculiar Support Equipment (PSE) includes items that are unique to the system and have no other application in DoD. PSE requires development of technical documentation in federal cataloging records. PSE will require support; support that is currently not available in the DoD system but will have to be developed concurrently with development of the major systems.

Why Support Equipment is Important

The Support Equipment product support element is critical to ensuring that weapon systems are well maintained and properly calibrated in order to support the readiness and operational availability of the system and to meet the Warfighter's needs. Support Equipment is important to understand because each piece of equipment may represent its own "mini-acquisition" process within the weapon system program.

One goal of the Product Support Manager is to minimize or eliminate support equipment through design influence or technology refresh. For that support equipment to be necessary for operations and sustainment, the Product Support Manager must ensure that it meets all the criteria of human systems integration, reliability, availability, cost optimization, and that overall it "makes sense" on how and where it is used. When support equipment is required, CSE is the preferred source.

Historically, Support Equipment activities have been the primary responsibility of engineering and product development, with resulting logistics activities being planned and implemented often under separate contract line items. The current view of integrated product support requires that the Life Cycle Sustainment Plan/Product Support Strategy include and implement an integrated strategy, inclusive of all the Product Support Elements, that is reviewed and reported on throughout the acquisition life cycle.

The current view represents support equipment activities being heavily influenced prior to system deployment by the design interface activities which focus on ensuring that the program KPP's are achieved through design to optimize availability and reliability at reduced life cycle cost. After deployment and during Operations and Sustainment (O&S), the activities of sustaining engineering (including product improvement, reliability fixes, continuing process improvements and technology refresh) continue those of design influence and integrate both back with engineering and manufacturing activities and forward to collect and validate system operational performance with the user. The Product Support Manager is thus capable of implementing a total enterprise sustainment strategy inclusive of all acquisition phases and all product support element scopes.

Product Support Manager Activities

8.1. Manual and automatic test equipment management

Test equipment must be managed in accordance with DoD policy regarding the acquisition, management, and disposition of property assets in which DoD organizations hold a legal interest on behalf of the United States. Readers are encouraged to review:

- DoDI 4165.14, Real Property Inventory (RPI) and Forecasting
- DoDI 5000.64, Accountability and Management of DoD Equipment and Other Accountable Property
- DoDM 4140.01, DoD Supply Chain Materiel Management Procedures (11 volumes),
- Defense Acquisition Guidebook (DAG)
- MIL-HDBK-2097, Acquisition of Support Equipment and Associated Integrated Logistics Support

Readers should check also for DoD Component policy and guidance for test equipment.

Manual Test Equipment
Per MIL-STD-1309, Definitions of Terms for Testing, Measurement and Diagnostics, manual test equipment refers to a system or device used to test end items or subsystems which relies primarily on manual operation and operator evaluation of results.

Automatic Test Equipment (ATE)
Per MIL-PRF-28800, Test Equipment for Use with Electrical and Electronic Equipment, General Specification For, automatic test equipment is a generic term for equipment (separate or built-In) satisfying a test function (diagnostic or condition indicating) and possessing automatic capability. In this sense, ATE can be either a part of the mission equipment or it can be a part of support equipment (see MIL-STD-1309, Definitions of Terms for Testing, Measurement and Diagnostics). The reader should also see Section 8.12 below for additional information and examples of automatic test systems.

General Purpose Maintenance Test and Support Equipment
Per MIL-PRF-28800, Test Equipment for Use with Electrical and Electronic Equipment, General Specification For, generic test equipment is commercially available and normally can be used for more than one purpose.

Special Purpose Maintenance Test and Support Equipment
Per MIL-PRF-28800, Test Equipment for Use with Electrical and Electronic Equipment, General Specification For, special purpose maintenance test and support equipment includes unique jigs, fixtures, and special test equipment, including single source and proprietary items.

Special Test Equipment (STE) is either single or multipurpose integrated test units engineered, designed, fabricated, or modified to accomplish special purpose testing in performing a contract. It consists of items or assemblies of equipment including standard or general-purpose items or components that are interconnected and interdependent to become a new functional entity for special testing purposes. STE does not include material, special tooling, real property (except foundations and similar improvements necessary for installing special test equipment), and equipment items used for general testing purposes, or property that with relatively minor expense can be made suitable for general-purpose use.

Special Tooling includes all jigs, dies, fixtures, molds, patterns, taps, gauges, all components of these items, and replacement of these items, which are of such a specialized nature that without substantial modification or alteration their use is limited to the development or production of particular supplies or parts thereof or to the performance of particular services. It does not include material, special test equipment, real property, or plant equipment (except foundations and similar improvements necessary for installing special tooling), machine tools, or similar capital items.

Self-Test Capability
Per MIL-PRF-28800, Test Equipment for Use with Electrical and Electronic Equipment, General Specification For, a self-test is a test or series of tests, performed by a device upon itself, that shows whether or not the device is operating within designed limits. This includes test programs on computers and ATE that check out their performance status and readiness. When specified, the equipment shall be able to provide automatic diagnostic self-test (see 6.5.2.26) information. The information provided shall indicate whether the equipment is operating within the performance specification. If the equipment exceeds the performance specification bounds, the information provided by the self-test shall identify the associated lowest replaceable unit (LRU) failure causing the malfunction.

8.2. Equipment design
MIL-PRF-28800, Test Equipment for Use with Electrical and Electronic Equipment, General Specification For provides guidance for support equipment design requirements considerations.

MIL-S-8512, Support Equipment, Aeronautical, Special General Specification for the Design Of**,** provides guidance for covers general requirements for design and construction of ground support equipment and provisions to be incorporated in detail specifications for specific items of equipment**.**

Built-in Test (BIT)/Built-in Test Equipment (BITE)
Per MIL-PRF-28800, Test Equipment for Use with Electrical and Electronic Equipment, General Specification For, the term Built-in Test (BIT) identifies the test approach using either BITE or self-test capability or both. The term Built-in Test Equipment (BITE) refers to any device that is part of or permanently mounted in the prime test equipment and used for the express purpose of testing that equipment, either independently or in association with external test equipment.

8.3. Equipment commonality management
Per MIL-HDBK-2097, Acquisition of Support Equipment and Associated Integrated Logistics Support, acquisition logistics efforts should strive to reduce or eliminate the number of tools and support equipment required to maintain the system. If tools and/or support equipment are shown to be necessary, standardization should be considered.

Common Support Equipment (CSE)
Per MIL-HDBK-2097, Acquisition of Support Equipment and Associated Integrated Logistics Support, common support equipment is designed for a wide-range of applications. Because CSE is already in the DoD inventory, its technical documentation, support requirements, provisioning records and maintenance requirements have been cataloged as part of the federal logistics information system and typically require minimal additional provisioning actions.

Special or Unique (Peculiar) Support Equipment (PSE)
Per MIL-HDBK-2097, Acquisition of Support Equipment and Associated Integrated Logistics Support, special or unique (peculiar) support equipment is designated for use with a specific equipment or equipment family. PSE requires development of technical documentation in federal cataloging records. PSE will require provisioning and its own product support infrastructure - support that would not currently be available in the DoD system but will have to be developed concurrently with development of the major systems.

Standardization
Standardization of support equipment is managed by the DoD from both a Joint and an individual Component perspective. Standardization can be from different perspectives:

- Functional
- Technical
- Operational
- Logistics requirements

For example, the Army's AR 70-12, "Research, Development, and Acquisition, Fuels and Lubricants Standardization Policy for Equipment Design, Operation, and Logistic Support," states that having similar military and commercial fuels is intended to simplify the total logistic support.

8.4. Maintenance Concept Integration
Support equipment should be considered as an integral part of the maintenance concept. Per the Defense Acquisition Guidebook (DAG), Chapter 4, Life Cycle Sustainment, the Program Manager should formulate design requirements to minimize support equipment, including testing, measurement, and diagnostic equipment. When the use of support equipment cannot be eliminated, the PM should standardize support equipment design for the broadest possible range of applications, consistent with maintenance concepts. Supportability analysis is performed as design and other technical information on the equipment reaches maturity. This analysis is performed for the weapon system and support equipment as an integral part of the systems engineering processes and events. The PM should align the design of hardware intensive Integrated Product Support (IPS) Elements, including support equipment and Packing, Handling, Storage, and Transportation (PHS&T) concurrently and in coordination with the system design to ensure R&M degradation factors are mitigated.

8.5. Ground handling and maintenance equipment management

Ground handling is a broad category of support equipment that is used to support aircraft servicing between flights, marine craft while at dock and land-based systems and operations.

The Defense Logistics Agency (DLA) Construction & Equipment site list the below DLA services focused on ground handling and maintenance equipment:

- Construction and Barriers
- Maintenance, Repair and Operations
- Special Operational, Lifesaving and Diving Equipment
- Fire and Emergency Services Equipment
- Lighting, HVAC, and Commercial Hardware
- Heavy Equipment Program
- Containers
- Material Handling Equipment
- Technical and Miscellaneous Equipment

A listing of Army publications related to ground support equipment is found at the Army Publishing Directorate. A listing of Air Force publications related to ground support equipment is found at WR-ALC Publicly releasable Technical Orders.

8.6. Equipment Capacity Determination

The capacity of an item of support equipment is determined by the usage requirements and specific factors that are unique to each type of equipment.

For example, per MIL-S-8512, Support Equipment, Aeronautical, Special General Specification for the Design Of**,** for design purposes of materials-handling equipment, lifting means may be defined as portable cranes having a minimum capacity of 5,000 pounds and forklift trucks having a minimum capacity of 2,000 pounds. Hoisting provisions can also be provided for all equipment components or assemblies which must be maintained and are of such a size, weight or location that they cannot be readily handled by one man as specified in MIL-STD-1472, Human Engineering. When specified in the detail specification, provisions shall be made for jack pads and eyelets or lugs for towing and tie-down.

8.7. Air Conditioners Requirement Determination and Management

The DoD Assist Database contains multiple references for determining air conditioner requirements. Management of air conditioners should be per references noted in Section 8.1 above in this chapter. For example, ASHRAE16, Method of Testing for Rating Room Air Conditioners and Packaged Terminal Air Conditions, prescribes a method of testing for obtaining cooling capacity and airflow quantity for rating room air conditioners and packaged terminal air conditioners.

8.8. Generators Requirement Determination and Management

Each DoD Component has acquisition organizations to acquire and manage the different types of generators (or power equipment) needed throughout the DoD. Two examples are below. Readers should check with their local organizations regarding generator/power system requirements and acquisition offices.

The U.S. Navy's Mobile Utilities Support Equipment office provides portable diesel engine-driven generators, substations and switchgear to meet utility shortcomings. Customers include U.S. Navy Activities and the U.S. Marine Corps, and other DoD activities and non-DoD activities with appropriate justification and approval. Equipment includes 420 kW diesel-driven electrical generators and 1500 kVA to 5000 kVA electrical substations.

The U.S. Army's Program Executive Office Combat Support and Combat Service Support mission is to Research, develop, acquire, field, train, modernize, sustain, and champion standardized Department of Defense mobile electric power solutions for full spectrum operations.

8.9. Tools Requirement Determination and Management

The term "Tools" in this context refers to support equipment that is used by maintenance, test, engineering, or construction personnel. This type of equipment includes hand and measuring tools such as found in a general mechanics toolkit.

Special tooling means jigs, dies, fixtures, molds, patterns, taps, gauges, other equipment and manufacturing aids, all components of these items, and replacements of these items that are of such a specialized nature that without substantial modification or alteration their use is limited to the development or production of particular supplies or parts thereof or per-forming particular services.

Hand or measuring tools such as chisels, files, hammers, pliers, screwdrivers, calipers, and micrometers are specifically indicated as products covered by the Berry Amendment. The amendment requires each individual tool or all the tools within tool sets or kits purchased by DoD be wholly produced in the United States, unless exemptions laid out in the law apply. A hand or measuring tool is defined as wholly U.S.-made if it is assembled in the United States out of components, or otherwise made from raw materials into the finished product. For example, DoD is generally prohibited from buying a wrench not forged in the United States.

8.10. Metrology and Calibration Equipment Requirement Determination and Management

The terms calibration and metrology are similar terms and sometimes used interchangeably. Per the Merriam-Webster dictionary, calibration is a set of graduations to indicate values or positions—usually used in plural, or the act or process of calibrating. Metrology is defined as the science of weights and measures or of measurement, or a system of weights and measures. The capability of DoD weapon platform mechanical systems, radios and communication devices, radar systems, targeting devices and fire control systems, missiles, and aviation platforms to operate accurately and effectively depend on the synchronization of these precise measurements against known standards.

Per MIL-STD-1839, Standard Practice Calibration and Measurement Requirements, calibration is defined as the set of operations that establish, under specified conditions, the relationship between values of quantities indicated by a measuring instrument or measuring system, or values represented by a material measure or a reference material, and the corresponding values realized by standards.

Test, Measurement, and Diagnostic Equipment (TMDE).
TMDE includes any system or device used to test, measure, evaluate, inspect, or otherwise examine materials, supplies, equipment, or a system to identify and/or isolate any actual or potential malfunction, or to determine compliance with specifications established in technical documents (e.g., research, development, test, and evaluation documents; specifications; engineering drawings; technical orders). TMDE is support equipment that provides for measurement traceability.

U.S. Air Force: Air Force Metrology and Calibration Program (Technical Order (TO) 00-20-14, Air Force Metrology and Calibration Program)

U.S. Army: The U.S. Army Test, Measurement, and Diagnostic Equipment Activity (USATA)

U.S. Navy: Technical Agent for the Navy's Metrology and Calibration (METCAL) Program

8.11. Deployability Requirement Determination Management
Per DoDI 4540.07, Operation of the DoD Engineering for Transportability and Deployability Program, developing efficiently functioning and economically transportable equipment and combat resources is an integral part of the DoD acquisition process. All DoD Components will consider transportability and deployability in the:
a. Acquisition of all types of developmental systems, re-procurement of fielded systems, modified materiel, commercial off-the-shelf items, or non-developmental items.
b. Acquisition of all systems defined as transportability problem items in the Glossary.
c. Procurement or modification of defense transportation systems. d. Modification of force structure designs.

Readers should review the Design Interface IPS Element chapter, section 2.7, Deployability Management.

8.12. Automatic Test Systems
Automatic Test Systems are used to identify failed components, adjust components to meet specifications, and assure that an item is ready for issue. An Automatic Test System (ATS) includes Automatic Test Equipment (ATE) hardware and its operating software, Test Program Sets (TPS), which include the hardware, software and documentation required to interface with and test individual weapon system component items, and associated TPS software development tools. The term "ATS" also includes on-system automatic diagnostics and testing.

Per the website of the DoD Automatic Test Systems (ATS) Executive Directorate, there are several ATS publications that have been developed to aid the DoD program manager. The ATS Acquisition Guide is a just-plain-English handbook for the DoD PM who is considering an ATS acquisition. The ATS Selection Process Guide provides processes and tools to help Program Managers with their ATS selection. In addition, the ED publishes an ATS Master Plan which addresses the implementation of the DoD ATS acquisition policy and investment strategy and summarizes DoD ATS R&D plans. With the publication in September 2004 of a new Joint Services ATS Memorandum of Agreement among the Service Acquisition Executives, these documents are in process of revision.

8.13. Support Equipment Integrated Product Support

MIL-HDBK-2097, Acquisition of Support Equipment and Associated Integrated Logistics Support, provides guidance for the identification, selection, production, distribution, and integrated logistic support of support equipment.

Acquisition

Per MIL-HDBK-2097, Acquisition of Support Equipment and Associated Integrated Logistics Support, acquisition logistics efforts should strive to reduce or eliminate the number of tools and support equipment required to maintain the system. If tools and/or support equipment are shown to be absolutely necessary, standardization should be considered. Support equipment is identified and developed concurrent with the equipment development. The objective of this element is to ensure that the necessary support equipment is available at the correct operational site and maintenance echelons for operation and maintenance of materiel equipment throughout their life cycle. Support equipment considerations also include the identification, analysis, and acquisition of logistics support for the support equipment itself.

Support Equipment Recommendation Data (SERD)

Per MIL-HDBK 2097, Acquisition of Support Equipment and Associated Integrated Logistics Support, the SERD is the contractor's recommendation for SE to support the contract end article. SERDS required by this standard are recorded in several parts. These parts provide key narrative and quantitative data used to propose and validate SE needs.

A narrative approach is used with engineering data that support the contractor's description of a function requiring support together with a recommended means to satisfy this need. Quantitative methods are also used to provide availability, logistics support, and acquisition data regarding the item of SE being recommended. The total SERD is intended to support overall systems management action for SE development, acquisition, and optimum standardization within and among systems.

The DI-SESS-80294, Maintenance Test and Support Equipment Requirements List (MT&SE) includes the support equipment, tools and materials, including computer maintenance and support hardware and software required to maintain the system or equipment at the level of maintenance identified in the contract. The list does not include (a) test alignment and calibration equipment built into the system configuration for test and monitoring, (b) equipment required to repair or calibrate items on the MT&SE list, or common hand tools.

Ship/Shore Portable Electrical/Electronic Test Equipment Requirements List (SPETERL)
Per MIL-STD 3034, Reliability-Centered Maintenance (RCM) Process, the SPETERL is the authoritative allowance document that details onboard prime systems for a specific Naval ship or activity. The SPETERL thereby establishes the test equipment configuration to support preventive and corrective maintenance for those subsystems and associated equipment.

A. Support Equipment Major Activities by Acquisition Phase

Activities of the Support Equipment IPS Element
Each activity of the Support Equipment IPS Element, as listed in the PSM Guidebook Appendix A, is under the responsibility of the Program Manager, the Product Support Manager, and the lead stakeholder from other areas as applicable, i.e., configuration management, engineering, environment, manufacturing, etc. Relevant proponent DoD offices are listed in this chapter below in Section C, Proponency.

Input to the LCSP/Product Support Strategy
Detailed guidance on development of the Life Cycle Sustainment Plan (LCSP)/Product Support Strategy states that "The purpose of this annotated outline is to improve sustainment planning for Department of Defense (DoD) weapon systems. This may be achieved when programs make design decisions that achieve operational performance requirements and reduce demand for sustainment."

While information from Support Equipment activities will impact many areas of the LCSP/Product Support Strategy, the below LCSP sections specifically address Support Equipment:
3.1 Sustainment Strategy Considerations
3.2 Sustainment Relationships
3.3 Product Support Arrangements
7.1 O&S Cost
8.1.2 Product Support Team
9.0 Supportability Analysis

As Support Equipment activities continue through the life cycle, their impacts will both directly and indirectly impact the system's KPP, KSA and APA parameters. The PSM and LCL should start these activities early in the system lifecycle for greatest impact.

When Is Support Equipment Delivered and Managed in the Lifecycle?
The activities within the Support Equipment IPS Element are best visualized in the DoD Product Support Implementation Roadmap Tool. This tool allows the User to check the box highlighting information specifically linked to the Support Equipment Integrated Product Support Element.

Once the Support Equipment IPS Element box is checked, the timeline expands to show the detailed activities and respective outputs for each activity by phase, as show in a partial illustration in Figure 8-1 below.

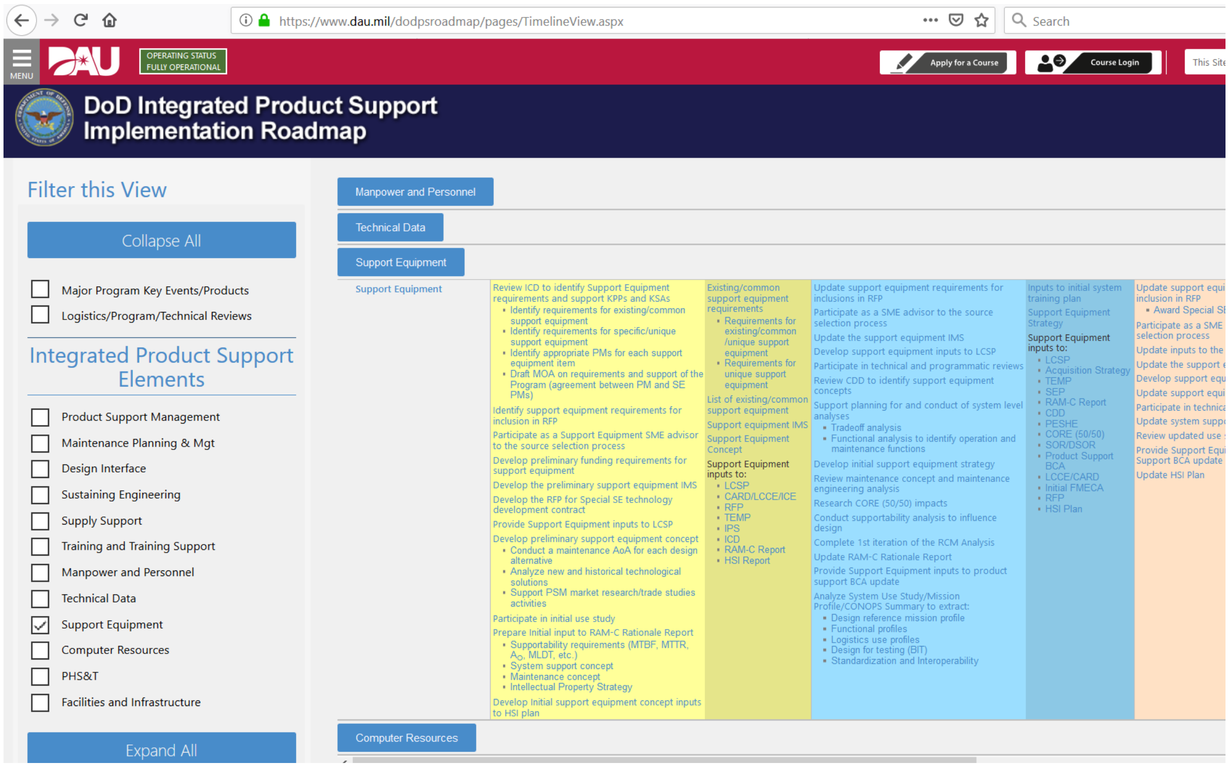


Figure 8-1, Screenshot of the DoD Integrated Product Support Implementation Roadmap Timeline View Homepage with the Support Equipment IPS Element box checked. Notice the Support Equipment activities and respective outputs are visible for each life cycle acquisition phase.

Each activity and output is then hyperlinked to a pop-up window that displays specific data related to that respective activity as shown in the screenshot below in Figure 8-2.   The specific data is in-turn hyperlinked to allow the user to subsequently search for detailed information regarding any specific activity.

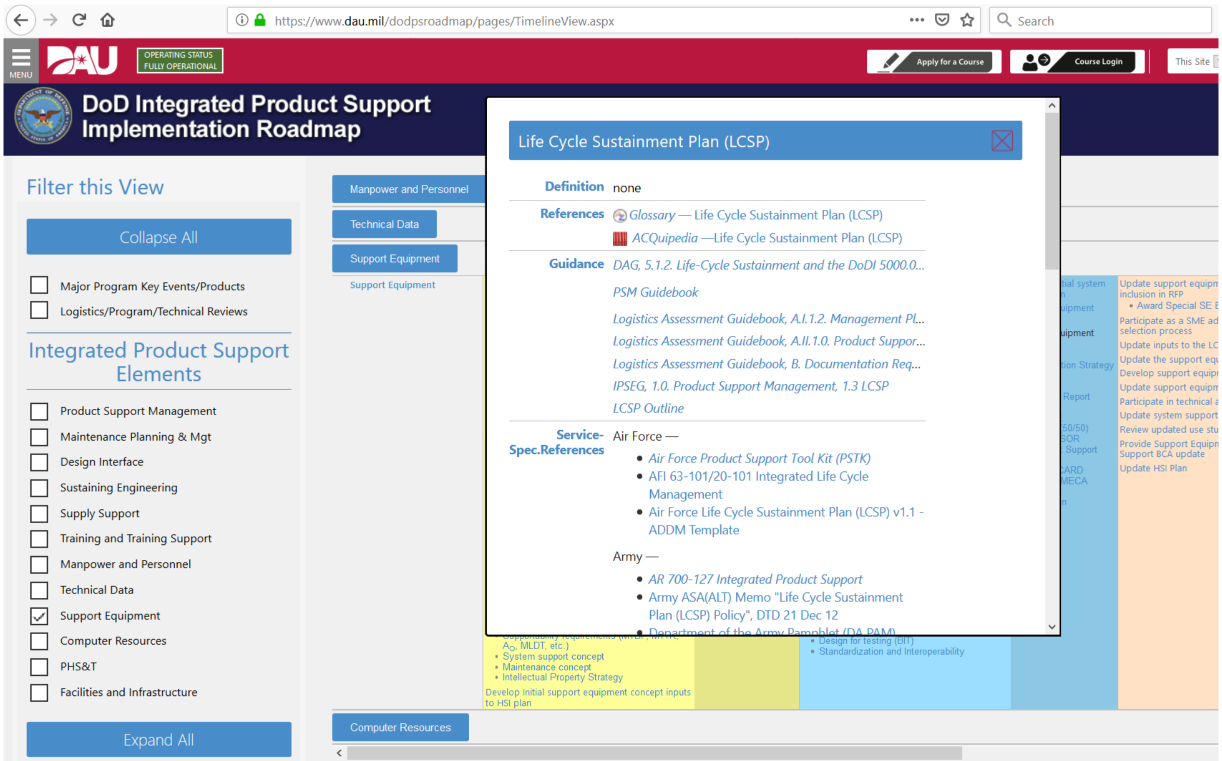


Figure 8-2, Screenshot of the DoD Integrated Product Support Implementation Roadmap Timeline View Homepage with the Support Equipment IPS Element box checked. The User then clicked on the outcome "Life Cycle Sustainment Plan (LCSP)" from the listing of activities and outcomes for Support Equipment. This data card provides further information for the User to search for further detailed information.

B. Data Item Description (DID) Deliverables

A Data Item Description (DID) is a completed document, typically identified in a Contract Data Requirements List (CDRL), that defines the data required of a contractor. The document specifically defines the data content, format, and intended use of the data. DIDs are found on the DLA Assist Database.

Helpful Search Hint: All DID's start with the letters "DI-." Once your search results are shown, click on the column header "Document ID" to sort by alphabetical order. The "DI-" items will be easier to find. The below DIDs are a representative listing and is not inclusive of all Support Equipment related DIDs.

- DI-ALSS-81529, Special Tools and Test Equipment List (STTEL)
- DI-ATTS-80284B, Test Program Set Documentation (TPSD)
- DI-ILSS-80454, Support Equipment Installation Data (SEID)
- DI-SESS-80294B, Maintenance Test and Support Equipment Requirements List
- DI-ATTS-80281A, Test Program Set (TPS) Integration Logbook
- DI-ATTS-80282B, TEST Program Set (TPS) and Operational Test Program Set (OTPS) Acceptance Test Procedures (ATP)

- DI-ATTS-81268, Electronic Test Equipment Capability Requirements Summary

C. Proponency

Please note that DoD organizational changes may result in changes to Office designations and Proponency responsibilities that may not match the content in this Guidebook.

The DoD Services maintain Proponency for most forms of support equipment, for example, many types of maintenance equipment, hand tools.

Automatic Test Systems

Support and test equipment is largely controlled by the policies, regulations and guidance that governs the acquisition of other IPS Elements products, e.g., spares and repair parts. The DoD has created an Executive Directorate (ED) for the Acquisition of Automatic Test Systems. The Automatic Test Systems Executive Directorate is chartered by the Office of the Secretary of Defense (Acquisition and Technology) to implement a coordinated Automatic Test Systems acquisition and research & development program throughout the Department, and to serve as the interface for DoD with other departments and agencies such as NASA and FAA. There is also an ATS ED Document Library.

Calibration

Each of the DoD Services maintain a Test, Measurement, and Diagnostic Equipment (TMDE) or Metrology and Calibration (METCAL) organization to service its equipment.

- U.S. Air Force AFMETCAL
- U.S. Army TMDE
- U.S. Marine Corps TMDE
- U.S. Navy NSWC Corona Division

PSMs should become knowledgeable of how their respective Service manages TMDE programs. Many Service specific tools are available for planning and management functions.

Mobile Electric Power Systems (MEPS)

Effective August 24, 2018, the Office of the Under Secretary of Defense for Acquisition and Sustainment reissued DoD Directive 4120.11, Mobile Electric Power Systems (MEPS), to

- Establish policy, assigns responsibilities, and provides guidance for the development, standardization, acquisition, and management of MEPS for the DoD.
- Establishes the MEPS Program Office to coordinate acquisition of MEPS.
- Updates and incorporates MEPS procedures.
- Recognizes the MEPS Joint Standardization Board (JSB) as a forum to coordinate joint interoperability and standardization.

D. U.S. Government Statute, Regulations, DoD Policy and Guidance

The list of DoD policy and guidance related to support equipment is very extensive. The below list identifies just some of the DoD level key documents. Readers should consult with their respective organizations for specific support equipment related policy and guidance.

Please note that due to the high rate of change occurring in policy and guidance, the letter designations found as part of a reference will be removed in this guide. Readers are encouraged to check the DoD reference source on a frequent basis to ensure they are using the current reference version.

Selected policy and guidance related to support equipment include, but are not limited to:

- DoD Directive 4120.11, Mobile Electric Power Systems (MEPS)
- DoDM 4140.01, DoD Supply Chain Materiel Management Procedures (11 volumes),
- Defense Acquisition Guidebook (DAG)
- DoDI 4165.14, Real Property Inventory (RPI) and Forecasting
- DoDI 4540.07, Operation of the DoD Engineering for Transportability and Deployability Program
- DoDI 5000.64, Accountability and Management of DoD Equipment and Other Accountable Property
- Automatic Test Systems Joint Memorandum of Agreement Among Service Acquisition Executives, subject: Automatic Test Systems Acquisition Procedures, 2004
- MIL-HDBK-2097, Acquisition of Support Equipment and Associated Integrated Logistics Support
- MIL-PRF-28800, Test Equipment for Use with Electrical and Electronic Equipment, General Specification For
- MIL-S-8512, Support Equipment, Aeronautical, Special General Specification for the Design Of
- MIL-STD-1309, Definitions of Terms for Testing, Measurement and Diagnostics
- MIL-STD-1472, Human Engineering
- MIL-STD-1839, Standard Practice Calibration and Measurement Requirements
- Product Support Implementation Roadmap
- Product Support Strategy Development Tool (formerly PSM Toolkit)
- Product Support Manager (PSM) Guidebook
- Performance Based Logistics (PBL) Guidebook
- Business Case Analysis (BCA) Guidebook
- Logistics Assessment (LA) Guidebook (ILA)
- Public-Private Partnership Guidebook

E. Communities of Practice and Interest

Support equipment covers such a vast scope of equipment that there is no one community of practice. Typically, support equipment communities focus on the support equipment of a type of system, for example, ships and aircraft, or of a type of DoD mission.

The Preface of this IPS Elements Guidebook provides a listing of "golden references," many of which provide libraries, research portals and other resources for finding additional information on specific topics of support equipment. Readers should check with their respective organizations for the communities of practice that focus on the type of support equipment most relevant to their interests.

F. Training Resources

DAU Courseware

A complete list of DAU training resources can be found on the DAU iCatalog. Courses are classified as Training Courses (e.g., Regular (certification and assignment specific), Continuous Learning, and Targeted Training (i.e., alternate means to meet training requirements). For the Product Support Manager, training resources are extensively listed on the DAU Community Hub under the Life Cycle Logistics Gateway. The topic of Support Equipment is found in many DAU courses which include, but are not limited to, the following:

- LOG 101 Acquisition Logistics Fundamentals
- LOG 102 Fundamentals of System Sustainment Management
- LOG 103 Reliability, Availability and Maintainability
- LOG 200 Product Support Strategy Development, Part A
- LOG 201 Product Support Strategy Development, Part B
- LOG 206 Intermediate Systems Sustainment Management
- LOG 211 Supportability Analysis
- LOG 235 Performance-Based Logistics
- LOG 340 Life Cycle Product Support
- LOG 350 Enterprise Life Cycle Logistics Management
- CLL 020 Independent Logistics Assessment
- CLL 030 Reliability Centered Maintenance

DAU ACQuipedia Articles

ACQuipedia articles focus on specific topics, are updated on a regular basis, and provide updated links to DoD policy and guidance, examples, tools, training resources, communities, and related articles. They are found on the DAU Online Resources Homepage.

ACQuipedia serves as an online encyclopedia of common defense acquisition topics. Each topic is identified as an article. Each article contains a definition, a brief narrative that provides context, and includes links to the most pertinent policy, guidance, tools, practices, and training which further augment understanding and expand depth.

ACQuipedia was developed as a collaborative project to create content around Defense Acquisition-related topics. Articles (topics) will be maintained as a collaborative effort of subject matter experts across the Defense Acquisition University (DAU). Future growth may expand the collaboration of subject matter experts beyond DAU.

ACQuipedia provides the acquisition workforce with quick access to information in a succinct and digestible format. Article content aggregates the most relevant references and learning assets to narrowly focus users and quickly provide high value information.

ACQuipedia articles relevant to support equipment include:

- Acquisition Plan
- Automatic Test System (ATS) & Automatic Test Equipment (ATE)
- Classification of Government Property
- Depot Level Maintenance
- Government Property
- Human Systems Integration
- Independent Logistics Assessment (ILA)
- Integrated Product Support (IPS) Elements
- Integrated Product Support (IPS) Element – Support Equipment
- Level of Repair Analysis (LORA)
- Life Cycle Management (LCM)
- Life Cycle Sustainment Plan (LCSP)
- Life Cycle Cost (LCC)
- Logistics Demonstrations (LOG Demo)
- Maintenance Levels
- Maintenance Task Analysis (MTA)
- Mean Time Between Failure (MTBF)
- Product Support Package
- Supportability Design Objectives
- Support Equipment Recommendation Data (SERD)

Training & Training Support

Objective

Plan, resource, and implement a cohesive integrated strategy early in the development process to train military and civilian personnel to maximize the effectiveness of the doctrine, manpower and personnel, to fight, operate, and maintain the equipment throughout the lifecycle. As part of the strategy, plan, resource, and implement management actions to identify, develop, and acquire Training Aids, Devices, Simulators, and Simulations (TADSS) to maximize the effectiveness of the manpower and personnel to fight, operate, and sustain equipment at the lowest TOC.

Description

Training and training support consist of the policy, processes, procedures, techniques, Training Aids, Devices, Simulators, and Simulations (TADSS), planning and provisioning for the training base including equipment used to train civilian and military personnel to acquire, operate, maintain, and support a system.

This includes New Equipment Training (NET), institutional, sustainment training and Displaced Equipment Training (DET) for the individual, crew, unit, collective, and maintenance through initial, formal, informal, On-the-Job Training (OJT), and sustainment proficiency training. Significant efforts are focused on NET which in conjunction with the overall training strategy is validated during system evaluation and test at the individual-, crew-, and unit-levels.

Overview

Training is the learning process by which personnel individually or collectively acquire or enhance pre-determined job-relevant knowledge, skills, and abilities by developing their cognitive, physical, sensory, and team dynamic abilities.

The "training/instructional system" integrates training concepts and strategies and elements of logistic support to satisfy personnel performance levels required to operate, maintain, and support the systems. It includes the tools used to provide learning experiences such as computer-based interactive courseware, simulators, and actual equipment (including embedded training capabilities on actual equipment), job performance aids, and Interactive Electronic Technical Manuals (IETM).

It is critical that to ensure alignment between system design and training program, any and all changes must be evaluated as to the impact on the training program. The training products themselves may require separate configuration management and supportability.

Why Training and Training Support is Important

Training gives users, operators, maintainers, leaders, and support personnel the opportunity to acquire, gain, or enhance knowledge and skills, and concurrently develop their cognitive, physical, sensory, team dynamics, and adaptive abilities to conduct joint operations and achieve maximized and fiscally sustainable system life cycles. The training of people as a component of material solutions delivers the intended capability to improve or fill capability gaps.

Cost-and mission-effective training facilitates DoD acquisition policy that requires optimized total system performance and minimizes the cost of ownership through a "total system approach" to acquisition management. The systems engineering concept of a purposely designed ‘total system’ includes not only the mission system equipment, but, more critically, the people who operate, maintain, lead, and support these acquired systems -- including the training, training systems, and the operational and support infrastructure.

The goal of training for new systems is to develop and sustain a ready, well-trained individual/unit, while considering options that can reduce life-cycle costs and provide positive contributions to the joint context of a system and provide positive readiness outcomes.

The Product Support Manager needs to understand the requirements for training related to the civilian and military workforce for weapon systems acquisition and the training required for civilians and military to lead, operate and sustainment the weapon system being fielded.

Training performed by the DoD can be viewed as focused according to specific outcomes:

- Institutional training for the military and civilian workforce;
- Weapon system acquisition-related training is developed and implemented to specifically support the fielding of new systems or major modifications of systems;
- Operational and field training primarily as part of individual, unit and organizational training typically conducted at home station, during major training events and while operationally deployed;
- Self-development training where individuals seek additional knowledge growth that complements what has been learned in the classroom and on the job.

DoD Policy for Military Training

Per DoDD 1322.18, Military Training, it is DoD policy that:
a. Individual, staff, and collective military training programs funded by the Department of Defense shall be available to Active and Reserve Component personnel, civilian employees and, when authorized, to contractors, allies, and other U.S. Government or non-Government agency personnel.
b. Military training to generate and sustain capabilities required by the Combatant Commanders (CCDR) and Chairman of the Joint Chief of Staff Concept (Reference (b)) shall encompass all phases of joint campaigns and the full range of integrated operations.
c. Members of the Department of Defense shall receive, to the maximum extent possible, timely and effective individual, collective, and staff training, conducted in a safe manner, to enable performance to standard during operations.

d. The Department of Defense shall maintain a comprehensive and effective Service, Defense Agency, and joint training management capability to develop, execute, and assess military training throughout the Department.
e. Training capabilities shall be based on a DoD training architecture and an open, net-centric, interoperable standard.
f. ET and development of netcentric training capabilities shall be considered as the first alternative for cost-effective delivery of instruction.
g. The Strategic Plan for Transforming DoD Training and the DoD Training Transformation (T2) Implementation Plan (References (c) and (d)) apply to all DoD Components.
h. The training and test and evaluation communities shall share infrastructure, resources, ranges, maneuver areas, and other facilities and devices, to the maximum extent possible, using a scheduling and priority rule set that balances the requirements of both communities.
i. Individual, collective, and staff pre-deployment training shall be certified to standards by either the mission commander or the commander responsible for the pre-deployment training.
j. The development of training for tasks driven by ILO, cross-Service, or multi-Service common training requirements shall be tasked to a lead DoD Component.
k. Integrated operations training shall be conducted as required by Mission Essential Tasks (MET). These training requirements shall be coordinated through the DoD Training Coordinator.
l. All proposals to construct new or modify existing DoD urban training facilities shall be evaluated in accordance with DoD Instruction 1322.27, DoD Urban Training Facilities.
m. Live training resources shall be sustained through good stewardship, public outreach, comprehensive planning, and the leveraging of advanced technologies.
n. Training realism shall be maximized through use of the live training domain supplemented by integrated virtual and constructive capabilities.
o. Cultural awareness and language training should be embedded in accession training, professional military education, and pre-deployment training and integrated across the Total Force.

Product Support Manager Activities

9.1. Initial, formal, informal, and On the Job Training (OJT) individual, crew, and unit New Equipment Training (NET)

Each of the DoD Components organizes, develops, and executes training as determined to be most effective. Below are some generic types of training.

Formal vs. Informal

Formal training is a generic term that recognizes structured training with a goal of achieving a certification or recognizable skill. Per MIL-HDBK 29612-4, Glossary for Training, formal training (including special training) occurs in an officially designated course conducted or administered in accordance with appropriate course outline and training objectives.

The term informal training or informal learning is widely used to describe the many forms of learning that takes place independently from instructor-led programs: books, self-study programs, performance support materials and systems, coaching, communities of practice, and expert directories. Per MIL-HDBK 29612-4, Glossary for Training, informal training is accomplished by actions for which structuring is not specifically planned beforehand.

Individual vs. Team

Collective, or team, training involves more than one person and supports the unit mission. It includes training at home station, training at designated training centers or sites, training while deployed, and unified action training exercises. Collective training must develop or sustain the unit's capability to deploy rapidly and accomplish any mission across the spectrum of conflict. Per MIL-HDBK 29612-4A, Glossary for Training, individual training prepares the individual to perform specified duties or tasks related to assigned duty position or subsequent duty positions and skill level. Individual training is typically oriented towards the training of individuals (either as a group or alone) through a formal instructor led training program where the individual, not the team, is tested and assessed. Many programs in formal learning institutions develop programs where both individual and team training occur in order to maximize the learning experience.

Common Military Training (CMT)

Per DoDI 1322.31, Common Military Training (CMT), is non-occupational directed training that sustains readiness, provides common knowledge, enhances awareness, reinforces expected behavioral standards or obligations, and establishes a functional baseline that improves the effectiveness of DoD and its constituent organizations. CMT is provided, upon entry into military service, or after initial entry training, and in response to events throughout Service members' careers to introduce and strengthen core values, institutional knowledge, and behavior standards needed to perform assigned duties and responsibilities.

New Equipment Training (NET)

Per MIL-HDBK 29612-4, Glossary for Training, new equipment training transfers knowledge gained during materiel development to trainers, users, and support personnel during development and fielding of new equipment. NET provides for the initial training from the program office or contractor to the tester and user. It represents the knowledge that is needed for operation, maintenance, and logistic support during testing and initial introduction of new materiel into the DoD inventory.

New equipment training assists commanders in achieving operational capability in the shortest time practical by training soldiers/crews and maintainers how to operate and maintain the new/improved equipment. It also provides unit leaders with training support components needed to sustain the proficiency of operators and maintainers of the new/improved equipment. Begin planning for NET at the onset of program initiation. NET is based on a system training plan.

Joint Training

Per CJCSI 3500.01H, Joint Training Policy for the Armed Forces of the United States, 25 April 2014, U.S. Forces may be employed across the range of military operations, predominantly in an interagency and multinational partner environment. The Department of Defense must support national security requirements with joint military capabilities designed to adapt and succeed in any operational environment. The Department of Defense and its mission partners must prepare to operate in a joint, interagency, intergovernmental, and multinational environment. The joint training challenge is to be responsive to all emerging and extant mission requirements of the Combatant Commanders.

Joint training uses joint doctrine, tactics, techniques, and procedures, and the training involves more than one Service component. However, two or more Services training together using their respective service doctrine, tactics, techniques, and procedures are Service-sponsored interoperability training. Although, not classified as joint training, Service sponsored interoperability is a vital component of joint proficiency and readiness.

Multinational Training
Per Joint Publication 3-16, Multinational Operations, training of forces within the Multinational Task Force (MNTF) command for specific mission standards enhances unified action. The multinational force commander should establish common training modules or certification training for assigned forces. Such training and certification of forces should occur prior to entering the MNTF operational area. Certification of forces should be accomplished by a team composed of subject matter experts from all nations providing military forces to the MNFC. Multinational training is based on applicable multinational, joint and/or service doctrine and is designed to prepare organizations for combined operations with allied nations.

9.2. Initial, formal, informal, and OJT individual, crew, and unit Institutional training

Institutional Training
Per MIL-HDBK 29612-4, Glossary for Training, individual training conducted in a school or training center of a centralized training organization. Institutional Training primarily includes initial training and subsequent professional military education for military service members and DoD civilians. It is conducted at schools and centers on various military installations across the United States and through a number of distant learning/digital venues. Institutional training is generally a type of formal training since there is recognition for a set of skills and/or knowledge.

Factory Training/Training with Industry
Per DoDI 1322.06, Fellowships, Legislative Fellowships, Internships, Scholarships, Training-With-Industry (TWI), and Grants Provided to DoD or DoD Personnel for Education and Training, factory training or TWI is a non-degree producing program designed to provide training and/or skills in best business procedures and practices not available through existing military or advanced civilian schooling programs for identifiable DoD requirements. The Department of Defense continues to pay normal pay and allowances to the individual while assigned outside the Department. In return for selection to this program, the individual is required to serve with the Department of Defense for the period specified in this Instruction and the agreement with the Secretary concerned under References (e) or (f), as applicable.

DoD Components may establish TWI programs for military and civilian personnel to provide training and/or development of skills in private sector procedures and practices not available through existing military or advanced civilian education programs or other established training and education programs.

9.3. Initial, Formal, Informal, and OJT Individual, Crew, and Unit Sustainment Training

Refresher Training
Per MIL-HDBK 29612-4, Glossary for Training, refresher training is used to reinforce previous training and/or sustain/regain previously acquired skills and knowledge.

On-the-Job Training
Per MIL-HDBK 29612-4, Glossary for Training, training in designated job skills provided at the job sites. Also see the definitions for "Formal On-the-Job Training (FOJT), "On-Board Training (OBT)," and "Supervised On-the-Job Training (OJT)." On-the-job training takes place in a normal working situation, using the actual tools, equipment, documents, or materials that trainees will use when fully trained.

Unit Sustainment Training
Unit sustainment training includes individual and collective training conducted by and within a unit, or organization, upon completion of new equipment training or displaced equipment training to ensure continued expertise on the operation, maintenance, and employment of fielded equipment under the control of the unit commander. Sustainment training includes a wide variety of training to include equipment proficiency, marksmanship, physical fitness, cybersecurity, safety, and many other topics.

9.4. Initial, formal, informal, and OJT individual, crew, and unit Displaced Equipment Training (DET)

Displaced Equipment Training
Training provided by the Program Manager on the operation and maintenance of previously fielded equipment that is scheduled for redistribution as a result of modernization processes. Per U.S. Army TRADOC Pamphlet 350-70-13, System Training Integration, displaced equipment and its software, while not new to the Army, are new to the receiving unit. DET provides training to the receiving unit personnel on how to operate, maintain, and employ the displaced or cascaded equipment.

9.5. Embedded training insertion and management
Per DoDD 1322.18, Military Training, embedded training accomplished through the use of the trainee's operational system within a live virtual constructive (LVC) training environment. Program managers should ensure training system acquisitions and embedded training capabilities comply with the open, net-centric, interoperable standard.

Per the Defense Acquisition Guidebook (DAG), CH 5-4.2.3.3.1, both the sponsor and the PM provide analysis that demonstrates careful consideration to the use of embedded training as defined in DoDD 1322.18 (para 3.b.) “Military Training”: The sponsor's decisions to use embedded training should be determined very early in the capabilities-assessment process. Analysis will be conducted to compare the embedded training with more-traditional training media (e.g., simulator-based training, traditional classroom instruction and/or maneuver training) for consideration of a system's Total Operating Cost. The analysis will compare the costs and the impact of embedded training (e.g., training operators and maintenance personnel on site, compared with off station travel to a temporary duty location for training).

9.6. Computer Based Training (CBT)

CBT uses computers as a primary means to impart training, monitor trainee progress, provide feedback, and assess training results. CBT is also known as Computer Aided Instruction (CAI) and is employed to implement distance learning.

9.7. Distance Learning

Distance learning, or distance education, employs training methods and technology which deliver teaching, often on an individual basis, to students who are not physically present in a traditional educational setting such as a classroom. Distance learning, when used in conjunction with an on-site workshop or other on-site activity is called “blended learning.” Per DoDI 1322.08, Voluntary Education Programs for Military Personnel, distance education is the delivery of education or training through electronically mediated instruction, including satellite, video, audiographic, computer, multimedia technology, and other forms of learning at a distance, such as correspondence and independent study.

Across the DoD, curriculums with distance learning are growing. A few examples include:

- Defense Acquisition University
- Air University
- Navy Postgraduate School
- The Army Training Information System
- The United States Army War College

Classroom Instruction

Classroom instruction is a form of training usually associated with traditional methods with includes one or more instructors conducting the training with students present in a designated room or facility for the period of time required to complete the training. Classroom training is also called resident training.

Distributed Learning

Per DoDI 1322.26, Distributed Learning (DL), distributed learning is learning content and systems, mediated with technology, that are accessed through a network or experienced via portable media. DoD personnel will have access to state-of-the-art, affordable, effective, and convenient education and training opportunities, in accordance with Chapter 41 of Title 5, U.S.C., various sections in Title 10, U.S.C. related to education and training, Executive Order 13111, DoDD 1322.18, Military Training, DoDD 5400.11, DoD Privacy Program, and DoDI 1322.31, Common Military Training (CMT).

Distributed learning is technology based and can be either synchronous (occurs at a specific time) or asynchronous (occurs at various times). The foundation of distributed learning is the matching of instructional strategies, delivery systems and materials to learner characteristics and course content. The Advanced Distributed Learning (ADL) Initiative is a program established consistent with Executive Order 13111 to facilitate a collaborative federal framework for using DL sponsored by the DoD. The ADL Initiative provides access to the highest-quality education, training, and performance-aiding that is tailored to individual needs and delivered cost-effectively, anytime, and anywhere.

9.8. Training Equipment

Training equipment is a broad term that includes hardware and software products used to assist in the development and implementation of training. Per MIL-HDBK 29612-4, Glossary for Training, the term "Training Aids, Devices, Simulators, and Simulations (TADSS)" is a general term that includes Combat Training Center (CTC) and training range instrumentation; Tactical Engagement System (TES); battle simulations; targetry; training-unique ammunition; and dummy, drill, inert munitions, casualty assessment systems, graphic training aids, and other training support devices.

Knowledge Management

DoDI 8100.02, Use of Commercial Wireless Devices, Services, and Technologies in the Department of Defense (DoD) Global Information Grid (GIG), directs the development and use of a Knowledge Management (KM) process to promote the sharing of wireless technology capabilities, vulnerabilities, and vulnerability mitigation strategies throughout the Department of Defense. Knowledge Management is broadly defined as the collection of processes that govern the creation, dissemination, and utilization of knowledge. Readers are encouraged to visit DAU's Homepage where there is a DoD community training center, online resources, quick links, and additional knowledge resources. Most OSD and DoD Component websites are excellent sources for knowledge management resources regarding the respective organizations.

Training Aids

Per MIL-HDBK 29612-4, Glossary for Training, training aids include items developed, procured, or fabricated for the purpose of assisting in the conduct of training and the process of learning, such as models, mockups, Interactive Multimedia Instruction (IMI), audiovisual aids, displays, slides, books, pictures, and magnetic/optical recordings. The other volumes of MIL-HDBK-29612 provide additional information on the acquisition and management of training aids.

Modeling and Simulation

Per the Defense Modeling & Simulation Coordination Office (M&SCO), the use of simulations and simulators to provide training procedures improves individual and collective capabilities. Military forces train with a wide range of simulated weapons, ships, aircraft, and other vehicles in conjunction with live training on actual equipment. Within the military--and in other professions--, Modeling and Simulation (M&S) helps provide a safer and lower resource-intensive rehearsal capability for a wide variety of training. Training is one of the most employed of the M&S applications, but there are many other ways that M&S enables Department's functions. M&S is used to analyze and inform the Department decisions in acquiring new capabilities, adopting new tactics, processing intelligence, and testing systems before they are put into the hands of our fighting forces.

9.9. Train the Trainer

An important component of preparing for and executing new equipment training is the Train-the-Trainer program established by the Program. Ensuring that those individuals who will conduct the training are not only subject matter experts but also knowledgeable in actual teaching/training practices is important. Trainers must be knowledgeable in all forms of training delivery to include classroom instruction, field training, and computer-assisted simulation including embedded training and distributed learning. Readers should check with their respective organizations for policy and guidance for "train the trainer" requirements.

9.10. Simulator Sustainment - Support of Training Systems

Most DoD training systems are acquired as support equipment with the primary DoD system and require a life cycle support system just as the primary weapon system does. Each DoD Component determines, funds, and executes the training system's life cycle support to align to its respective organizational operations and requirements.

A. Training & Training Support Major Activities by Acquisition Phase

Activities of the Training & Training Support IPS Element

Each activity of the Training & Training Support IPS Element, as listed in the PSM Guidebook Appendix A, is under the responsibility of the Program Manager, the Product Support Manager, and the lead stakeholder from other areas as applicable, i.e., configuration management, engineering, environment, manufacturing, etc. Relevant proponent DoD offices are listed in this chapter below in Section C, Proponency.

Input to the LCSP/Product Support Strategy

Detailed guidance on development of the Life Cycle Sustainment Plan (LCSP)/Product Support Strategy states that "The purpose of this annotated outline is to improve sustainment planning for Department of Defense (DoD) weapon systems. This may be achieved when programs make design decisions that achieve operational performance requirements and reduce demand for sustainment."

While information from Training & Training Support activities will impact many areas of the LCSP/Product Support Strategy, the below LCSP sections specifically address Training & Training Support:

3.1 Sustainment Strategy Considerations
3.2 Sustainment Relationships
3.3 Product Support Arrangements
7.1 O&S Cost
8.1.2 Product Support Team
9.0 Supportability Analysis

As Training & Training Support activities continue through the life cycle, their impacts will both directly and indirectly impact the system's KPP, KSA and APA parameters. The PSM and LCL should start these activities early in the system lifecycle for greatest impact.

When Is Training & Training Support Delivered and Managed in the Lifecycle?
The activities within the Training & Training Support IPS Element are best visualized in the [DoD Product Support Implementation Roadmap Tool](). This tool allows the User to check the box highlighting information specifically linked to the Training & Training Support Integrated Product Support Element.

Once the Training & Training Support IPS Element box is checked, the timeline expands to show the detailed activities and respective outputs for each activity by phase, as show in a partial illustration in Figure 9-1 below.

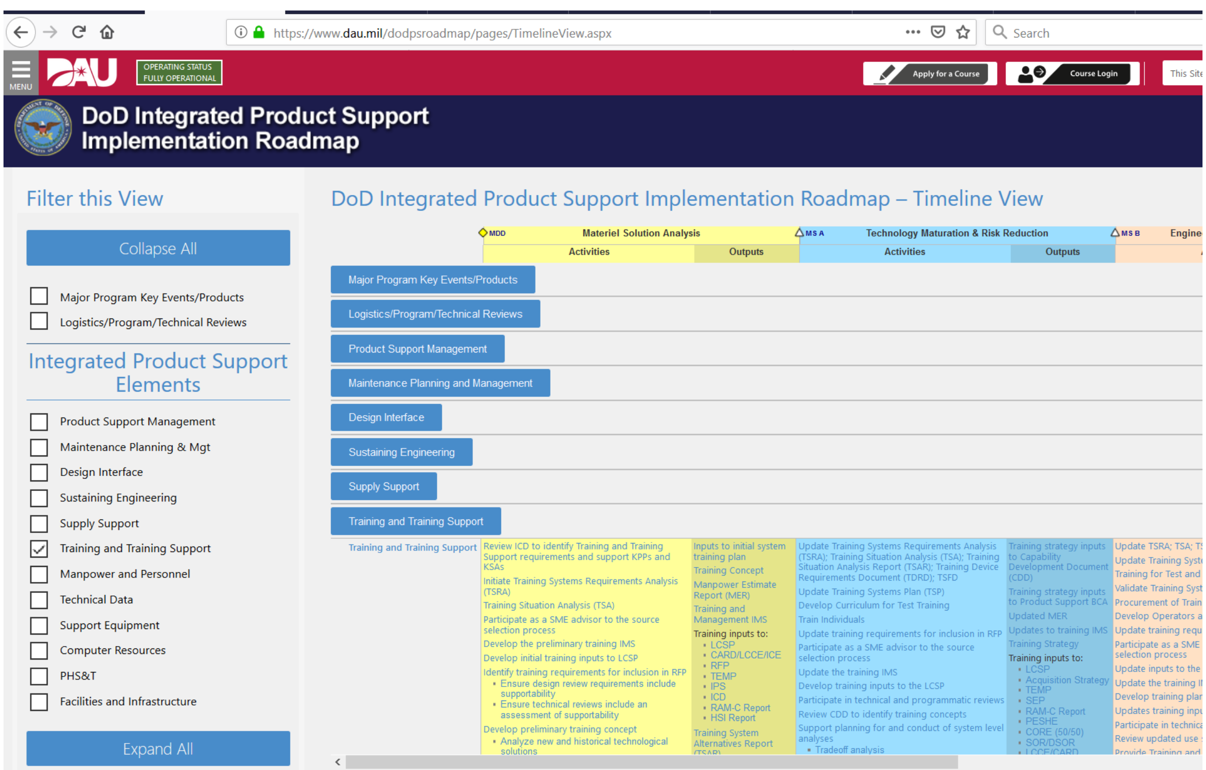


Figure 9-1, Screenshot of the DoD Integrated Product Support Implementation Roadmap Timeline View Homepage with the Training & Training Support IPS Element box checked.

Notice the Training & Training Support activities and respective outputs are visible for each life cycle acquisition phase.

Each activity and output is then hyperlinked to a pop-up window that displays specific data related to that respective activity as shown in the screenshot below in Figure 9-2. The specific data is, in turn, hyperlinked to allow the user to subsequently search for detailed information regarding any specific activity.

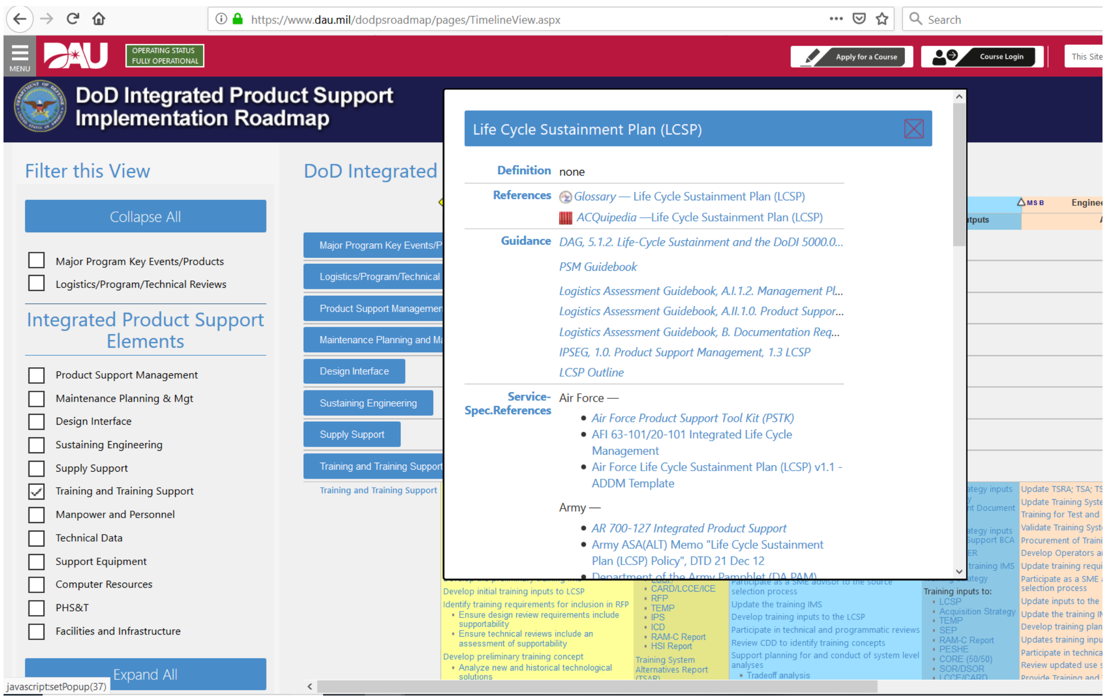


Figure 9-2, Screenshot of the DoD Integrated Product Support Implementation Roadmap Timeline View Homepage with the Training & Training Support IPS Element box checked. The User then clicked on the outcome "Life Cycle Sustainment Plan (LCSP)" from the listing of activities and outcomes for Training & Training Support. This data card provides further information for the User to search for further detailed information.

Training Planning

Per the Defense Acquisition Guidebook (DAG), Chapter 5, training planning helps the PM understand acquisition program (new or upgraded) systems training as a key performance parameter to successfully integrate DoD Decision Support Systems, e.g., the Acquisition System (DoD 5000 Series), the Joint Capabilities Integration and Development System (JCIDS) and the Planning, Programming, Budgeting & Execution (PPBE) Process, and to effectively translate joint capabilities into training system design features. Initially, the JCIDS process should address joint training requirements for military (Active, Reserve and Guard) and civilian support personnel who will operate, maintain, lead, and support the acquired system.

Training programs should employ integrated cost-effective solutions and may consist of a blend of capabilities that use existing training program insights and introduce new performance-based training innovations. These may include requirements for school and unit training, as well as new equipment training or sustainment training. They also may include requirements for instructor and key personnel training and new equipment training teams. Training planning should be initiated early by the PM, in coordination with the training community within the capabilities-development process beginning with the Capabilities-Based Assessment and Analysis of Alternatives. These support the development of the Initial Capabilities Document, inform the Materiel Development Decision to support the Material Solutions Analysis phase, and continue the development of the Capability Development Document. Training should also be considered in collaboration with the other HSI domains in order to capture the full range of human integration issues to be considered within the Systems Engineering process.

Training Needs and Requirements Analyses

Per MIL-HDBK 29612/1, Guidance for Acquisition of Training Data Products and Services, to begin the training acquisition or development process there must be a training need. This training need is defined by conducting a training needs analysis. A training needs analysis is conducted to verify that training is able to provide a partial solution to a performance deficiency or requirement. The requirements are defined by conducting a training requirements analysis. MIL-HDBK 29612/2, Instructional Systems Development/Systems Approach to Training and Education, provides detailed guidance on conducting training analyses.

Development of Training Requirements

Per the Defense Acquisition Guidebook (DAG), Chapter 5, when developing the training system, the PM shall employ transformational training concepts, strategies, and tools such as computer-based and interactive courseware, simulators, and embedded training consistent with the program's acquisition strategy, goals, and objectives and reflect the tenants outlined in the next generation training strategy. In addition, the program should address the requirement for a system's training key performance parameter, as described in the JCIDS Manual, Manual for the Operation of the Joint Capabilities Integration and Development System (Encl. D-G-1).

The USD (P&R), with the manpower, personnel, and training communities, assesses the ability of the acquisition process to support the Military Departments, COCOMs and other DoD Components acquisition programs from a manpower, personnel, and training readiness perspective. The acquisition program characterizes training planning, development, and execution within the (CARD). Life-Cycle Support Plans and Reports are tailored to each document type. These training summaries capture the support traceability of planned training across acquisition and capability documents, and includes logistics support planning for training, training equipment, and training device acquisitions and installations.

Front-end analysis (FEA)

Front-end analysis, also referred to as Training Systems Requirements Analysis (TRSA), is the structured process used to examine training requirements and identify alternative approaches to training job tasks. Per AFI 36-2251, Management of Air Force Training Systems, for new and emerging weapon systems, a Training System Requirements Analysis shall be conducted to fully define the training system requirements and to identify any risks to develop and implement the training system. For existing weapon systems, TSRAs will be conducted when major modifications to existing training capability are anticipated or when the training system program manager, or training planning team, determines the need for a TSRA.

Using the process, the training analyst identifies job tasks to be performed, analyzes the skills and knowledge needed to perform them, assesses the technologies available for training the skills and knowledge, performs a media analysis to recommend the best mix of delivery media and provides cost and lead-time comparisons for the feasible alternatives. The purpose of the analysis is to provide the customer with enough information to meet training needs within budgetary and other constraints.

Competencies
A competency is that set of skills, knowledge and experience which allows an individual or group to be successful at their job or mission. Competency is sometimes thought of as being shown in action in a situation and context that might be different each time a person has to act. To be competent a person would need to be able to interpret the situation in the context and to have a repertoire of possible actions to take and have trained in the possible actions in the repertoire, as relevant. Regardless of training, competency in a specific skill set or knowledge area would grow through experience and the extent of an individual to learn and adapt. Each of the DoD Component training organizations is responsible for the development and validation of those competencies identified for each job position. Readers should contact the Defense Acquisition University (DAU) for more information on the respective career field competencies.

Learning Objectives
Per MIL-PRF 29612, Training Data Products, a learning objective is a statement of the behavior or performance expected of a trainee as a result of a learning experience, expressed in terms of the behavior, the conditions under which it is to be exhibited, and the standards to which it will be performed or demonstrated. Readers can find the learning objectives of each DAU course on the DAU iCatalog by selecting the link to the desired course and downloading the “Objectives” from the course information sheet.

Terminal Learning Objectives (TLO)
Terminal learning objectives describe the learner’s expected level of performance by the end of the course/training and describe results and not processes. Terminal learning objectives will assist in focusing efforts and to develop the subordinate enabling learning objectives.

Enabling Learning Objectives (ELO)
Enabling Objectives (there are usually 2 to 5 ELOs per TLO) define the skills, knowledge, or behaviors students must reach in order to successfully complete terminal objectives.

Enabling objectives help us track student competency with three components:

- Performance (or task): states what the student will be doing and how to demonstrate the knowledge, skill, or behavior. Performance is described through action verbs.

- Condition: defines the circumstances under which learners perform the desired tasks.
- Standards: define what level the student must perform the task at. This might involve physical measurement and time metrics.

Student Assessment (Testing)
The primary purpose of testing is to assess the student's attainment of the behavior specified in the LO. MIL-HDBK 29612-2, Instructional Systems Development/Systems Approach to Training and Education, provides information on testing and guidance on how to establish appropriate student assessment.

Instructor Certifications
An instructor certification is a confirmation of an instructor's ability to teach. Certification is a credential normally issued by non-governmental agencies, associations, schools, or industry-supported companies to individuals who meet specific education, experience, and qualification requirements. These requirements are generally established by professional associations, industry, or product-related organizations. Certification is typically an optional credential, although some state licensure boards, and some employers may require specific certifications. Each of the DoD learning organizations maintain instructor certification programs.

Courses and Lessons
Per MIL-PRF 29612, Training Data Products, a course is a complete integrated series of lessons which are identified by a common title and/or number. A lesson is a segment of instruction that contains one or more learning objectives, information to be imparted to the student, and may contain an evaluation instrument. The lesson is designed in detail and is the basic building block of all training.

Courseware Development Tools
Courseware development, or authoring tools, provide a means of developing course content and maintaining that content. These tools are able to integrate courses developed with different authoring tools through a conversion process by templates with emphasis on the capabilities of customizing, defining, and storing additional templates. Per MIL-HDBK-29612-5, Advanced Distributed Learning (ADL) Products and Systems, the following items should be considered when selecting a courseware development/authoring tool (see Table 28, Sample courseware development/authoring tool evaluation checklist):

- Intended product. What is to be produced with the tool?
- Ease of use. Whenever possible test the software. There are products that can be obtained for free trial use or a tour of the software's capabilities can be accessed on the Internet.
- Presentation tools. When creating a course to be put on the Web, a presentation tool can
- be used. This may provide limited choices as to what can be included in the course. A fully functional courseware development/authoring tool will offer more design options.

Individual Training Plan (ITP) or Individual Development Plan
Per DoDI 1400.25, Volume 410, DoD Civilian Personnel Management System: Training, Education, and Professional Development, it is DoD policy to: a. Invest in civilian human capital as a strategic corporate asset by deliberate planning, programming, budgeting, operation, evaluation, and improvement of Training, Education and Professional Development (TE&PD) activities and programs for civilian employees that will enhance individual and organizational performance, assist in achieving performance objectives and the DoD mission, and maximize the return on investment to the Department of Defense. b. Identify and implement effective strategies for developing civilian employees, including specific objectives, and intended outcomes of TE&PD activities and programs to enhance the mission performance of individual functional communities and DoD Components.

Each DoD Component also establishes regulations governing individual training plan development. For example, per the U.S. Army TRADOC Pamphlet 350-70-9, Training and Education Budgeting and Resourcing, the ITP is the proponent's long-range planning document. It is the plan for implementing the cradle-to-grave, individual, long-range training strategy that lays out how the center or school will develop agile, competent, self-disciplined, confident leaders and master performers. This plan helps ensure the proponent provides the required cradle-to-grave training and education to the students.

Course Administrative Data (CAD)
Each DoD Component also establishes regulations governing course administrative data development. For example, per the U.S. Army TRADOC Pamphlet 350-70-9, Training and Education Budgeting and Resourcing, the CAD is a requirements document that provides critical planning information about a course. The CAD information estimates the required resources to implement a course and provides personnel resource requirements as input to the Program Objective Memorandum (POM).

Program of Instruction (POI)
Per MIL-HDBK-29612-4, Glossary for Training , a Program of Instruction (POI) is A formal course record that identifies and describes the course content, course material, type of instruction, the major learning objectives, student information, and resources required to conduct training in an institutional setting. A plan of instruction is a qualitative course control document designed for use primarily within a school for course planning, organization, and operation. Generally, for every block of instruction within a course there is a listing of criterion objectives, duration of instruction, and support materials/guidance factors. Both documents may also be referred to as a "syllabus.”

POI revision or creation of a new course will result in course growth and requires additional justification with proponent commander/commandant approval. Course growth could result from creation of a course or a number of changes, such as an increase in course hours, optimum class size, or an increased number of potential students participating.

Curriculum and Use of Sharable Content Object Reference Model (SCORM®)
Per MIL-HDBK-29612-4, Glossary for Training, Sharable Content Object Reference Model (SCORM®) is software that defines the interrelationship of course components, data models, and protocols such that content "objects" are shareable across systems that conform with the same model accommodating reuse and repurposing." SCORM® is a collection of standards and specifications for web-based e-learning. It defines communications between client-side content and a host system called the run-time environment, which is commonly supported by a learning management system SCORM® also defines how content may be packaged into a transferable ZIP file called "Package Interchange Format."

SCORM® is a specification of the Advanced Distributed Learning (ADL) Initiative, which comes out of the Office of the United States Secretary of Defense. Per DoDI 1322.26, Distributed Learning (DL), the DoD is to continue to use the Sharable Content Object Reference Model (SCORM®) specification to implement asynchronous course tracking capabilities that are limited to a computer's web browser. Future updates pertaining to SCORM® implementation in the DoD will be provided on the SCORM® Reference Website.

Course Validation
Per MIL-HDBK-29612-2, Instructional Systems Development/Systems Approach to Training and Education, once the learning objectives have been developed, tests written, instructional methods and media selected, and instruction is being developed, there is needed assurance the instruction will be effective. Therefore, the instruction should undergo validation to prove that the instruction provides graduates with knowledge, skills, and attitudes to meet job performance requirements. If deficiencies are found in the instruction during validation, they are corrected before course implementation. Validation consists of technical accuracy review, individual tryouts, and small-group tryouts which are conducted as a part of formative evaluation and operational (field) tryouts which make up summative evaluation.

Per MIL-PRF-29612, Training Data Products, there are two types of verification (Type A and Type B), which can be used for the verification of training data products: a. Training data product accuracy and completeness verification procedures (section 4.2.1). b. Training data product life-cycle maintenance verification procedures (section 4.2.2).

Course Pilots
During the process of course validation, a "pilot" or test training course may be run with a selected student group, composed of both subject matter experts and those who are new to the material, to attend the training course and provide feedback on the quality of the course content, methods of delivery and other course related attributes.

Training Evaluation
Per MIL-HDBK-29612-2, Instructional Systems Development/Systems Approach to Training and Education, after the instruction is validated, a summative evaluation has been completed, and the system functions are in place, the instructional system is ready for implementation. Once the system is implemented and starts producing graduates, it is time to begin conducting

operational evaluations. Evaluation is a continuous activity that is integrated throughout each stage of ISD/SAT, beginning with analysis, and continuing throughout the life cycle of the system. Operational evaluation is a continuous process that assesses how well course graduates are meeting the established job performance requirements. Its focus is quality improvement. The last stage of the evaluation process is operational evaluation.

a. When evaluating, look for both strengths and weaknesses in the system. Focus on:
(1) How well the graduates are meeting job performance requirements.
(2) Whether training is being provided that is not needed.
(3) Whether any needed training is not being provided.
(4) How well each system component is contributing to overall system quality.
(5) Ways to improve the graduate's performance as well as the system.

b. The two operational evaluation activities are:
(1) Internal evaluation, gathers and analyzes internal feedback and management data from within the training environment to assess the effectiveness and quality of the training process. Internal evaluation data is normally gathered by the instructional developers and instructors during training.
(2) External evaluation, gathers and analyzes external feedback data from the field to assess graduates' on-the-job performance in an operational environment. Most external evaluation data is gathered by training evaluators from the organization providing the training or is provided by the graduates and their supervisors directly from the field. However, in some cases, external evaluation data is gathered and provided to the organization by inspection and evaluation teams, consultants, advisory bodies, Board of Visitors, accrediting agencies, and professional certification groups after training has taken place.

B. Data Item Description (DID) Deliverables

A Data Item Description (DID) is a completed document, typically identified in a Contract Data Requirements List (CDRL), that defines the data required of a contractor. The document specifically defines the data content, format, and intended use of the data. DIDs are found on the DoD Assist Database.

Helpful Search Hint: All DID's start with the letters "DI-." Once your search results are shown, click on the column header "Document ID" to sort by alphabetical order. The "DI-" items will be easier to find. The below DIDs are a representative listing and is not intended to be inclusive of all Training and Training Support related DIDs.

- DI-ALSS-80037B, Phased Support Plan
- DI-ILSS-8872, Training Materials
- DI-ILSS-81070, Training Program Development and Management Plan
- DI-ILSS-81089, Training Facilities Report
- DI-MGMT-82151, Contractor's Training Plan
- DI-MISC-81184, Training Equipment Summary

- DI-MISC-81191B, Training Device Inventory Checklist/Record (ICL/R)
- DI-SESS-80502A, List of Faults Inserted for Training Purposes

C. Proponency

Please note that DoD organizational changes may result in changes to Office designations and Proponency responsibilities that may not match the content in this Guidebook.

Acquisition Training

Within the Office of the Under Secretary of Defense for Acquisition & Sustainment, Human Capital Initiatives is responsible for assisting the USD(A&S) in carrying out statutory powers, functions, and duties of the Secretary of Defense with respect to the Defense Acquisition Workforce (AWF), and as it relates to the Defense Acquisition Workforce Improvement Act (DAWIA).

The Office of Human Capital Initiatives will implement workforce strategies, policies and procedures that position the DoD to attract and retain the most competent professionals, to guarantee that the AWF is highly skilled and trained to meet current and future needs, and that DoD acquisition professionals share a culture that is dedicated to excellence and to serving the needs of the Warfighter.

DoD Colleges and Universities

The Defense Acquisition University (DAU) is the primary training organization for the Defense Acquisition Workforce. It is committed to providing the training—both formal and informal—to improve the professionalism of the acquisition workforce by engaging students both in the classroom and on the job.

National Defense University (NDU) develops joint warfighters and other national security leaders through rigorous academics, research, and engagement to serve the common defense. The National War College mission is to educate future leaders of the Armed Forces, Department of State, and other civilian agencies for high-level policy, command, and staff responsibilities by conducting a senior-level course of study in national security strategy.

Joint Forces Staff College mission is to educate national security professionals to plan and execute operational-level joint, multinational, and interagency operations to instill a primary commitment to joint, multinational, and interagency teamwork, attitudes, and perspectives.

DoD Component Specific Training

Each of the DoD Services is dedicated to training its military and civilian personnel at all levels of leadership and technical proficiency.   Each Service is proponent of its Service-specific training and interested readers should contact the respective Service for more information.

The Defense Logistics Agency (DLA) offers Logistics Information Services Training and Small Business Training through their website.

Defense Modeling & Simulation Coordination Office

The Department of Defense (DoD) Modeling and Simulation Coordination Office (DMSCO) is the focal point for coordinating all matters regarding modeling and simulation across the DoD for the Undersecretary of Defense (Acquisition and Sustainment)) (USD(A&S)). Modeling and Simulation (M&S) is an enabler of warfighting capabilities. It helps to save lives, to save taxpayer dollars, and to improve operational readiness. DMSCO assists the DoD to use M&S in a cost-effective manner through tools, policies, standards, guidance, and collaborative forums.

D. U.S. Government Statute, Regulations, DoD Policy and Guidance

The list of DoD policy and guidance related to training and training support is very extensive. The below list identifies just some of the key documents. Readers should consult with their respective organizations for specific training related policy and guidance.

Please note that due to the high rate of change occurring in policy and guidance, the letter designations found as part of a reference will be removed in this guide. Readers are encouraged to check the DoD reference source on a frequent basis to ensure they are using the current reference version.

Selected policy and guidance important to Training and Training Support include, but are not limited to the below:

- Defense Acquisition Guidebook (DAG), Chapter 5, Manpower Planning and Human Systems Integration
- DoDI 1322.06, Fellowships, Legislative Fellowships, Internships, Scholarships, Training-With-Industry (TWI), and Grants Provided to DoD or DoD Personnel for Education and Training
- DoDD 1322.18, Military Training
- DoDI 1400.25, Volume 410, DoD Civilian Personnel Management System: Training, Education, and Professional Development
- DoD Directive 5000.01, The Defense Acquisition System
- DoDI 5000.02, Operation of the Adaptive Acquisition Framework
- Other policy located on the DoD AAF website and DoD Issuances website
- DoDI 5000.66, Defense Acquisition Workforce Education, Training, Experience and Career Development Program
- DoDI 1322.26, Distributed Learning (DL)
- DoDI 1400.25 Vol 410, DoD Civilian Personnel Management System
- JCIDS Manual, Manual for the Operation of the Joint Capabilities Integration and Development System
- Joint Publication 3-16, Multinational Operations
- MIL-PRF-29612, Training Data Products

- MIL-HDBK-29612-1A, -2A, -3A, -4A and 5, Training Data Products. (Note: this Handbook is found on the DoD Assist Database and is composed of 5 Parts labeled “1A” to “5.”)
  - MIL-HDBK-29612-1, Guidance for Acquisition of Training Data Products and Services
  - MIL-HDBK-29612-2, Instructional Systems Development/Systems Approach to Training and Education
  - MIL-HDBK-29612-3, Development of Interactive Multimedia Instruction (IMI)
  - MIL-HDBK-29612-4, Glossary for Training
  - MIL-HDBK-29612-5, Advanced Distributed Learning (ADL) Products and Systems
- CJCSM 3511.01, Joint Training Resources for the Armed Forces of the United States
- CJCS Guide 3501, The Joint Training System: A Guide for Senior Leaders, 5 May 2015
- CJCSI 3500.01H, Joint Training Policy for the Armed Forces of the United States, 25 April 2014
- CJCSI 3500.02, Universal Joint Task List Policy and Guidance
- CJCSN 3500.01, 2017-2020 Chairman's Joint Training Guidance
- CJCSM 3500.03, Joint Training Manual
- CJCSM 3500.04, Universal Joint Task Manual
- CJCSI 3401.02, Force Readiness Reporting, current as of 17 July 2014
- U.S. Air Force Instruction 36-2251, Management of Air Force Training Systems
- U.S. Army TRADOC Pamphlet 350-70-12, The Army Distributed Learning (DL) Guide
- U.S. Army TRADOC Pamphlet 350-70-13, System Training Integration
- Product Support Implementation Roadmap
- Product Support Strategy Development Tool (formerly PSM Toolkit)
- PSM Guidebook
- PBL Guidebook
- Business Case Analysis (BCA) Guidebook
- Logistics Assessment (LA) Guidebook

E. Communities of Practice and Interest

The DAU Community Hub provides a listing of all DoD Communities of Practice by topic/title. It is best to sign up for a login account to access additional capabilities not available to the public.

DAU hosts Functional Area Gateways for each acquisition career field.

Joint Knowledge Online (JKO) provides a global online joint training & education capability to enhance individual & staff proficiency in joint operations & improve operational readiness.

Each of the DoD Components also offers communities of interest for training. Readers are encouraged to contact their respective organizations for more information.

Many DoD training organizations now offer communities of interest via social media channels. h links are generally available at the organization's homepage.

F. Training Resources

A complete list of DAU training resources can be found in the DAU iCatalog. Courses are classified as Training Courses (Regular (certification and assignment specific) training courses), Continuous Learning, and Targeted Training (Alternate means to meet training requirements). For the Product Support Manager, training resources are extensively listed on the DAU Community Hub under the Life Cycle Logistics Gateway.

A few courses, tools, ACQuipedia articles and workshops especially relevant for the Product Support Manager related to Training and Training Support include:

- Acquisition Leadership Insights
- CLL 001 Life Cycle Management & Sustainment Metrics Continuous Learning Module
- CLL 005 Developing a Life Cycle Sustainment Plan (LCSP) Continuous Learning Module
- CLL 015 Product Support Business Case Analysis (BCA) Continuous Learning Module
- CLL 020 Independent Logistics Assessments (ILA) Continuous Learning Module
- CLL 036 Product Support Manager (PSM) Continuous Learning Module
- Product Support Implementation Roadmap
- US Army Materiel Command Logistics Support Activity (LOGSA) Tools Suite
- AMSAA Tools Suite
- Product Support Analytical Tools Database
- DAU Tools Site
- Product Support Business Model (PSBM)
- DoD Integrated Product Support Implementation Roadmap
- Defense Acquisition Life Cycle Wall Chart
- Integrated Product Support Tools Suite

For information on training resources at specific institutions, readers should contact the learning institution directly.

There are many non-profit organizations (Universities and professional societies) that have partnerships with the DoD to provide training to military and DoD civilian members. Training from these organizations is typically focused on a very specific topic, i.e., corrosion prevention, cybersecurity, manufacturing quality, reliability engineering, etc. Be sure to check that any training you are interested in is approved by the DoD. Examples of these organizations include:

- [American Society for Quality (ASQ)]
- [NACE International]
- [Information Assurance Support Environment (IASE)]

Manpower & Personnel (M&P)

Objective
Identify, plan, resource and acquire personnel, civilian and military, with the grades and skills required: a) to operate equipment, to complete the missions, to effectively fight or support the fight, to win our nation's wars; b) to effectively support the Soldier, and to ensure the best capability is available for the Warfighter when needed.

Description
It is essential to identify and acquire personnel (military and civilian) with the skills and grades required to operate, maintain, and support systems over their lifetime. Early identification is essential. If the needed manpower is an additive requirement to existing manpower levels of an organization, a formalized process of identification and justification must be made to higher authority.

Overview
The terms "Manpower" and "Personnel" are not interchangeable terms.

"Manpower" represents the number of personnel or positions required to perform a specific task. This task can be as simple as performing a routine administrative function, or as complex as operating a large repair depot. Manpower analysts determine the number of people required, authorized, and available to operate, maintain, support, and provide training for the system. Manpower requirements are based on the range of operations during peacetime, low intensity conflict, and wartime. Requirements should consider continuous, sustained operations and required surge capability.

"Personnel," on the other hand, indicates those human aptitudes (i.e., cognitive, physical, and sensory capabilities), knowledge, skills, abilities, and experience levels that are needed to properly perform job tasks. Personnel factors are used to develop the military occupational specialties (or equivalent DoD Component personnel system classifications) and civilian job series of system operators, maintainers, trainers, and support personnel.

Personnel officials contribute to the Defense acquisition process by ensuring that the program manager pursues engineering designs that minimize personnel requirements and keep the human aptitudes necessary for operation and maintenance of the equipment at levels consistent with what will be available in the user population at the time the system is fielded.

Manpower & Personnel is one of the twelve Integrated Product Support Elements. The activities occurring within the scope of this area should be integrated with other product support element areas in keeping with KPP and KSA optimization goals and constraints.

Why Manpower and Personnel is Important

The mix of military, DoD civilian, and contract support necessary to operate, maintain, and support (to include providing training) the system will be determined based on the manpower mix criteria (see DoD Instruction 1100.22). Manpower mix data will be reported to cost analysts and factored into the preparation of independent cost estimates and DoD Component cost estimates. Economic analyses used to support workforce mix decisions will use costing tools, to include DoD Instruction 7041.04 (Reference (bn)), that account for fully loaded costs (i.e., all variable and fixed costs, compensation and non-compensation costs, current and deferred benefits, and cash and in-kind benefits) approved by the DoD Component manpower authority.

The role of Manpower Planning is to establish the right mix of personnel required for a program: military (Active, Guard, and Reserve), government civilians (U.S. and foreign nationals) and contract support manpower. Manpower analysts determine the number of people required, authorized, and available to operate, maintain, support and train for the system. Requirements are based on the range of operations during peacetime, low-intensity conflict, and wartime, and should consider continuous, sustained operations, and required surge capability. (Defense Acquisition Guidebook [DAG], Chapter 5-2.1.1)

Manpower is typically the highest cost driver in the development and sustainment of acquisition programs and can account for 67-70% of the program budget. When Manpower Planning is engaged along with Human Systems Integration, Program Managers have the tools to effectively manage systems and to ensure that the human element of the system is included in the pros, cons, and risks of using a program. (Defense Acquisition Guidebook [DAG], Chapter 5-2.1)

Manpower estimates serve as the authoritative source for out-year projections of active-duty and reserve end-strength, civilian full-time equivalents, and contractor support work-years. As such, references to manpower in other program documentation should be consistent with the manpower estimate once it is finalized. In particular, the manpower estimates should be consistent with the manpower levels assumed in the final Affordability Assessment and the Cost Analysis Requirements Description (CARD).

Product Support Manager Activities

10.1. Identification and acquisition of required numbers of active and reserve military officers and enlisted personnel as well as civilian personnel with the skills and grades required for system operation

Manpower Requirements

Per the Defense Acquisition Guidebook (DAG), CH 5-3, Best Practice, the Program Manager should evaluate the manpower required and/or available to support a new system and consider manpower constraints when establishing contract specifications to ensure that the human resource demands of the system do not exceed the projected supply. This assessment shall determine whether the new system requires a higher, lower, or equal number of personnel than the predecessor system, and whether the distribution of ranks/grade will change. Critical manpower constraints should be identified in the Departments' capability documents to ensure that manpower requirements remain within DoD Component end-strength constraints. If sufficient end strength is not available, a request for an increase in authorizations should be submitted and approved as part of the trade-off process.

When assessing manpower, the system designers should examine labor-intensive, "high-driver" tasks. Moreover, these high-driver tasks might result from hardware design or hardware/ software interface design problems. These tasks can sometimes be eliminated during engineering design by increasing equipment or software performance. Based on a top-down functional analysis, an assessment should be conducted to determine which functions should be automated, eliminated, consolidated, or simplified to keep the manpower numbers within constraints.

Manpower requirements should be based on task analyses, which consider all factors, including fatigue; cognitive, physical, and sensory overload, and environmental conditions (e.g., heat/ cold); and reduced visibility. Additionally, manpower requirements should be calculated in conjunction with personnel capabilities, training and human factors engineering trade-offs.

Tasks and workload for individual systems, systems-of-systems and families-of-systems should be reviewed together to identify commonalities, merge operations, and avoid duplication. The cumulative effects of systems-of-systems, families-of-systems and related systems integration should be considered when developing manpower requirements.

Per the Defense Manpower Requirements Report Fiscal Year 2018, manpower is not a requirement in itself. DoD manpower investments must be complementary in areas, such as platforms, weapons, maintenance, and training, to deliver capabilities; such as battlespace awareness and logistics. These capabilities drive requirements. The Services each define their workload requirements so capabilities can be operationalized in a cost-effective manner. In addition to arriving at fiscally informed Total Force manpower solutions, we must work to ensure Total Force policies, including standards, pay, education, training, non-monetary compensation, quality of life, and promotion of diversity, are aligned to help attract, develop, and retain the All-Volunteer Force's Soldiers, Sailors, Marines, and Airmen.

Manpower Planning

Per the Defense Acquisition Guidebook (DAG), CH 5–3.1 Manpower Planning, the requirements of manpower planning for MDAPS are included in Operating and Support Cost-Estimating Guide (para 3.10.1 – Page 3-20) for inclusion in the Cost Assessment and Program Evaluation (CAPE) Cost Analysis Requirements Description (CARD). Additionally, manpower-planning documentation is used by Service components to estimate the number and types of people needed for specific programs and by personnel and training communities to plan and forecast their program requirements. DoD components should require manpower planning documentation for all Acquisition Category (ACAT) I through ACAT IV programs to support development of CARD and Life Cycle Sustainment Estimates.

At program initiation, the Service component manpower authority and PM, in consultation with the MDA, should agree to reporting requirements and assumptions for manpower planning based on ACAT level and on whether the program has significant manpower implications.

Required and recommended data elements of manpower planning should meet CARD and/or Life Cycle Cost Estimate content requirements. Lower level ACAT/AAP programs with little to no manpower implications/risks may not need extensive manpower planning documentation.

Program Managers should agree upon required manpower planning with the component manpower authority. The component manpower authority should approve the manpower planning for MDAP and designated manpower-significant programs prior to submission of the program CARD at major milestones.

Additionally, USD (P&R) promulgates separate and specific guidance concerning acquisition-related Total Force manpower planning. This guidance addresses the enduring need to provide Total Force manpower projections -- active/reserve military, Government civilians, and contracted services for the ICE/CARD. This ensures that manpower plans are feasible and affordable and result in desired operational and support capabilities.

Readers should review the Defense Acquisition Guidebook (DAG), Chapter 5, for more information on manpower planning.

Workforce Mix
Per DoDI 1100.22, Policy and Procedures for Determining Workforce Mix, the workforce of the Department of Defense shall be established to successfully execute Defense missions at a low to moderate level of risk.

When establishing the workforce mix, manpower planners shall review all mission requirements and design units and/or organizations to accomplish baseline operations and transition quickly and easily to support military operations (e.g., contingency, humanitarian, peacekeeping) and crises.

Assignment
DoDI 1315.18, Procedures for Military Personnel Assignments, provides DoD policy governing military personnel assignments. Readers are encouraged to contact the DoD Service personnel center for more specific information.

Table of Organization & Equipment (TOE)/Table of Distribution & Allowances (TDA)
Per the U.S. Army Center of Military History, TDA units are organized to perform specific missions for which there are no appropriate TOEs and are discontinued as soon as their assigned missions have been accomplished. Unlike TOE units, TDA organizations are considered

non-deployable, even when organized overseas, as their missions are normally tied to a geographic location. The personnel of TDA organizations can be military, civilian, or a combination of both.

A TOE prescribes the normal mission, organizational structure, and personnel and equipment requirements for a military unit and is the basis for an authorization document. Units are constituted and activated in accordance with an approved TOE or modified TOE. All personnel are military, and the unit can be deployed anywhere in the world. Some current TOE organizations have TDA augmentations, which may include civilians and foreign personnel, to assist in performing their non-tactical missions. These augmentations are not deployable, however.

Although TDA and TOE units are distinct types of organizations, there are some instances in which either could be used, the military police company at a garrison or installation, for example. A TOE military police company can perform the function, but such units are deployable, and in the event of war the post conceivably might be left without military police support. If the post TDA includes the military police function, then the personnel and equipment authorizations remain with the post regardless of war or other contingencies.

Government Civilian Workforce Management

Per DoDI 1100.22, Policy and Procedures for Determining Workforce Mix, consistent with DoD Instruction 1400.25, Volume 250, Civilian Strategic Human Capital Plans shall provide for the development of a DoD civilian workforce with competencies needed to meet mission requirements. Manpower shall be designated as civilian except when one or more of the following conditions apply:
(1) Military-unique knowledge and skills are required for performance of the duties.
(2) Military incumbency is required by law, E.O., treaty, or IA.
(3) Military performance is required for command and control, risk mitigation, or esprit de corps.
(4) Military manpower is needed to provide for overseas and sea-to-shore rotation, career development, or wartime assignments.
(5) Unusual working conditions or costs are not conducive to civilian employment.

The DoD Civilian Careers website provides more information on civilian workforce management.

Contractor Management

A defense contractor (or security contractor) is a business organization or individual that provides products or services to a military or intelligence department of a government.

The following guidebooks provide information on planning for contractor participation (i.e., Product Support Integrator or Product Support Provider) in the Life Cycle Sustainment Plan.

- Product Support Managers (PSM) Guidebook

- Performance Based Logistics (PBL) Guidebook
- Business Case Analysis (BCA) Guidebook
- Logistics Assessment (LA) Guidebook (also known as Independent Logistics Assessment [ILA])
- Public-Private Partnering (PPP) for Product Support Guidebook
- Operations & Support (O&S) Cost Management Guidebook

DAU's Community-Hub features 9 communities of practice supporting DoD contracting practices:

- ACE For Services
- Acquisition Law
- Commercial Off the Shelf Products and Commercial Services
- Contingency Contracting
- Contract Cost, Price & Finance
- Contracting
- Contracting Officers Representative
- Enterprise Software Initiative (ESI)
- Interagency Acquisition Support

DAU's Product Support Manager Homepage provides Statues, Policy, Guidance, Articles & Reports, Awards, Tools & Training and Workshops information.

Operational Contract Support
DoDI 3020.41, Operational Contract Support (OCS), establishes policy, assigns responsibilities, and provides procedures for OCS, OCS program management, contract support integration, and integration of defense contractor personnel into contingency operations outside the United States.

10.2. Identification and acquisition of required numbers of active and reserve military officers and enlisted personnel as well as civilian personnel with the skills and grades required for system maintenance

Identification and planning for manpower and personnel requirements for system maintenance is a series of activities integrated with system maintenance planning. Examples of key planning activities which address manpower and personnel planning for system maintenance include:

- Maintenance Concept Design
- Failure Modes Effects and Criticality Analysis (FMECA) Required Repair Times Determination
- Depot Workload Allocation, Planning, Activation, and Execution
- Levels of Maintenance & Level of Repair Analysis (LORA)
- Public Private Partnering (PPP)

The Integration Annex to this Guidebook contains a graphic showing the key maintenance and manpower related DoD acquisition life cycle product deliverables.

Readers should review the Maintenance Planning & Management IPS Element chapter in this Guidebook.

10.3. Identification and acquisition of required numbers of active and reserve military officers and enlisted personnel as well as civilian personnel with the skills and grades required for system support

Per the Defense Acquisition Guidebook (DAG), CH 5-3, Best Practice, when reviewing support activities, the PM should work with manpower and functional representatives to identify process improvements, design options or other initiatives to reduce manpower requirements, improve the efficiency or effectiveness of support services or enhance the cross-functional integration of support activities. The product support strategy should consider the approach used to provide for the most efficient and cost-effective mix of manpower and contract support. The product support strategy should also identify any cost, schedule, performance issues; or uncompleted analyses that could impact the PM's ability to execute the program.

10.4. Wartime versus peacetime personnel requirements determination and management

Per DoDD 1100.4, Guidance for Manpower Programs, assigned missions shall be accomplished using the least costly mix of personnel (military, civilian and contract) consistent with military requirements and other needs of the Department as prescribed by reference (d). Functions that are inherently governmental shall not be contracted. Manpower authorities shall consider all available sources when determining manpower mix to include the Active and Reserve military manpower, U.S., and foreign national civilian manpower; intra-governmental, contract, and host-nation support.

10.5. Additional personnel identification and justification process management

Per the Defense Acquisition Guidebook (DAG) CH 5–4.2.2.1 Personnel Parameters/ Requirements requires the PM to work with the personnel community to define the performance characteristics of the user population, or "target audience," early in the acquisition process. The PM should work with the personnel community to establish a Target Audience Description (TAD) that identifies the cognitive, physical, and sensory abilities, i.e., capabilities and limitations, of the operators, maintainers and support personnel expected to be in place at the time the system is fielded. When establishing the TAD, Human Systems Integration (HSI) practitioners should verify whether there are any recruitment or retention trends that could significantly alter the characteristics of the user population over the life of the system. Additionally, HSI analysts should consult with the personnel community and verify whether there are new personnel policies that could significantly alter the scope of the user population (e.g., policy changes governing women in combat significantly changed the anthropometric requirements for occupational specialties).

Per the Defense Acquisition Guidebook (DAG) CH 5–4.2.2.2 Personnel Planning, Personnel capabilities are normally reflected as Knowledge, Skills and Abilities (KSA), and other characteristics. The availability of personnel and their KSAs should be identified early in the acquisition process. The DoD Components have a limited inventory of personnel available, each with a finite set of cognitive, physical, and psychomotor abilities. This could affect specific system thresholds. The PM should summarize major personnel initiatives that are necessary to achieve readiness or rotation objectives or to reduce manpower or training costs, when developing the acquisition strategy.

The Life Cycle Sustainment Plans/Product Support Strategies should address modifications to the knowledge, skills, and abilities of military occupational specialties for system operators, maintainers or support personnel and should highlight the modifications having cost or schedule issues that could adversely impact program execution. The PM should also address actions to combine, modify or establish new military occupational specialties or additional skill indicators, or issues relating to hard-to-fill occupations if they impact the PM's ability to execute the program.

Career Fields
Career fields are managed by DoD Services, each using their respective organizational structure and nomenclature using some type of character code (either numbers or alpha-numeric) to designate each type of job. Readers should contact the DoD Service for more information on specific military specialties and occupations.

The DoD encourages civil servants and military professionals to pursue acquisition career paths in support of Federal and Defense Agencies. More information can be found at the Defense Pricing and Contracting website and the Defense Acquisition University website.

PSMs should become knowledgeable of both the operational and support job category assignments for their respective programs. In some cases, a job specialty for a weapon system may not yet exist when fielding a new technology as seen during the past 10 years with electronic warfare, unmanned systems, or robotics. In this situation, PSMs may be required to provide input into the development or updating of position codes and descriptions.

A. Manpower & Personnel Major Activities by Acquisition Phase

Activities of the Manpower & Personnel IPS Element
Each activity of the Manpower & Personnel IPS Element, as listed in the PSM Guidebook Appendix A, is under the responsibility of the Program Manager, the Product Support Manager, and the lead stakeholder from other areas as applicable, i.e., configuration management, engineering, environment, manufacturing, etc. Relevant proponent DoD offices are listed in this chapter below in Section C, Proponency.

Input to the LCSP/Product Support Strategy
Detailed guidance on development of the Life Cycle Sustainment Plan (LCSP)/Product Support Strategy states that "The purpose of this annotated outline is to improve sustainment planning for Department of Defense (DoD) weapon systems. This may be achieved when programs make design decisions that achieve operational performance requirements and reduce demand for sustainment."

While information from Manpower & Personnel activities will impact many areas of the LCSP/Product Support Strategy, the below LCSP sections specifically address Manpower & Personnel:
3.1 Sustainment Strategy Considerations
3.2 Sustainment Relationships
3.3 Product Support Arrangements
7.1 O&S Cost
8.1.2 Product Support Team
9.0 Supportability Analysis

As Manpower & Personnel activities continue through the life cycle, their impacts will both directly and indirectly impact the system's KPP, KSA and APA parameters. The PSM and LCL should start these activities early in the system lifecycle for greatest impact.

When Is Manpower & Personnel Delivered and Managed in the Lifecycle?
The activities within the Manpower & Personnel IPS Element are best visualized in the DoD Product Support Implementation Roadmap Tool. This tool allows the User to check the box highlighting information specifically linked to the Manpower & Personnel Integrated Product Support Element.

Once the Manpower & Personnel IPS Element box is checked, the timeline expands to show the detailed activities and respective outputs for each activity by phase, as show in a partial illustration in Figure 10-1 below.

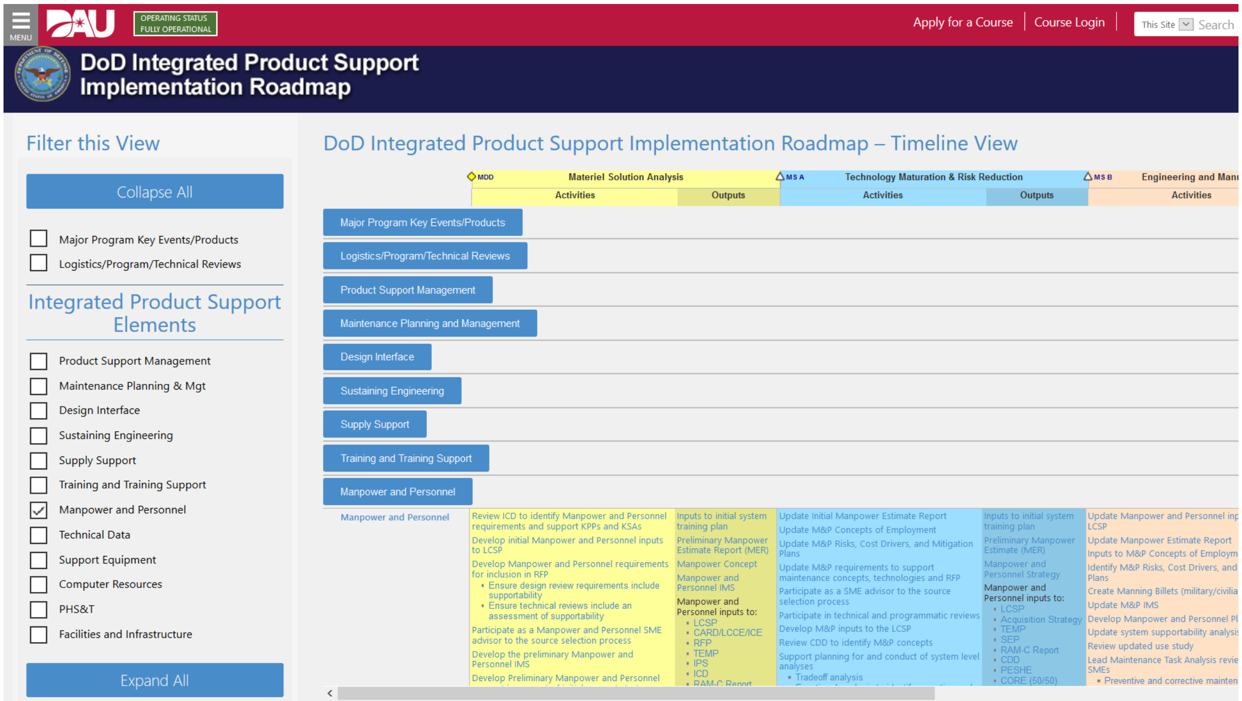


Figure 10-1, Screenshot of the DoD Integrated Product Support Implementation Roadmap Timeline View Homepage with the Manpower & Personnel IPS Element box checked. Notice the Manpower & Personnel activities and respective outputs are visible for each life cycle acquisition phase.

Each activity and output is then hyperlinked to a pop-up window that displays specific data related to that respective activity as shown in the screenshot below in Figure 10-2. The specific data is, in turn, hyperlinked to allow the user to subsequently search for detailed information regarding any specific activity.

Figure 10-2, Screenshot of the DoD Integrated Product Support Implementation Roadmap Timeline View Homepage with the Manpower & Personnel IPS Element box checked. The User then clicked on the outcome "Life Cycle Sustainment Plan (LCSP)" from the listing of activities and outcomes for Manpower & Personnel. This data card provides further information for the User to search for further detailed information.

B. Data Item Description (DID) Deliverables

A Data Item Description (DID) is a completed document, typically identified in a Contract Data Requirements List (CDRL), that defines the data required of a contractor. The document specifically defines the data content, format, and intended use of the data. DIDs are found on the DLA Assist Database.

Helpful Search Hint: All DID's start with the letters "DI- ." Once your search results are shown, click on the column header "Document ID" to sort by alphabetical order. The "DI-" items will be easier to find.

The below DIDs are a representative listing and is not inclusive of all Manpower & Personnel related DIDs.

- DI-MGMT-81954, Personnel Qualification Standard (PQS)
- DI-MGMT-81834, Contractor's Personnel Roster
- DI-MSC-81419, Personnel Report
- DI-FNCL-81116, Manhour Estimate, Technical Cost Proposals

C. Proponency

Please note that DoD organizational changes may result in changes to Office designations and Proponency responsibilities that may not match the content in this Guidebook.

DoDD 1100.4, Guidance for Manpower Management, identifies the policy and organization responsibilities for manpower management.

The Under Secretary of Defense for Personnel and Readiness (USD(P&R)) ensures that new policy, including fiscal policy, is fully evaluated for its effect on manpower and personnel performance prior to implementation.

The Heads of the DoD Components shall designate an individual(s) with full authority for manpower management.

The Secretaries of the Military Departments shall plan for the effective retention or replacement in wartime of civilian employees and contractor personnel who are performing critical support activities.

The Chairman of the Joint Chiefs of Staff shall, consistent with reference (d), advise the Secretary of Defense on Critical deficiencies and strengths in manpower force capabilities identified during the preparation and review of contingency plans and assessing the effect of such deficiencies and strengths on meeting national security objectives and policy and on strategic plans.

The Commanders of the Combatant Commands, through the Chairman of the Joint Chiefs of Staff, shall plan for the effective retention or replacement in wartime of civilian employees and contractor personnel who are performing critical support activities.

D. U.S. Government Statute, Regulations, DoD Policy and Guidance

DoD issuances for manpower and personnel are found at the Executive Services Directorate Directives and Issuances Homepage. There is a search bar in the upper right-hand side that provides current issuances.

Please note that due to the high rate of change occurring in policy and guidance, the letter designations found as part of a reference will be removed in this guide. Readers are encouraged to check the DoD reference source on a frequent basis to ensure they are using the current reference version.

Selected policy and guidance important to Manpower and Personnel include, but are not limited to the below:

- DoDD 1100.4, Guidance for Manpower Management
- DoDD 1322.18, Military Training
- DoDI 1100.22, Policy and Procedures for Determining Workforce Mix

- DoDI 1120.11, Programming and Accounting for Active Component (AC) Military Manpower, March 17, 2015
- DoDI 1145.01, Qualitative Distribution of Military Manpower
- DoDI 1312.01, DoD Occupational Information Collection and Reporting
- DoDI 1315.18, Procedures for Military Personnel Assignments
- DoDI 7041.04, Estimating and Comparing the Full Costs of Civilian and Active Duty Military Manpower and Contract Support, Jul 3, 2013
- DoDI 7730.64, Automated Extracts of Manpower and Unit Organizational Element Files
- CJCS Instruction 3170.01, Joint Capabilities Integration and Development System
- JCIDS Manual, Operation of the Joint Capabilities Integration and Development System
- Defense Acquisition Guidebook (DAG) – Chapter 5, Manpower Planning and Human Systems Integration
- Product Support Implementation Roadmap
- Product Support Strategy Development Tool (formerly PSM Toolkit)
- Product Support Managers (PSM) Guidebook
- Performance Based Logistics (PBL) Guidebook
- Business Case Analysis (BCA) Guidebook
- Logistics Assessment (LA) Guidebook (also known as Independent Logistics Assessment [ILA])

E. Communities of Practice and Interest

The DAU Integrated Product Support Tools and Resources website contains 17 information sources to help the Product Support Manager. Manpower and Personnel information is included in these resources.

The Office of Human Capital Initiatives is responsible for assisting the USD(A&S) in carrying out statutory powers, functions, and duties of the Secretary of Defense with respect to the Defense Acquisition Workforce (AWF), and as it relates to the Defense Acquisition Workforce Improvement Act (DAWIA).

The Preface of this IPS Elements Guidebook provides a listing of "golden references," many of which provide libraries, research portals and other resources for finding additional information on specific topics of support equipment.

F. Training Resources

DAU Courseware

A complete list of DAU training resources can be found in the DAU iCatalog. Courses are classified as Training Courses (Regular (certification and assignment specific) training courses), Continuous Learning, and Targeted Training (Alternate means to meet training requirements). For the Product Support Manager, training resources are extensively listed on the DAU Community Hub under the Life Cycle Logistics Gateway Product Support Manager (PSM) link.

The topic of Manpower and Personnel is found in many DAU courses which include, but are not limited to, the following:

- LOG 101 Acquisition Logistics Fundamentals
- LOG 201 Intermediate Acquisition Logistics
- LOG 350 Enterprise Life Cycle Logistics Management
- CLL 005 Developing A Life Cycle Sustainment Plan (LCSP)
- CLL 020 Independent Logistics Assessments
- CLE 062 Human Systems Integration
- CLM 035 Environment, Safety and Occupational Health
- CLR 030 Environment, Safety and Occupational Health in JCIDS

DAU ACQuipedia Articles

ACQuipedia serves as an online encyclopedia of common defense acquisition topics. Each topic is identified as an article. Each article contains a definition, a brief narrative that provides context, and includes links to the most pertinent policy, guidance, tools, practices, and training which further augment understanding and expand depth.

ACQuipedia was developed as a collaborative project to create content around Defense Acquisition-related topics. Articles (topics) will be maintained as a collaborative effort of subject matter experts across the Defense Acquisition University (DAU). Future growth may expand the collaboration of subject matter experts beyond DAU.

ACQuipedia provides the acquisition workforce with quick access to information in a succinct and digestible format. Article content aggregates the most relevant references and learning assets to narrowly focus users and quickly provide high value information.
Below is a listing of linked ACQuipedia articles relevant to Technical Data. The reader is encouraged to visit the homepage to see additional articles.

- Contractor Logistics Support (CLS)
- Contractor Performance Assessment Report (CPAR) and the Contractor Performance Assessment Reporting System (CPARS)
- Functional Services Manager (FSM)
- Human Factor Engineering (HFE)
- Human Systems Integration
- Independent Logistics Assessment (ILA)
- Integrated Product Support (IPS) Element - Manpower & Personnel
- Interim Contractor Support (ICS)
- Joint Staff

- Labor Laws
- Life Cycle Cost (LCC)
- Life Cycle Logistics Career Field
- Life Cycle Management (LCM)
- Life Cycle Sustainment Plan (LCSP)
- Loaning Property to Contractors
- Logistics Demonstrations (LOG Demo)
- Logistics Footprint
- Logistics Human Capital Strategy (HCS)
- Maintainability Demonstration (M-Demo)
- Maintenance Levels
- Maintenance Task Analysis (MTA)
- Manpower Planning
- O&S Cost Estimating for the PSM
- Operating and Support Costs (O&S)
- Personal Services
- Services Acquisition
- System Safety

Facilities and Infrastructure

Objective

Identify, plan, resource, and acquire facilities to enable training, maintenance, and storage to maximize effectiveness of system operation and the logistic support system at the lowest TOC. Identify and prepare plans for the acquisition of facilities to enable responsive support for the Warfighter.

Description

Consists of the permanent and semi-permanent real property assets required to support a system, including studies to define types of facilities or facility improvements, location, space needs, environmental and security requirements, and equipment. It includes facilities for training, equipment storage, maintenance, supply storage, ammunition storage, and so forth.

Overview

Facilities and Infrastructure is a key element of the DoD acquisition process. This discipline encompasses a variety of functions that focus on the life cycle design, construction, resourcing and maintenance of military installations, facilities, civil works projects, test ranges, airfields, roadways, maintenance depots and ocean facilities. Due to the potential long lead times in funding (i.e., MILCON), acquisition or construction, and resourcing, planning must start early in the acquisition process with validation to ensure requirements are aligned to facilities planning objectives.

Per the Office of the Assistance Secretary of Defense for Sustainment, Facilities Management**,** **Facility Sustainment** is further described as below:

DoD facilities require regularly scheduled sustainment to make sure they remain in good working order throughout their service lives. Such activities include:

A. Emergency and routine repairs
B. Regularly scheduled inspections and preventive maintenance tasks
C. Scheduled repair or replacement of major facility components as needed to maintain the facility (e.g., scheduled roof replacement; wall surface refinishing; HVAC system replacement, etc.)

Facility sustainment efforts do ***not*** include:

- Activities related to Restoration or Modernization
- Repair or replacement of non-attached equipment or furniture, or building components that typically last more than 50 years (such as foundations and structural elements)
- Tasks associated with facilities operations (such as custodial services, grass cutting, landscaping, waste disposal, and the provision of central utilities)

- Environmental compliance efforts, specialized historical preservation, or costs related to “acts of God,” all of which are funded elsewhere.

Some key terms related to Facilities and Infrastructure:

- Facility— A real property entity consisting of one or more of the following: a building, a structure, a utility system, pavement, and underlying land.
- Facility substitutes—Items such as tents and prepackaged structures requisitioned through the supply system that may be used to substitute for constructed facilities.
- Force beddown—The provision of expedient facilities for troop support to provide a platform for the projection of force.
- Forward arming and refueling point—A temporary facility, organized, equipped, and deployed to provide fuel and ammunition necessary for the employment of aviation maneuver units in combat.
- Maintenance—The routine recurring work required to keep a facility in such condition that it may be continuously used at its original or designed capacity and efficiency for its intended purpose.
- Real property—Lands, buildings, structures, utilities systems, improvements, and appurtenances, thereto that includes equipment attached to and made part of buildings and structures, but not movable equipment.

Why Facilities and Infrastructure is Important

Programs’ responsibilities for facilities and infrastructure vary depending on the scope and outcomes of the program. Generally, for programs delivering weapon systems, coordination with the appropriate installation, test range, or other facilities proponent organizations is required early in the acquisition process. The funding, management, sustainment, upgrade and even disposal of facilities may be the responsibilities of multiple organizations. Program leadership must examine each facilities requirement to determine the appropriate management approach.

Facilities and Infrastructure is one of the twelve Integrated Product Support Elements. The activities occurring within the scope of this area should be integrated with other product support element areas in keeping with KPP and KSA optimization goals and constraints.

Product Support Management Activities

11.1 Facilities Plan Management

Real Property Management

Per DoDD 4165.06, Real Property, it is DoD policy that:

- The acquisition, management, and disposal of real property within the Department of Defense is a function of the Military Departments acting on behalf of the Department of

Defense, subject to such specific exceptions as are established by law or by direction of the Secretary of Defense.

- The acquisition, management, and disposal of real property shall be performed to advance the overall mission of the Department of Defense and shall not be governed solely by the individual interests of the DoD Components.
- A Military Department shall meet the real property requirements of the DoD Components utilizing real property under its jurisdiction by applying Department of Defense and its own policies.
- DoD real property shall be managed in the most economical manner to reduce costs to the Department without obstructing or prejudicing current or projected defense requirements.
- DoD real property that is no longer required for current or projected defense requirements shall be disposed.
- Utilizing the multiple-use principle, DoD real property shall be made available for mineral exploration and extraction to the maximum extent possible consistent with military operations, national defense activities, environmental conservation and protection, and Army civil works activities.
- In accordance with reference (b), DoD real property shall be managed to promote the most efficient and economic use of DoD real property assets and to ensure management accountability for implementing Federal real property reforms.

Also see DoDI 4165.70, Real Property Management.

Unified Facilities Criteria Program

The Unified Facilities Criteria (UFC) system (prescribed by MIL-STD 3007) provides planning, design, construction, sustainment, restoration, and modernization criteria; applicable to the Military Departments, the Defense Agencies, and the DoD Field Activities; in accordance with DoD Directive 4270.5, Military Construction.

UFC documents are applicable to all DoD-led construction projects and are of two general types:

1. Planning and design requirements, which are divided into technical UFC documents (generally aligned by engineering or professional discipline) and functional UFC documents (aligned by facility type)
2. Guide specifications, which provide material requirements for the selection of components or systems

The Office of the Assistant Secretary of Defense for Sustainment, Facilities Management, participates in the management of the UFC program as the representative of the Office of the Secretary of Defense on the DoD Engineer Senior Executive Panel (ESEP). The other members of

ESEP are the Chief of Engineering and Construction of the Army Corps of Engineers; the Chief Engineer of the Naval Facilities Engineering Command; and the Director of the Air Force Facilities Engineering Center of Excellence. UFC documents are distributed only in electronic form and are available on the Whole Building Design Guide.

Facilities planning is also included in the system's Life Cycle Sustainment Plan (LCSP)/Product Support Strategy to address how facilities will support the system throughout its life cycle.

Critical Infrastructure

Critical Infrastructure includes systems and assets, whether physical or virtual, so vital to the United States that the incapacity or destruction of such systems and assets would have a debilitating impact on security, national economic security, national public health or safety, or any combination of those matters.

Critical Infrastructure Protection

Critical Infrastructure Protection (CIP) are actions taken to prevent, remediate, or mitigate the risks resulting from vulnerabilities of critical infrastructure assets. Depending on the risk, these actions could include changes in tactics, techniques, or procedures; adding redundancy; selection of another asset; isolation or hardening; guarding, etc.

Protected Critical Infrastructure Information (PCII) Program

The DoD Protected Critical Infrastructure Information (PCII) Program, created under the Critical Infrastructure Information (CII) Act of 2002, and accredited by the Department of Homeland Security (DHS). The PCII Program offers public disclosure protection to CII voluntarily shared with government entities for homeland security/defense purposes. This program offers government security analysts a way to access CII given by the private sector while owners/operators of critical infrastructure are assured that their information is protected from public disclosure.

Technology Control Plan

The Defense Technology Security Administration (DTSA) may impose requirements for a Technology Security Plan (TSP) or Technology Transfer Control Plan (TTCP) during the review process to mitigate risks associated with an international transfer conducted via a Direct Commercial Sale (DCS) or Foreign Military Sale (FMS). TSPs and TTCPs help organizations and/or foreign recipients establish the plans and procedures that foster compliance with export laws, regulations, and license provisions.

11.1.1 Facility Planning

Per DoDD 4275.5, Acquisition and Management of Industrial Resources, it is DoD policy to minimize Government ownership of facilities in consonance with the need to ensure economical support of essential peacetime, surge, and mobilization requirements; maintain a base of Government-owned facilities for those industries determined essential to defense production, when private investment is inadequate or unavailable; as required by law, notify the Congress of all Government construction to be accomplished under the authorities of this

Directive; and maintain accountability of Government property in accordance with DoD Instruction 5000.64, Defense Property Accountability.

Each DoD Component develops facilities planning regulations to address its respective requirements. For example, the Air Force Instruction 32-1024, Standard Facility Requirements, provides guidance on the Facility Requirements System to develop and approve standards that define the type, number, and size of facilities. Readers should check with their organizations for applicable regulations and guidance on facility planning.

Installation Master Planning

The DoD Facilities and Installation Management Office (FIM) is the proponent for DoD policy related to installation master planning (as contained in DoD Instruction 4165.70, Real Property Management. "Installation master planning" is DoD's term for community or urban planning; it establishes patterns and rules for land use and development, architectural forms, and transportation networks on military installations. In addition to enhancing installation sustainability, master planning has the goal of improving life quality for installation residents, while preserving and reinforcing the installation's ability to support the defense mission.

Consistent with these goals, in May 2012 the Department released Unified Facilities Criteria (UFC) 2-100-01, Installation Master Planning. The new guidelines advocate for implementation of a comprehensive master plan to transform installations both physically and operationally. Specific examples of transformative projects include the creation of walkable, mixed-use neighborhoods; higher-density developments; and more energy-efficient buildings.

Types of Facilities

The term Facilities includes the permanent, semi-permanent, or temporary real property assets required to operate and support the materiel system, including conducting studies to define types of facilities or facility improvements, locations, space needs, utilities, environmental requirements, real estate requirements, and equipment.

Permanent or Fixed Facilities

Per the JP 3-34, Joint Engineer Operations, permanent facilities are designed and constructed with finishes, materials, and systems selected for high energy efficiency and low maintenance and life-cycle costs, permanent standard construction has a life expectancy of more than 10 years. Construction standards should also consider the final disposition and use of facilities and any long-term goals for these facilities to support HN reconstruction. The CCDR must specifically approve the use of permanent construction standards at non-enduring locations.

Semi-Permanent

Per the JP 3-34, Joint Engineer Operations, semi-permanent buildings and facilities are designed and constructed to serve a life expectancy of less than 10 years. With maintenance and upkeep of critical building systems, the life expectancy of a facility can be extended to 25 years. Expediency of construction and material availability may be a factor. Facilities are intended for a more enduring presence with operational characteristics and functional performance similar to permanent construction. The types of structures used will depend on duration. It may be used initially if directed by the CCDR after carefully considering the political situation, cost, quality of life, and other criteria.

Per the UFC 1-201-01, Non-Permanent DoD Facilities In Support Of Military Operations, non-permanent facilities are broken down into three Construction levels: Initial, Temporary and Semi-permanent. The levels of construction are based on life expectancy of the facility established in Joint Publication 3-34, Joint Engineer Operations.

Temporary

Per the JP 3-34, Joint Engineer Operations, temporary buildings and facilities are designed and constructed to serve a life expectancy of five years or less. A minimal facility intended to increase efficiency of operations and moderately improve quality of life for occupants. Maintainability is a secondary consideration. Construction features are characterized by low cost, expedient construction utilizing locally available materials and construction methods and equipment. Temporary construction typically cannot be economically converted to a higher construction level. Temporary standard construction can be used from the start of an operation if directed by a CCDR. It is typical for non-transient mission activities.

Host Nation Support (HNS)

Per the JP 3-34, Joint Engineer Operations, through national planning channels, HNS and contingency mutual support agreements are developed to facilitate joint operations. Whenever possible, available, and suitable HNS should be considered as an alternative to deploying major or specialized support. HNS may also increase the timeliness of response to a developing situation.

While HNS may be encouraged for common support items, the use of HNS must be weighed against mission requirements. The JFC must carefully balance the advantages of using HNS with the danger of establishing dependence on potentially unreliable sources.

Per the DoD Facilities and Installation Management Office (FIM), in some instances, DoD allies help sustain regional and global security through their support of stationed U.S. forces. Installation and operational costs are shared between the U.S. and host nations either directly or indirectly.

Host Nation Funded Construction

Per The DoD Facilities and Installation Management Office (FIM), one of the chief methods through which host nations share the cost of stationed U.S. forces is through **Host Nation Funded Construction** (HNFC). There are currently several major ongoing HNFC programs in Japan and Korea.

FIM's responsibility is to ensure that before seeking Deputy Under Secretary of Defense (Installations and Environment) (DUSD(I&E)) approval, proposed construction projects are executable; reasonably priced and scoped; and most importantly, that they support theater commanders' highest priorities. To ensure the optimization of HNFC resources, FIM reviews projects submitted by U.S. Forces Korea and U.S. Forces Japan through U.S. Pacific Command, endorsing the most mission-essential facilities and infrastructure projects.

Major Ranges and Test Facility Base (MRTFB)
Per the DoDD 3200.11, Major Range and Test Facility Base (MRTFB), MRTFB is the designated core set of DoD Test and Evaluation (T&E) infrastructure and associated workforce that must be preserved as a national asset to provide T&E capabilities to support the DoD acquisition system.

Navy Engineering Organizations Supporting Facilities and Infrastructure
Per the JP 3-34, Joint Engineer Operations, Navy engineers provide services across a full range of civil and military operations. Engineering projects, services, and missions are generally handled between two major organizations: the Naval Facilities Engineering and Expeditionary Warfare Center (NAVFAC) and the Naval Construction Force (NCF).
(1) The NCF conducts peacetime, contingency engineering, and expeditionary construction operations in support of Navy, USMC, and joint forces. The NCF provides the JFC with an expeditionary toolkit of scalable and rapidly deployable military engineers who provide contingency construction and limited public works capabilities in support of mission objectives.
(2) NAVFAC manages the Navy and Marine Corps MILCON projects and environmental restoration programs and supports Commander, Navy Installations Command's, shore installation management program. Providing engineering services, acquisition, and technical support to shore facilities and real property are the responsibilities of NAVFAC. NAVFAC also provides support to the joint warfighter. Though not a part of an operating force, CCDRs and component commanders receive support from NAVFAC in three areas:
(a) Execute contract construction funded from the MILCON appropriation.
(b) Provide construction supplemental and contingency contracting capability to plan, design, and execute construction in theater, including architect-engineering services, real estate, environmental compliance, and BOS facility services.
(c) Provide a broad spectrum of technical support capabilities in engineering and scientific disciplines during both deliberate planning and CAP and solve challenging problems related to engineering, infrastructure, and environmental compliance during contingency operations.

Building Systems
Per the JP 3-34, Joint Engineer Operations, building systems may provide a rapid solution to facilities requirements. The engineer planner analyzes cost, availability, and timeline for execution of construction when considering the procurement and use of building systems (e.g., fabric skin, metal frame structures, steel arch structures, and panel building systems).

(a) The US Air Force and the US Army maintain and deploy a number of expeditionary basic camps that consist of tents and fabric skin and metal frame structures that are rapidly assembled. These systems may require engineer support for site preparation and set layout and assembly.
(b) Commercial building systems are also available worldwide. These systems include basic shelters and modular building systems complete with built-in utility wiring and utilities. While

rapidly assembled and usually capable of being relocated, they are typically more expensive than austere facilities constructed in the field.

Government vs. Contractor Ownership & Operation
Note: Definitions below are from the DAU Glossary.

Government Owned – Government Operated (GOGO)
The term GOGO refers to a manufacturing plant that is both owned and operated by the government. Note that per 10 USC 2464, the DoD shall maintain a core logistics capability that is Government-owned and Government-operated (including Government personnel and Government-owned and Government operated equipment and facilities).

Government Owned – Contractor Operated (GOCO)
The term GOCO refers to a manufacturing plant that is owned by the government and operated by a contractual civilian organization.

Contractor Owned – Government Operated (COGO)
A manufacturing facility owned and operated by a private contractor performing a service, under contract, for the government.

Contractor Owned – Contractor Operated (COCO)
The term GOGO refers to a manufacturing plant that is both owned and operated by the government.

Facilities & Infrastructure for Information Technology (IT) Systems
Facilities and Infrastructure for IT systems pose unique challenges and are addressed as an integral part of the DoD Enterprise Service Management Framework (DESMF) and the Department's IT Service Management (ITSM) capability.

In support of IT Operations, Facilities and Infrastructure management encompasses all computer hardware (owned or deployed on behalf of DoD), all software that runs on the infrastructure, and all network components. Command Centers, Data Centers, and outsourced facilities fall within the Facilities Management scope of IT Operations.

Facility Planning, Design and Construction
DoD's military construction (or "MILCON") program includes work necessary to produce complete and usable facilities or to complete usable improvements to existing facilities in support of DoD Components. For Fiscal Year 2012, the Department received approximately $12 billion for the design, construction, and major renovation of facilities worldwide. The MILCON process ranges from facility planning (at installations with requirements for new facilities) through project programming and budgeting (in DoD Component commands and headquarters) to project design and construction (via the Department's design and construction agents—the Army Corps of Engineers and the Naval Facilities Engineering Command).

The DoD Facilities and Installation Management Office (FIM) monitors DoD's MILCON program to ensure that DoD construction agents execute MILCON projects in the most efficient and cost-effective manner possible. FIM has responsibility for:

- Oversight of the Department's execution of statutory authorities for MILCON, as contained in chapter 169 of title 10, United States Code
- Publication of Department policy for MILCON in DoD Directive 4270.5, Military Construction (PDF, 102KB)
- Review of Component requests for MILCON projects in the annual budget process
- Generation of the annual draft MILCON authorization bill for submission to Congress
- Supervision of MILCON project execution and status reporting
- Submission of congressionally mandated reports

Facilities Inventory

Per DoDI 4165.70, Real Property Management, the Military Departments shall keep accurate records of the real property of the Department of Defense under their jurisdiction, custody, and control pursuant to 10 U.S.C. 2721 (reference (i)), and in accordance with DoD Instruction 4165.14 (reference (j)). The Military Department having real property accountability for a joint installation or leased facility will include that property in their inventory data.

DoD Efforts to Reduce Excess Facility Inventory

Per the DoD Facilities and Installation Management Office (FIM), the Department aggressively manages a demolition program aimed at reducing excess and obsolete facilities on its installations. In 1998, Defense Reform Initiative Directive #36 directed the Military Departments to eliminate 80 million square feet (MSF) of excess facilities by Fiscal Year (FY) 2003. The Department exceeded that objective, eliminating a total of 86.6 MSF of excess facilities.

The current phase of the demolition program was initiated in December 2004, following a comprehensive survey of DoD's excess facilities, including those controlled by the Defense Agencies and Activities. Despite funding constraints, the Defense Components achieved the Department's goal of eliminating an additional 62.3 MSF of excess facilities by the end of FY 2013. Further, as part of a renewed effort to improve space usage, consistent with the Unified Facilities Criteria on Installation Master Planning (UFC 2-100-01), the Components have identified an additional 28.6 MSF of facilities that could be demolished by FY 2019.

The Department will continue working with the Defense Components to develop and implement more effective and efficient methods of eliminating excess infrastructure. This includes more proactively managing the Department's processes to meet historic-preservation requirements; address environmental concerns; and expedite efforts intended to mitigate adverse environmental impacts. In addition, the Department will continue working with host nations to expedite the return or disposal of excess facilities in foreign countries, thereby removing such facilities from DoD's real property inventory.

Budgeting for Facilities
The Facilities Sustainment, Restoration, and Modernization (FSRM) program provides funds to keep the Department's inventory of facilities in good working order (i.e., day-to-day maintenance requirements). In addition, the program provides resources to restore facilities whose age is excessive or have been damaged. FSRM includes alterations of facilities to implement new or higher standards or to accommodate new functions or missions. The demolition program provides funds to demolish and dispose of obsolete and excess structures, some of which date back to World War II.

Working Capital Funds
Some facility and infrastructure operations may be supported by working capital funds such as:

- Direct costs, such as labor and materials,
- Indirect costs, such as facilities operation and maintenance,
- Hardware costs, such as acquisition and repair of equipment needed to support warehouse operations,
- Operations costs, such as labor, travel, training, transportation of personnel, and
- Other general and administrative costs.

Readers should check with their organizations for applicable regulations.

Also see Product Support Management IPS Element in this guidebook for more information.

11.1.2 Location Selection
Location selection of DoD facilities is dependent upon many factors to include:

- DoD mission requirements
- Type of facility
- Purchase, Construction, Sustainment costs
- U.S. and international laws
- Availability of space suitable for the intended facility

Each DoD Component develops facilities planning regulations to address its respective requirements for location selection. For example, Air Force Manual 32-1084, Facility Requirements, provides specific guidance on requirements and criteria for determining location selection during Air Force facility and infrastructure planning. Readers should check with their organizations for applicable regulations and guidance on facility location selection.

Geospatial engineering
Per Joint Publication 3-34, Joint Engineer Operations, geospatial engineering consists of those engineer capabilities and activities that portray and refine data pertaining to the geographic location and characteristics of natural and constructed features and boundaries in order to provide engineering services to commanders and staffs.

Examples include terrain analysis, terrain visualization, digitized terrain products, nonstandard tailored map products, precision survey, geospatial data management, baseline survey data, identification of significant cultural sites and natural resources, facility support, and force beddown analysis. Geospatial engineering tasks require highly technical and specialized capabilities. These may include processing data from disparate sources such as remote sensed imagery, field reconnaissance, digital data, intelligence data, existing topographic products, and other collateral data.

11.1.3 Space Requirements Determination

Per DoDD 4165.06, Real Property, it is DoD policy that DoD real property shall be managed in the most economical manner to reduce costs to the Department without obstructing or prejudicing current or projected defense requirements. Based on this policy, facilities and infrastructure size and capacity should be planned to meet mission requirements.

Each DoD Component develops facilities planning regulations to address its respective requirements for space requirements. For example, Air Force Manual 32-1084, Facility Requirements, provides guidance for determining space allocations for Air Force facilities and may be used to program new facilities or evaluate existing spaces. It provides facility space allowance guidance by category code (CATCODE). These criteria are used in assigning occupancy of existing facilities and in programming new facilities. Readers should check with their organizations for applicable regulations and guidance on facility space requirements.

Storage Facilities Planning

Unified Facilities Criteria (UFC), UFC 4-440-01, contains criteria for planners, engineers, and architects on the planning, engineering, and design of Department of Defense (DoD) storage facilities. The information in this UFC applies to the design of all new construction projects, to include additions, alterations, and renovation projects in the continental Unites States (CONUS) and outside the continental US (OCONUS). Alteration and renovation projects must update existing facilities to meet the guidance and criteria contained in this UFC within budgetary constraints. This is supplementary guidance to be used in conjunction with Facility Requirements Documents (FRD), Facility Requirements Supplements (FRS), Intrusion Detection Systems Engineering Plans (IDSEP), Installation Appearance Plan (IAP), and other DoD material for the planning and construction of DoD storage facilities

11.1.4 Environmental Requirements Determination

Per the JP 3-34, Joint Engineer Operations, Executive Order (EO) 12114, Environmental Effects Abroad of Major Federal Actions, and Title 32, Code of Federal Regulations (CFR), Part 187, provide direction and policy guidance regarding environmental planning when major federal actions have significant effect on the environment outside the US and its territories. For operations within the US, its territories, and jurisdictions, environmental planning must be accomplished as required by the National Environmental Policy Act, and the implementing regulations of the Council on Environmental Quality. In cases of emergency or where national security interests are involved, DoD actions may be exempted from environmental planning requirements or applicable requirements may be modified.

Legal counsel should be consulted to determine applicable requirements and confirm that DoD actions are lawful.

Environmental and Hazardous (EPA)
Per the United States Environmental Protection Agency, federal agencies and their facilities must comply with environmental laws and requirements in the same manner and to the same extent as any other regulated facility. Federal facilities include lands and improvements to lands (buildings, structures, and equipment) owned by, constructed, or manufactured for the purpose of leasing to, the federal government.

Role of Occupational Safety and Health Administration (OSHA)
Per DoDI 6055.01, DoD Safety and Occupational Health (SOH) Program, all new facility designs must be reviewed and facilities inspected before use to ensure they meet safety, health, and fire standards for occupancy and use.

11.1.5 Security Requirements Determination

Per DoD Manual 5200.08, Volume 3, Physical Security Program: Access to DoD Installations, It is DoD policy that:
a. In accordance with DoDI 5200.08, DoD installations, property, and personnel must be protected. Commanders have authority to take reasonably necessary and lawful measures to protect installation property and personnel, but that authority must not be exercised in an arbitrary, unpredictable, or discriminatory manner. Removal or denial actions must be based on reasonable grounds and be judiciously applied.
b. In accordance with DoDD 5400.11, personally identifiable information collected, used, maintained, or disseminated in the execution of this issuance will be appropriately maintained and safeguarded to prevent its unauthorized access, use, disclosure, or loss. The collection, use, maintenance, and dissemination of personally identifiable information must comply with the requirements of 5 U.S.C. 552a, DoDD 5200.27, DoDD 5400.11, DoD 5400.11-R, DoDI 5505.17, DoDI 5400.16, and Volume 4 of DoD Manual (DoDM) 5200.01.

Refinement of Antiterrorism Standards for Buildings
Antiterrorism (AT) building standards help protect personnel, assets, and facilities from acts of terrorism by incorporating defensive safeguards into the construction of inhabited buildings. Key objectives of AT standards are to:

- avoid progressive building collapse
- reduce flying debris hazards
- limit airborne contamination
- provide mass notification

AT standards are developed by the DoD Security Engineering Working Group, in accordance with applicable DoD policy guidance, and published as Unified Facilities Criteria under the authority of the DoD Engineering Senior Executive Panel.

In February 2012, DoD updated Unified Facilities Criteria 4-010-01, Minimum AT Standards for Buildings, included a refinement in the table of minimum standoff distances between protected buildings and vehicles. Rather than the previous "one-size-fits-all" approach, the table reflects discrete distances for each type of building construction, based on the results of field testing. This will allow more accurate planning and site layout options without compromising protection for building occupants.

In December 2012, the Deputy Secretary of Defense directed a change to the Department's AT standards for off-installation leased facility space. For these locations, the Department now uses the standards developed by the federal Interagency Security Committee (ISC) that apply to all other federal agencies. The ISC is comprised of representatives from twenty-one federal agencies and is chaired by the Department of Homeland Security.

Readers should check with their organizations for applicable regulations and guidance on facility AT requirements.

11.1.6 Utilities Requirements Determination

The Unified Facilities Criteria documents provides guidance on utilities requirements determination. A listing by title of these documents is found at the UFC Homepage.

Power Generation

Per the JP 3-34, Joint Engineer Operations, access to safe, reliable power is critical to the military's ability to complete nearly every mission at every level, from the tactical to strategic. In some cases, the level of electrical service available may serve as a measure of success for the operation itself. Since power generation is a component of general engineering, this consideration must include synchronizing work on power systems with the overall general engineering effort and associated environmental considerations. Effective planning of power generation and distribution systems, to include the proper utilization of alternative energy, will ensure that electrical power is utilized efficiently, and logistical requirements are minimized.

Wells and Water Distribution

Per the JP 3-34, Joint Engineer Operations, maintaining a constant supply of water is critical to sustaining the joint force. Specialized engineer teams are capable of drilling water wells and supporting water distribution systems. However, for engineers to successfully drill producing wells, sufficient data on location and availability of groundwater is required. Such data is maintained for Do D in the Water Resources Database at the US Army Geospatial Center. Engineers also have water purification capabilities to include reverse osmosis water purification units which can be used to purify most water sources, including saltwater or brackish water.

Heating, Ventilation and Air Conditioning (HVAC)

UFC 3-410-01 Heating, Ventilating, and Air Conditioning Systems, provides requirements and guidance in the design of heating, ventilating, and air-conditioning (HVAC) systems, together with the criteria for selecting HVAC materials and equipment.

11.1.7 Storage Requirements Determination
Unified Facilities Criteria (UFC), UFC 4-440-01, contains criteria for planners, engineers, and architects on the planning, engineering, and design of Department of Defense (DoD) storage facilities. The information in this UFC applies to the design of all new construction projects, to include additions, alterations, and renovation projects in the continental Unites States (CONUS) and outside the continental US (OCONUS). Alteration and renovation projects must update existing facilities to meet the guidance and criteria contained in this UFC within budgetary constraints. This is supplementary guidance to be used in conjunction with Facility Requirements Documents (FRD), Facility Requirements Supplements (FRS), Intrusion Detection Systems Engineering Plans (IDSEP), Installation Appearance Plan (IAP), and other DoD material for the planning and construction of DoD storage facilities and to support the preparation of DD 1391 project documentation.

11.1.8 Equipment Requirements Determination

Facility Components and Special Equipment
Facility components and special equipment requirements are determined by the needs of the individual facility. Examples of special equipment include medical equipment, environmental regulation for dust-free laboratories or manufacturing areas, hardware restoration equipment such as paint booths or metal shops, information technology infrastructure, usage of hazardous materials such as in battery manufacturing, high voltage requirements, security requirements such as soundproofing, high security monitoring systems, etc.

Readers should also review the Support Equipment IPS Element chapter in this guidebook.

Nonseverable Property
Nonseverable property includes property that cannot be removed after erection or installation without substantial loss of value or damage to the property or to the premises.

Plant Equipment (PE)
Plant equipment is personal property of a capital nature (consisting of equipment, machine tools, test equipment, furniture, vehicles, accessory, and auxiliary items, but excluding special tooling and special test equipment) used or capable of use in the manufacture of supplies, in the performance of services, or for any administrative or general plant purposes.

11.1.9 Existing vs New Facilities Determination

Facility Acquisition Methods
Although there are other types of acquisition, UFC 1-300-08 Criteria for Transfer and Acceptance of DoD Real Property, with Change 2, establishes the process required for documenting the following four methods of acquisition:

- Acquisition by construction – transfer and acceptance of accountability of a newly constructed real property asset from a construction agent to the receiving Service; also provides for the relief of the construction in progress (CIP) account;
- Capital improvement to existing facilities - transfer and acceptance of accountability for an improvement to a real property asset from a construction agent to the receiving Service; also provides for the relief of the CIP account;
- Transfer between Services - transfer and acceptance of real property asset accountability between the Military Services or Washington Headquarters Services (WHS);
- Inventory adjustment (also known as "found on site") - provides initial documentation for an undocumented real property asset found on site until sufficient documentation is located.

Standardized Facility Inspection
Per the Office of the Deputy Assistant Secretary of Defense for Construction (ODASD (CON)), for the Department to assess the health of its facility infrastructure, it needs to regularly collect data on the condition of every DoD facility. One critical metric that enables this assessment is the Facility Condition Index (FCI)**.** The FCI is a quality rating expressed as a comparison between the cost of repairing a facility to like-new condition, versus the cost of fully replacing that facility. For real-property professionals to make informed assessments about facility conditions, it is essential that they have accurate and consistent FCI data.

In the past, each DoD Component has used its own processes to determine how facility inspections are to be conducted. Unfortunately, this has resulted in inconsistent assessments of similar facilities despite their being in similar condition. To ensure that the Department has consistent facility-condition information on which to base its investment decisions, FIM led an initiative that resulted in a DoD facility condition assessment policy issued on September 10, 2013. The policy established a DoD-wide facility condition assessment process that incorporates the Sustainment Management System (SMS) developed by the U.S. Army Corps of Engineers' Engineer Research and Development Center - Construction Engineering Research Laboratory (ERDC-CERL).

The Unified Facilities Criteria documents contain facility inspection guidelines for many different types of facilities and related infrastructure, i.e., fire protection systems, HVAC, etc.

Leasing
Per DoDI 4165.71, Real Property Acquisition, leases shall be for "Government purposes" rather than for specific whenever possible. If the Government plans to construct facilities, then the lease must address transfer of the facilities at the end of the lease, so as to avoid disposal issues. Before a leasehold can be acquired, it must be shown that the activity to be accommodated is essential to an assigned mission and suitable Government-owned property is not available.

United States Code, Title 10, Section 2667, Leases: non-excess property of military departments and Defense Agencies, allows the Secretary of a Military Department to lease non-excess real and personal property under its control that is not needed for a public use for the time that it is leased. All fees received from such leases (other than from leases of property at a military installation designated for closure or realignment) shall be deposited into a special fund Treasury receipt account. Funds deposited into the special fund Treasury receipt account will be distributed to the Military Department by the USD(C) consistent with applicable appropriations acts. There are many legal and financial requirements related to leasing DoD property. Readers should check with their local organizations for specific applicable regulations.

Facilities Accreditation

There are accreditation programs to ensure specialized facilities meet proscribed standards to adequately support specific operational requirements. Facilities typically require accreditation when used for purposes requiring specific environmental, handling, safety, occupational hazards, medical, or designated scientific purposes. PSMs should check with their local facilities/installation offices for accreditation requirements.

Examples of Facilities related certifications are shown below.

Energy and Environmental Design (LEED) Certification

Air Force Sustainable Design and Development (SDD) policy supports the principles of LEED and requires all new MILCON projects be designed and built to achieve LEED Silver, with a percentage set aside for actual LEED Certification. LEED is a third-party certification program developed by the United States Green Building Council (USGBC) and is a nationally accepted benchmark for the design, construction, and operation of high-performance green buildings. LEED focuses on sustainable sites, water efficiency, energy and atmosphere, materials and resources, and indoor environmental quality.

DoDM 5105.21, Sensitive Compartmented Information (SCI) Administrative Security Manual: Administration of Physical Security, Visitor Control, and Technical Security, provides guidance for DoD Sensitive Compartmented Information Facilities (SCIF) accreditation.

NIST Federal Laboratory Accreditation/Acceptance and Recognition Programs

Laboratory Accreditation is formal confirmation by a third-party that a laboratory has demonstrated its competence to carry out specific laboratory tasks. Laboratory Acceptance generally involves a less rigorous evaluation of a laboratory's competence. In some cases, federal agencies do not accredit laboratories directly. Instead, the agencies recognize laboratory accreditation bodies and the laboratories accredited by those bodies.

Requirements for laboratory acceptance/accreditation/recognition programs within the federal government vary greatly by program. While some programs are quite comprehensive, others involve only minimal review of a laboratory's or the laboratory accreditation body's qualifications. The requirements and scope of each program generally are tailored to meet specific agency needs. In some cases, the laboratories provide only an initial product screening, with federal laboratories maintaining final responsibility for producing the test data used in enforcing regulations. Eligibility requirements for acceptance/accreditation as well as for the recognition of laboratory accreditation programs also vary among programs.

The DoD programs listed on the NIST website include:

- Army Corps of Engineers: Materials Testing Center The Army Corps of Engineers validates commercial laboratories in accordance with ER 1110-1-261 to perform the Army Corps work for CONUS MSCs.
- Environmental Laboratory Accreditation Program Using third-party Accreditation Bodies (AB), the DoD ELAP provides a unified DoD program through which laboratories can demonstrate competency and document conformance to the DoD Quality Systems Manual for Environmental Laboratories (DoD QSM).

Community Impacts

DoDD 5410.12, Economic Adjustment Assistance to Defense-Impacted Communities, establishes policies and guidance, assigns organizational responsibilities, and guides the administration of an Economic Adjustment Program to minimize economic impacts on communities resulting from changes in Defense programs, such as base closures, realignments, consolidations, transfer of functions, and/or reduction in force.

The National Environmental Policy Act (NEPA) requires federal agencies to address environmental values in their decision-making processes by considering the environmental impacts of their proposed actions and weighing reasonable alternatives to those actions.

Facilities Maintenance

Per the DoD Facilities and Installation Management Office (FIM), DoD facilities require regularly scheduled and unscheduled sustainment to make sure they remain in good working order throughout their service lives. Such activities include:

- Emergency and routine repairs
- Regularly scheduled inspections and preventive maintenance tasks
- Scheduled repair or replacement of major facility components as needed to maintain the facility (e.g., scheduled roof replacement; wall surface refinishing; HVAC system replacement, etc.)

The Facility Sustainment Model (FSM)

Per the Office of the Deputy Assistant Secretary of Defense for Construction (ODASD (CON)), FIM's facility sustainment responsibilities focus on developing budget guidance and establishing funding benchmarks for DoD Components' sustainment efforts.

By aggregating the estimated annual sustainment costs of DoD's individual facilities, the FSM calculates DoD's Annual Sustainment Requirement (ASR), through the current Budget and Future Years Defense Program years. For any given year, the sustainment metric is expressed as the percentage of the ASR that is funded. Current budgeting guidance for DoD Components is to fund sustainment at a minimum of 90% of the FSM-derived requirement; however due to budgetary issues, in recent years the Department has funded sustainment at average lower levels across the enterprise.

Recapitalization: Facility Restoration and Modernization
Per the Office of the Deputy Assistant Secretary of Defense for Construction (ODASD (CON)), facility service life is extended* through the practice of Recapitalization, which includes the restoration, modernization, or replacement of facilities or their structural components. The distinctions between Restoration and Modernization activities are as follows:

- **Restoration** activities intend to restore real property to such a condition that it may be used for its designated purpose. Such activities include repair and replacement efforts to renovate facilities damaged by inadequate sustainment, excessive age, natural disaster, fire, accident, or other causes.
- **Modernization** activities involve the alteration or replacement of facilities solely to implement new or higher standards (including regulatory changes); to accommodate new functions; or to replace building components that typically last more than 50 years (such as foundations and structural elements).

(*note that Restoration and Modernization activities are distinct from **Sustainment** activities. For further clarification on the distinctions of each term, please refer to DoD Regulation 7000.14.)

Facility Recapitalization Initiative
Per the Office of the Deputy Assistant Secretary of Defense for Construction (ODASD (CON)), DoD installations must support the needs of the warfighter, either through the use of existing facilities or through the fiscally responsible construction of new facilities. Management of existing real property involves both facility sustainment and recapitalization. Whereas sustainment focuses on keeping facilities operational through preventative maintenance and repair; recapitalization includes the restoration, modernization, or replacement of facilities or their structural components to extend or restore a facility's lifecycle.

Demolition and Disposal of Excess Facilities
Per the Office of the Deputy Assistant Secretary of Defense for Construction (ODASD (CON)), DoD has made significant strides to strategically eliminate excess facilities from its property inventory. Per DoDI 4165.72, Real Property Disposal, that real property with no foreseeable military use or that is not economically feasible to repair will be disposed of in accordance with applicable law, policies, guidance, and procedure. FIM provides guidance and procedures to implement this policy.

Demolition and disposal of excess or obsolete facilities serves to:

- Reduce operating and maintenance costs.
- Eliminate potential fire and safety hazards from installations.

- Remove the potential for the unauthorized use of excess facilities.
- Eliminate degraded facilities that detract from the overall integrity of installations.

Consistent with legal requirements, the Department uses situation-appropriate methods to eliminate obsolete, inefficient, and underutilized support infrastructure. For example, DoD may demolish and rebuild or renovate an obsolete facility to satisfy newer operational or mission requirements.

Shuttering Buildings

Per the Office of the Deputy Assistant Secretary of Defense for Construction (ODASD (CON)), although only a short-term solution, in some cases it is more cost-effective to "shutter" an excess facility than to demolish it. Shuttering a building involves removing it from active use, disconnecting its utilities, and rendering it inaccessible to unauthorized personnel. Such procedures all but eliminate operating costs and keep unneeded facilities from being used for inappropriate purposes. However, while this approach saves demolition costs, it does not fully eliminate potential secondary problems. Left vacant and unmaintained for years, "shuttered" buildings can become eyesores and even fire or safety hazards if not kept under regular surveillance. For those reasons, shuttered buildings still ultimately need to be removed from installations.

11.2 Site Activation

Site Activation refers to rendering operational those facilities required to house, service, and launch prime mission equipment. Deployment and fielding are generic terms used interchangeably, covering the activities known as fleet introduction in the Navy, site activation in the Air Force, materiel fielding in the Army, and fielding in the IT/AIS community.

The deployment process is designed to turn over newly acquired or modified systems to users who are being and have been trained and equipped to operate and maintain the equipment. All organic or contractor-operated elements of logistics must be in place at appropriate levels at the time of deployment.

Although it may seem a straightforward process, deployment is complex and can be costly if not properly managed. When properly planned and executed, deployment can make a major contribution toward mission achievement if planned levels of unit readiness are met, planned costs are not exceeded, and logistics turmoil is minimized. Specific DoD Component references are found in the DAU ACQuipedia article, System Fielding and Site Activation.

A. Facilities and Infrastructure Major Activities by Acquisition Phase

Activities of the Facilities & Infrastructure IPS Element

Each activity of the Facilities & Infrastructure IPS Element, as listed in the PSM Guidebook Appendix A, is under the responsibility of the Program Manager, the Product Support Manager, and the lead stakeholder from other areas as applicable, i.e., configuration management, engineering, environment, manufacturing, etc. Relevant proponent DoD offices are listed in this chapter below in Section C, Proponency.

Input to the LCSP/Product Support Strategy
Detailed guidance on development of the Life Cycle Sustainment Plan (LCSP) states that "The purpose of this annotated outline is to improve sustainment planning for Department of Defense (DoD) weapon systems. This may be achieved when programs make design decisions that achieve operational performance requirements and reduce demand for sustainment."

While information from Facilities & Infrastructure activities will impact many areas of the LCSP/Product Support Strategy, the below LCSP sections specifically address Facilities & Infrastructure:
3.1 Sustainment Strategy Considerations
3.2 Sustainment Relationships
3.3 Product Support Arrangements
7.1 O&S Cost
8.1.2 Product Support Team
9.0 Supportability Analysis

As Facilities & Infrastructure activities continue through the life cycle, their impacts will both directly and indirectly impact the system's KPP, KSA and APA parameters. The PSM and LCL should start these activities early in the system lifecycle for greatest impact.

When Is Facilities & Infrastructure Delivered and Managed in the Lifecycle?
The activities within the Facilities & Infrastructure IPS Element are best visualized in the DoD Product Support Implementation Roadmap Tool. This tool allows the User to check the box highlighting information specifically linked to the Facilities & Infrastructure Integrated Product Support Element.

Once the Facilities & Infrastructure IPS Element box is checked, the timeline expands to show the detailed activities and respective outputs for each activity by phase, as show in a partial illustration in Figure 11-1 below.

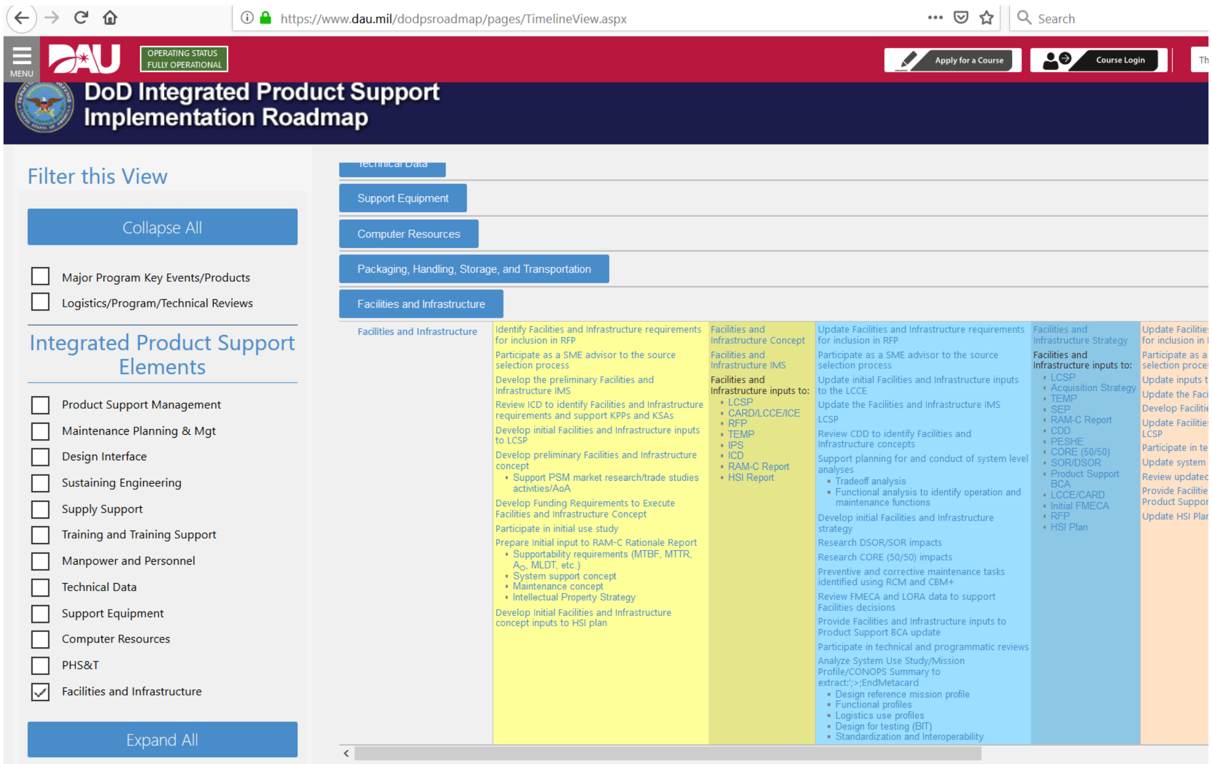


Figure 11-1, Screenshot of the DoD Integrated Product Support Implementation Roadmap Timeline View Homepage with the Facilities & Infrastructure IPS Element box checked. Notice the Facilities & Infrastructure activities and respective outputs are visible for each life cycle acquisition phase.

Each activity and output is then hyperlinked to a pop-up window that displays specific data related to that respective activity as shown in the screenshot below in Figure 11-2. The specific data is in-turn hyperlinked to allow the user to subsequently search for detailed information regarding any specific activity.

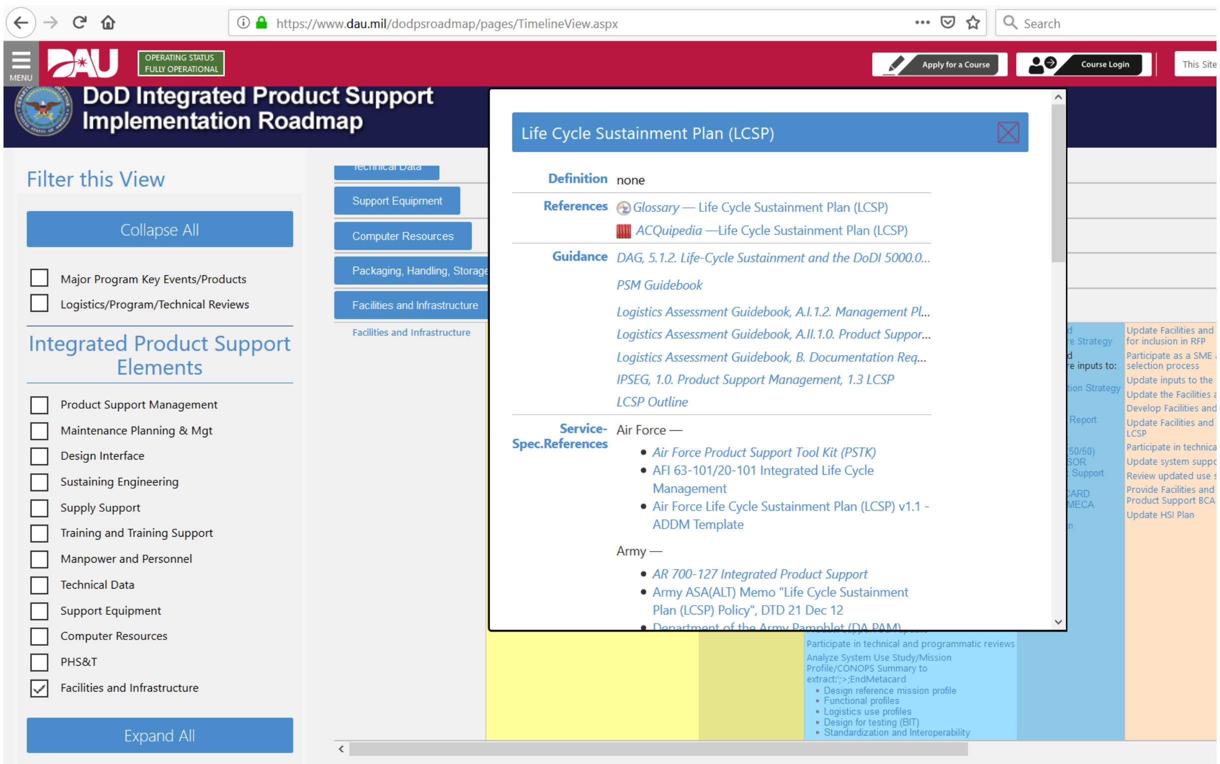


Figure 11-2, Screenshot of the DoD Integrated Product Support Implementation Roadmap Timeline View Homepage with the Facilities & Infrastructure IPS Element box checked. The User then clicked on the outcome "Life Cycle Sustainment Plan (LCSP)" from the listing of activities and outcomes for Facilities & Infrastructure. This data card provides further information for the User to search for further detailed information.

B. Data Item Description (DID) Deliverables

A Data Item Description (DID) is a completed document, typically identified in a Contract Data Requirements List (CDRL), that defines the data required of a contractor. The document specifically defines the data content, format, and intended use of the data. DIDs are found on the DLA Assist Database.

Helpful Search Hint: All DID's start with the letters "DI-." Once your search results are shown, click on the column header "Document ID" to sort by alphabetical order. The "DI-" items will be easier to find. The below DIDs are a representative listing and is not inclusive of all Facilities and Infrastructure related DIDs.

- DI-FACR-80810, Test Facility Requirements Document (TFRD)
- DI-FACR-80966, Trainer Facilities Report
- DI-FACR-80976, Facilities Plan
- DI-ILSS-81089, Training Facilities Report
- DI-MISC-81423, Facilities Maintenance Report
- DI-SESS-81638, Equipment Facility Requirements (EFR) Plan
- DI-MGMT-80033, Site Preparation Requirements and Installation Plan

- DI-MGMT-81825, Facilities Requirements Data (FRD) Development for Typical Shore-based and Shipboard Sites
- DI-MGMT-81836, Facilities Requirements Document (FRD)
- DI-MGMT-81931, Intermediate Level Maintenance Facility Report

C. Proponency

Please note that DoD organizational changes may result in changes to Office designations and Proponency responsibilities that may not match the content in this Guidebook.

Due to a re-organization of the Office of the Secretary of Defense, the directorates previously listed as part of the Office of the Assistant Secretary of Defense for Energy, Installations and Environment have been re-structured under the Office of the Assistant Secretary of Defense for Sustainment. The offices have been renamed as follows:

Office of the Deputy Assistant Secretary of Defense for Infrastructure (INF)

This office ensures strategic alignment of infrastructure capabilities and capacity with the training, readiness, and support requirements of Military Departments and Combatant Commanders in the joint operational environment.

Office of the Deputy Assistant Secretary of Defense for Facilities Management (FM)

The office of Facilities Management (FM) is responsible for the stewardship of DoD installations on behalf of the Secretary of Defense. In this role, FM is the central policy advocate on facilities for the Defense Agencies, DoD Field Activities, and U.S. Special Operations Command, as these DoD Components do not report through a Military Department.

Office of the Deputy Assistant Secretary of Defense for Environment (ENV)

The DoD is committed to implementing environmental practices to facilitate and improve the capabilities of our forces while safeguarding the long-term sustainability of our Nation's priceless resources. By acting as a responsible environmental steward, the Department can more effectively manage and sustain training, testing, and operational lands to achieve mission readiness.

Office of the Deputy Assistant Secretary of Defense for Energy

The Office of the Deputy Assistant Secretary of Defense for Energy oversees the DoD's programs related to installation energy, water use management and the cybersecurity of facility related control systems. The ODASD is responsible for issuing policy and guidance, coordinating the Defense Department’s Installation Energy Strategy, engaging with DoD Components, and coordinating all congressional reports related to Energy programs.

Office of Local Defense Community Cooperation

The U.S. Department of Defense Office of Local Defense Community Cooperation helps states and communities strengthen critical relationships with Department of Defense’s assets and installations.

Office of the Secretary of Defense, Defense Technology Security Administration

The Defense Technology Security Administration (DTSA) administers the development and implementation of DoD technology security policies on international transfers of defense-related goods, services, and technologies. It ensures:

- Critical U.S. military technological advantages are preserved.
- Transfers that could prove detrimental to U.S. security interests are controlled and limited.
- Proliferation of weapons of mass destruction and their means of delivery is prevented.
- Diversion of defense-related goods to terrorists is prevented.
- Military interoperability with foreign Allies and friends is supported.
- Health of the U.S. Defense Industrial Base is assured.

D. U.S. Government Statute, Regulations, DoD Policy and Guidance

The core listing of important policy, guidance and government reports are found at the Office of the Assistance Secretary of Defense for Sustainment, Construction Library and Archives.

Please note that due to the high rate of change occurring in policy and guidance, the letter designations found as part of a reference will be removed in this guide. Readers are encouraged to check the DoD reference source on a frequent basis to ensure they are using the current reference version.

Statutes and DoD Directives, Instructions and Manuals relevant to Facilities Management include:

- United States Code, Title 10, Section 2667, Leases: non-excess property of military departments and Defense Agencies
- DoD Directive 3020.40, Defense Critical Infrastructure Program (DCIP)
- DoDD 3200.11, Major Range and Test Facility Base (MRTFB)
- DoDD 4165.06, Real Property
- DoDD 4270.5, Military Construction
- DoDD 4275.5, Acquisition and Management of Industrial Resources
- DoDD 5105.71, Department of Defense Test Resource Management Center (TRMC)
- DoDD 5410.12, Economic Adjustment Assistance to Defense-Impacted Communities
- DoD Directive 5000.01, The Defense Acquisition System
- DoDI 5000.02, Operation of the Adaptive Acquisition Framework
- Other policy located on the DoD AAF website and DoD Issuances website
- Defense Acquisition Guidebook (DAG)
- DoDI 3200.18 - Management and Operation of the Major Range and Test Facility Base (MRTFB)
- DoDI 4165.03 - DoD Real Property Categorization

- DoDI 4165.14, Real Property Inventory and Forecasting
- DoDI 4165.56, Relocatable Buildings
- DoDI 4165.69 - Realignment of DoD Sites Overseas
- DoDI 4165.70 - Real Property Management
- DoDI 4165.71, Real Property Acquisition
- DoDI 4165.72, Real Property Disposal
- DoDI 6055.01, DoD Safety and Occupational Health (SOH) Program
- DoDM 5105.21, Vol 1, Sensitive Compartmented Information (SCI) Administrative Security Manual: Administration of Information and Information Systems Security
- DoD Manual 5200.08, Volume 3, Physical Security Program: Access to DoD Installations
- DoD Regulation 7000.14-R, Department of Defense Financial Management Regulation (DoD FMR)
- JP 3-34, Joint Engineer Operations
- MIL-STD 3007, Unified Facilities Criteria, Facilities Criteria and Unified Facilities Guide Specifications

The Unified Facilities Criteria (UFC) Program is prescribed by MIL-STD 3007 and provides planning, design, construction, sustainment, restoration, and modernization criteria, and applies to the Military Departments, the Defense Agencies, and the DoD Field Activities in accordance with USD (AT&L) Memorandum dated 29 May 2002. UFC will be used for all DoD projects and work for other customers where appropriate. All construction outside of the United States is also governed by Status of Forces Agreements (SOFA), Host Nation Funded Construction Agreements (HNFA), and in some instances, Bilateral Infrastructure Agreements (BIA). Therefore, the acquisition team must ensure compliance with the most stringent of the UFC, the SOFA, the HNFA, and the BIA, as applicable. UFC are living documents and will be periodically reviewed, updated, and made available to users as part of the Services' responsibility for providing technical criteria for military construction. Headquarters, U.S. Army Corps of Engineers (HQUSACE), Naval Facilities Engineering Command (NAVFAC), and the Air Force Civil Engineer Center (AFCEC) are responsible for administration of the UFC system. Defense agencies should contact the preparing service for document interpretation and improvements. Technical content of UFC is the responsibility of the cognizant DoD working group. UFC are effective upon issuance and are distributed only in electronic media from the following source: Whole Building Design Guide.

- DoD is responsive to the Department of Homeland Security in executing its national responsibilities. DoD's approach to executing its SSA responsibilities is detailed in the Sector-Specific Plan for the Defense Industrial Base, an annex to the National Infrastructure Protection Plan.

GAO Reports.
The following is a list of reports generated by GAO in order to satisfy Congressional reporting requirements:

- Excess Facilities
- Navy Depot Maintenance
- Economical Building Materials and Methods
- Building Security
- Army Facility Planning
- Support Standards and Costs at Joint Bases
- Oversight of Relocatable Facilities
- Federal Renewable Energy Goals
- Support for Installation Facilities and Operations
- Fiscal Exposure from Repair and Maintenance Backlogs
- Infrastructure Support for Army Installations
- High Risk Series
- Federal Real Property
- Assessing Critical Infrastructure
- Managing and Funding Base Operations and Facilities Support
- Funding and Strategic Planning Changes
- Suggested Changes to Improve Facilities Conditions

Other DoD Guidance important to facilities and infrastructure include:

- Product Support Implementation Roadmap
- Product Support Strategy Development Tool (formerly PSM Toolkit)
- PSM Guidebook
- PBL Guidebook
- Business Case Analysis (BCA) Guidebook
- Logistics Assessment (LA) Guidebook

Readers should consult with their respective organizations for specific facilities and infrastructure related policy and guidance.

E. Communities of Practice and Interest

The DAU Acquisition Community Connection maintains a Facilities Engineering Community of Practice (CoP). This Community is a platform to connect facilities engineering practitioners from across multiple career fields, offering them a chance to talk, share, and acquire knowledge about key facilities topics.

The Integrated DAU Product Support Tools and Resources website contains 17 information sources to help the Product Support Manager. Facilities and Infrastructure information is included in these resources.

The Whole Building Design Guide (WBDG) Web site is available free to the building community with the support of the Department of Defense, the General Services Administration, the Department of Veterans Affairs, NASA, and the Department of Energy. The site also hosts more than 100 free online continuing education courses, including many from the Federal Energy Management Program.

The National Institute of Building Sciences, authorized by Congress in 1974, is a nonprofit, nongovernmental organization that brings together representatives of government, the professions, industry, labor, and consumer interests to identify and resolve building process and facility performance problems. The Institute serves as an authoritative source of advice for both the private and public sectors with respect to the use of building science and technology.

F. Training Resources

The Facilities Engineering career field includes professional individuals with skills in design, construction, and life cycle maintenance of military installations, facilities, civil work projects, airfields, roadways, and ocean facilities. It involves all facets of facilities life cycle management.

DAU Courseware

Specific information is found on the Defense Acquisition University (DAU) Facilities Engineering homepage. Note, if this link does not work, then search on "DAU Facilities Engineering" and the correct link should appear near the top of the search results list. You will see links for:

- Training Courses, for example:
  - LOG 201 Intermediate Acquisition Logistics, Part B
  - CON 243 Architect-Engineer Contracting
  - FE 201 Intermediate Facilities Engineering
  - FE 301 Advanced Facilities Engineering
  - IND 100 Contract Property Administration and Disposition Fundamentals
  - IND 103 Contract Property Systems Analysis Fundamentals
  - IND 200 Intermediate Contract Property Administration and Disposition
- Continuous Learning Modules
  - CLC 103 Facilities Capital Cost of Money
  - CLC 120 Utilities Privatization Contract Administration
- DoD career field certification standards for Facilities Engineering

DAU ACQuipedia Articles

ACQuipedia serves as an online encyclopedia of common defense acquisition topics. Each topic is identified as an article. Each article contains a definition, a brief narrative that provides context, and includes links to the most pertinent policy, guidance, tools, practices, and training which further augment understanding and expand depth.

ACQuipedia was developed as a collaborative project to create content around Defense Acquisition-related topics. Articles (topics) will be maintained as a collaborative effort of subject matter experts across the Defense Acquisition University (DAU). Future growth may expand the collaboration of subject matter experts beyond DAU.

ACQuipedia provides the acquisition workforce with quick access to information in a succinct and digestible format. Article content aggregates the most relevant references and learning assets to narrowly focus users and quickly provide high value information.
Below is a listing of linked ACQuipedia articles relevant to Facilities and Infrastructure. The reader is encouraged to visit the homepage to see additional articles.

- Depot Maintenance Statute – 10 USC 2460
- Depot Maintenance Statute – 10 USC 2464
- Depot Maintenance Statute – 10 USC 2466
- Depot Maintenance Statute – 10 USC 2469
- Facilities & Infrastructure for Information Technology (IT) Systems
- Facilities Capital Cost of Money
- Government Contract Property Receipt and Issue System
- Government Property
- Human Factors Engineering (HFE)
- Independent Logistics Assessment (ILA)
- Integrated Product Support (IPS) Elements
- Integrated Product Support (IPS) Element – Facilities & Infrastructure
- Public-Private Partnerships (PPP)
- System Fielding and Site Activation

Information Technology (IT) Systems Continuous Support

Definition

As defined by U.S. Code § 11101, Title 40:
"(A) Information Technology with respect to an executive agency means any equipment or interconnected system or subsystem of equipment, used in the automatic acquisition, storage, analysis, evaluation, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information by the executive agency, if the equipment is used by the executive agency directly or is used by a contractor under a contract with the executive agency that requires the use—
(i) of that equipment; or
(ii) of that equipment to a significant extent in the performance of a service or the furnishing of a product;
(B) includes computers, ancillary equipment (including imaging peripherals, input, output, and storage devices necessary for security and surveillance), peripheral equipment designed to be controlled by the central processing unit of a computer, software, firmware and similar procedures, services (including support services), and related resources; but
(C) does not include any equipment acquired by a federal contractor incidental to a federal contract."

Objective

Identify, plan, resource, and acquire facilities, hardware, software, documentation, manpower and personnel necessary for planning and management of mission critical computer hardware and software systems. Coordinate and implement agreements necessary to manage technical interfaces, and to manage work performed by maintenance activities. Establish and update plans for periodic test and certification activities required throughout the life cycle.

Description

Information technology systems continuous support encompasses the facilities, hardware, software, firmware, documentation, manpower, and personnel needed to operate and support mission critical information technology systems hardware/software systems.
As the primary end item, support equipment, and training devices increase in complexity, more and more software is being used. The expense associated with the design and maintenance of software programs is so high that one cannot afford not to manage this process effectively and proactively. It needs to become standard practice for the Program Manager (PM) and Product Support Manager (PSM) to participate in the engineering and continuous development process from program inception to ensure software engineers, systems engineers, users, and product support managers are integrated and collaborating continuously in order to accomplish the necessary planning and management of IT systems continuous support to include management of weapon system information assurance across the system life cycle.

Information systems, electronics, and software are often part of the technical data that defines the current and future configuration baseline of the system necessary to develop safe and effective procedures for continued operation of the system.

Software technical data comes in many forms to include, but not limited to, specifications, flow/logic diagrams, Computer Software Configuration Item (CSCI) definitions, test descriptions, operating environments, user/maintainer manuals, and computer code. IT systems interface with the Global Information Grid (GIG) via the Defense Information Switch Network (DISN) or other network connectivity must be identified, managed, and actively coordinated throughout the life cycle to assure mission critical connectivity.

Electromagnetic Compatibility/Interference (EMC/EMI) requirements must be periodically evaluated and tested as weapon systems and mission scenarios evolve. Electromagnetic Pulse (EMP) and other survivability requirements must be evaluated and tested at specific intervals over the life cycle.

System Security/Information Assurance is a total life-cycle management issue, with a constantly evolving cyber threat. Consider cybersecurity and supply chain risk management practices throughout the lifecycle to reduce vulnerabilities. Disaster recovery planning and execution is a requirement for mission critical systems and will be driven by continuity of operations plans of the using organizations.

Automated Identification Technology (AIT) will be a significant consideration for systems that deploy or components that are transported through standard supply channels for distribution, maintenance, and repair. Electronic Data Interchange (EDI) will be a constant management challenge as commercial methods and standards will change many times during the operational life of a weapon system.

PMs, through the PSM, need to coordinate at program inception with an organic software engineering entity in order to identify intellectual property and data rights for inclusion in subsequent contracts. PSMs should collaborate with the software engineers in order to tailor data/license rights acquisition and ensure it is aligned with the acquisition and product support strategies. The PSM will also ensure the data rights and license management strategies are documented within the IP strategy. The PSM will coordinate with the software engineer to develop a holistic business case analysis to determine a best value product support strategy that considers all aspects of hardware and software.

Overview

Nearly all DoD systems rely on information technology and software for their operation, integrated into every facet of military systems, from the more common Information Technology (IT) systems to the less obvious "embedded" software-intensive systems. Software is embedded in the weapon system, ground equipment, test equipment, and support equipment that the DoD delivers to the fleet and supports throughout their life cycle. It adds tools and weapons capabilities that would likely not be possible otherwise. With the advent of software-driven Portable Electronic Maintenance Aides (PEMA), diagnostics and prognostics, and maintenance data collection systems, software is also an increasingly critical part of the maintenance environment.

Per the DFARS 239.7301, "Information technology" (see 40 U.S.C 11101(6)) means, in lieu of the definition at FAR 2.1, any equipment, or interconnected system(s) or subsystem(s) of equipment, that is used in the automatic acquisition, storage, analysis, evaluation, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information by the agency. The term "information technology" includes computers, ancillary equipment (including imaging peripherals, input, output, and storage devices necessary for security and surveillance), peripheral equipment designed to be controlled by the central processing unit of a computer, software, firmware and similar procedures, services (including support services), and related resources. The term "information technology" does not include any equipment acquired by a contractor incidental to a contract.

Per the Technical Data and Computer Software Rights Handbook 9th Edition , computer software is defined by DFARS 252.227-7013(a)(3) and DFARS 252.227-7014(a)(4) as computer programs, source code, source code listings, object code listings, design details, algorithms, processes, flow charts, formulae and related material that would enable the software to be reproduced, recreated or recompiled, but excludes computer databases or computer software documentation. This definition does not expressly mention firmware as being a type of computer software. (SMCI62-109 defines firmware as the "combination of a hardware device and computer instructions or computer data that reside as read-only software on the hardware device.") Nevertheless, the software portion of firmware is encompassed by the broad definition of the term "computer program," i.e., "a set of instructions, rules, or routines recorded in a form that is capable of causing a computer to perform a specific operation or series of operations."

Computer hardware, due to the rapid pace of technology change, is often acquired through a Commercial-Off-the Shelf (COTS) system. Per the Defense Acquisition Guidebook, maximum use of mature technology (including non-developmental and/or standards-based COTS computer hardware) provides the greatest opportunity to adhere to program cost, schedule, and performance requirements by leveraging industry's research & development and is consistent with an incremental acquisition approach. However, this is not a one-time activity.

Unanticipated changes and the natural evolution of commercial items may drive reconsideration of engineering decisions throughout the life cycle. In addition, the program must consider the logistics implications of supporting commercial items in a military environment. Finally, because COTS items have a relatively short life, a proactive diminishing manufacturing sources and material shortages/obsolescence approach should also be considered. Consequently, care must be taken to assess the long-term sustainability of COTS options and to avoid or minimize single source options.

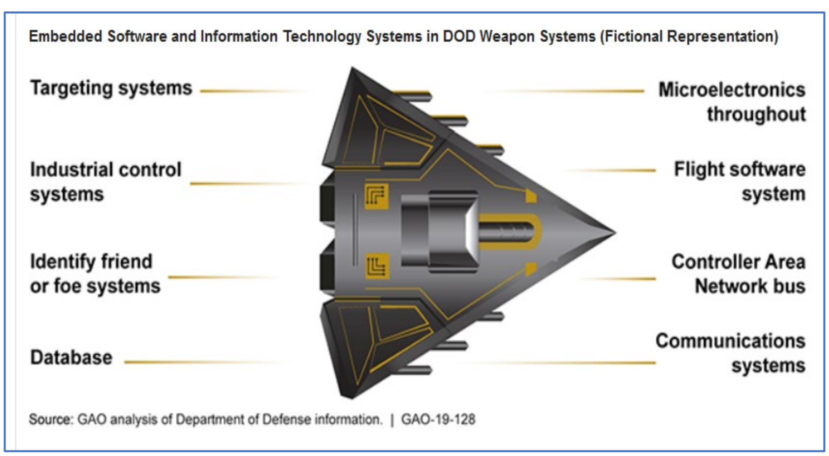
Because software is fundamentally different from hardware, these differences factor into the approach for sustaining software systems.

What Makes Software Different than Hardware	
Cause of Failures	In hardware, most failures can be traced back to problems to material and manufacturing issues. Software defects usually are built into the system as a result of undiscovered errors in the requirements, design, and coding.
Product Life (Wear-out)	Hardware will physically wear out over time. Software, not being a physical product, does not wear out.
Reparability	When hardware breaks, parts are replaced to maintain the system in operation. When software breaks, the software must be analyzed, redesigned, and recoded to bring the system to full functionality.
Reliability	Hardware reliability is predictable. Software reliability is not predictable and depends almost entirely on human factors in design.
Redundancy	Hardware reliability will improve when redundant components are used in the system. Software reliability will not improve with redundant software modules. An error that affects one software module will affect all similar modules.
Interfaces	Hardware interfaces have physical properties and can be visually inspected. Software interfaces are purely conceptual and cannot be completely tested.
Component Standardization	Hardware modularization helps improve maintainability and reduce downtime. Software code modularity has been around for some time but is used to a limited extent. Strictly speaking there are no standard parts for software.

Why IT Systems Continuous Support is Important

The role of information technology and computer hardware and software is becoming ever more integral to the operation and support of all weapon systems. In fact, most weapon systems can no longer function properly without their integrated information technology system operating correctly.

According to [GAO reports](), DoD's weapon systems are more software dependent and more networked than ever before—making them more vulnerable to cyberattacks. DoD's networks can also be used to attack other information technology systems. The DoD is now



prioritizing cybersecurity in weapon systems acquisition.

Product Support Manager Activities

12.1. Life Cycle Sustainment Planning and Management
Life cycle sustainment planning and management for the IT Systems Continuous Support IPS Element includes the following objectives:

a) Identify, plan, resource, and acquire facilities, hardware, software, documentation, manpower and personnel necessary for planning and management of mission critical computer hardware and software systems.
b) Coordinate and implement agreements necessary to manage technical interfaces, and to manage work performed by maintenance activities.
c) Establish and update plans for periodic test and certification activities required throughout the lifecycle.

See also DAU CLL 027, Introduction to DoD Software Life Cycle Management.

12.1.1 Pathway Specific Requirements (e.g., KPPs, KSAs, or for the Software Acquisition Pathway, the Capability Needs Statement)
The DoD 5000 series policies were updated to reflect the new set of key tenets of the Defense Acquisition System with new policies for each acquisition pathway and functional area. This Adaptive Acquisition Framework (AAF) website integrates the policies, guides, and resources for the acquisition workforce to navigate their program lifecycle.

PMs, with the approval of MDAs/DAs, may use a single acquisition pathway or leverage a combination of acquisition pathways to provide value not otherwise available through use of a single pathway. The use of multiple pathways does not affect the application of statutory thresholds otherwise applicable to the program as a whole, such as the MDAP or major system (ACAT II) thresholds unless a statute permits.

PMs employing multiple pathways will:

- Define the transition points from one pathway to another pathway;
- Anticipate, develop, and coordinate the information requirements required at the new pathway entry point.

Per Defense Acquisition Guidebook (DAG), CH 6–3.6.9 Contracting - Special Circumstances and Best Practices, there is no one “best fit” type of contract for the acquisition of information technology. Many program offices have found that having a contracting officer integrated into the program planning activities up-front to gain subject matter expertise into the IT capability enables more appropriate contracting vehicles to be applied. When acquiring IT and developing requests for proposals (RFP) and contract statements of work (SOW/PWS), they should be reviewed as part of the acquisition process to ensure that IT standards established in a program's requirements document are translated into clear contractual requirements. Various methodologies, toolsets, and information repositories have been developed to assist the Program Manager (PM) and the Product Support Manager (PSM) in the implementation of COTS software-based programs. The remainder of this section provides the PM descriptions of best practices, available tools and methods, and critical success factors for use in the acquisition of commercially based solutions.

Per the DAG Chapter 3, Systems Engineering, given the challenge and importance of SW acquisition, the Program Manager (PM) should understand and emphasize the following key Software Engineering (SWE) principles that enable efficient capability delivery to the warfighter:

- Integrate SWE into the SE Process:
  - Plan for and integrate SWE activities within SE processes and acquisition documents, particularly for system-level technical reviews and technical baselines.
  - Integrate SWE design analysis, test, and demonstrations within SE processes.
- Commit to Measurement: use predictive SW metrics and quantitative analysis techniques to support data-driven decisions at every level (e.g., IPT Lead, Chief SE, PM, PEO, SAE).
- Continuously Evaluate and Update SW Schedule Estimates:
  - Substantiate SW schedule realism with a rigorous basis of estimate.
  - Continuously evaluate the viability and degree of optimism in SW schedules.
- Measure and Project SW Maturity & Readiness for T&E/User: (e.g., defects, stability).
- Rigorously Manage SW Requirements:
  - Integrate SW considerations into system requirements and design.
  - Ensure SW requirements are stable, traceable, allocated to iterations and assessed for dependencies to meet iteration goals for capability and test.
  - Manage cascading/deferred requirements and mitigate development concurrency.
- Adopt Continuous Integration/Delivery and Automated Testing:
  - Measure and incrementally deliver end-to-end performance and capabilities.
  - Verify and validate capabilities (to include prototypes) through early, incremental user demonstrations and tests in high-fidelity environments.
  - Use SW development environments that enable continuous builds and automated testing.
- Continuously Assess Sufficiency of SW Staffing: quantity/experience within The Program Management Office/Support Contractor Organization .

As part of the program's Acquisition Strategy, the PM and Systems Engineer should establish a SW acquisition strategy aligned with the program's Acquisition Strategy, as early as possible.

Software Measures of Effectiveness (MOE)
Per the DAG CH 3–2.3.1 Software, Quantitative SWE and SW Measurement, commitment to a quantitative (i.e., data-driven) Software Engineering (SWE) and Systems Engineering (SE) approach is vital to shape program plans; monitor execution; and inform leadership of technical risks throughout the life cycle, particularly in support of major decisions. The lack of effective SW measurement plans and best practices that address acquirer, supplier and developer needs may expose the program to high risk. The PM and SE/SWE should plan and use predictive metrics on a frequent, periodic basis to rigorously: (1) measure and control SW product performance; and, (2) assess SW schedule realism and maturity/ readiness of SW for test and delivery to user. Leading indicators provide "early warning" to enable timely risk mitigation. The program's measurement process and its associated goals, metrics and reports should be planned/contracted for early in the life cycle to ensure maximum insight across the prime and subcontractor suppliers/developers. The plan should consider both knowledge points (and associated decision makers) and inflection points (changes in metric values/trends that alert decision makers to emerging problems).

Per the DAG CH 3–2.3.1 Software, establish and manage to a core set of predictive quantitative metrics:

- Establish predictive metrics within the Systems Engineering Plan (SEP), Software Development Plan (SDP) and SW Measurement Plan.
- Key areas to monitor include: Requirements development progress and volatility, Design progress, and Code development progress (e.g., agile development metrics such as 'expected features delivered', 'release burn-up charts', etc; or traditional metrics such as 'effective software lines of code (eSLOC)', 'eSLOC growth'; 'SW staffing', 'Build delivery progress'; 'Capability delivery'; 'SW test progress'; 'Defects discovered/ fixed/ deferred', 'Defect aging/density', 'SW maturity/quality' (i.e.,. stability),etc.)
- The PM and developer should select metrics relevant to the development methodology in use (e.g., Agile metrics – such as Team & Aggregate Velocity).
- Ensure that the RFP requires the collecting and reporting of SW metrics
- Establish time-based plans (monthly, key knowledge points) with thresholds and control bounds to mitigate metrics that are off track from the goal.
- Regularly (e.g., monthly) review metrics; understand how they serve as "leading indicators," provide early warning, and use this information to make informed decisions.
- Establish benchmarks based on actual performance to inform future planning.

Net-Ready KPP Requirements for Interoperability and Operational Effectiveness
Per the Defense Acquisition Guidebook (DAG) Chapter 6, Information Technology and Business Systems, net-ready attributes determine specific criteria for interoperability, and operationally effective end-to-end information exchanges which are traceable to their associated operational context, and are measurable, testable, and support efficient and effective T&E.

- The NR KPP identifies operational, net-centric requirements in terms of threshold and objective values for Measures of Effectiveness (MOE) and Measures of Performance (MOP). The NR KPP covers all communication, computing, and EM spectrum requirements involving information elements among producer, sender, receiver, and consumer. Information elements include the information, product, and service exchanges. These exchanges enable successful completion of the warfighter mission or joint business processes.
- The NR KPP includes three attributes derived through a three-step process of mission analysis, information analysis, and systems engineering. These attributes are then documented in solution architectures developed according to the current Department of Defense Architecture Framework (DoDAF) standard.
    - Attribute 1: Supports military operations
    - Attribute 2: Is entered and managed on the network
    - Attribute 3: Effectively exchanges information

The most recent JCIDS Manual added a Certification Guide for the Net-Ready KPP (NR KPP) and expanded the Content Guide for the NR KPP.

Per the DoDI 8330.01, Interoperability of Information Technology (IT), Including National Security Systems (NSS), it is DoD policy that:
a. IT that DoD Components use must interoperate, to the maximum extent practicable, with existing and planned systems (including applications) and equipment of joint, combined, and coalition forces, other U.S. Government departments and agencies, and non-governmental organizations, as required based on operational context.
b. All IT, including defense acquisition and procurement programs and enterprise services, must have a net ready key performance parameter (NR KPP) as part of its interoperability requirements documentation. The NR KPP consists of measurable and testable performance measures and metrics derived from associated DoD architectures, and is used to assess both the technical exchange of information, data, and services, and the end-to-end operational effectiveness of those exchanges.

Software Analysis of Alternatives
Per the Defense Acquisition Guidebook (DAG) CH 2–2.3.4. Analysis of Alternatives Considerations for Major Automated Information Systems (MAIS), most likely, the effectiveness analysis in a MAIS program AoA will not involve scenario-based analysis as is common for the weapon system AoAs. The effectiveness analysis for an MAIS program should be tied to the organizational missions, functions, and objectives directly supported by the implementation of the system being considered.

The results of the AoA should provide insight into how well the various alternatives support the business outcomes that have been identified as the business goals or capabilities sought. In some cases, it may be possible to express the assessment of effectiveness across the alternatives in monetary terms, so effectiveness could be assessed as benefits in the framework for the Economic Analysis. In other cases, the effectiveness might be related to measurable improvements to business capabilities or better or timelier management information (leading to improved decision-making, where it can be difficult or impossible to quantify the benefits). In these cases, a common approach is to portray effectiveness by the use of one or more surrogate metrics. Examples of such metrics might be report generation timeliness, customer satisfaction, or supplier responsiveness. In addition to management information, the effectiveness analysis also should consider information assurance and interoperability issues.

See also the DAU ACQuipedia article, Analysis of Alternatives.

12.1.2. Identify Pathway Specific IT Requirements

See DoD Directive 5000.01, The Defense Acquisition System and DoDI 5000.02, Operation of the Adaptive Acquisition Framework for policy on defense program pathways tailored to the type of product being acquired or to the need for accelerated acquisition, to include the acquisition of software intensive systems.

The statutes governing defense acquisition programs are complex, and the categories into which a program falls will impact acquisition procedures. The designation of a program as an MDAP, a MAIS program, or a Major Weapons System; and the determination that the program is an Information System, a Defense Business System, or responds to an urgent need affect program procedures and policies.

Product Support Managers should ensure that all system sustainment requirements are addressed and supporting documentation is completed in accordance with the specific system acquisition pathway processes.

12.1.3. Life Cycle Sustainment Plan (LCSP)/Product Support Strategy Inputs and Reporting Requirements

The sustainment of software is inherently different from hardware. When hardware fails, a repair person either:

1. Removes the failed part, repairs it, and then reinstalls it, or
2. Replaces the failed part with an identical but functioning part.

Hardware support activities are typically dominated by corrective maintenance (fixing and replacing) and preventative maintenance to prolong service life. Hardware maintenance consists of activities taken to keep the current, established product baseline functioning as expected. When software fails, the software engineer does not replace the offending code with an identical piece of code. The code must be modified to function correctly.

Software maintenance, through modification, essentially creates a new product baseline after each modification (through versioning). These modifications drive additional sustainment planning considerations that are inherent to any other updated baseline (such as the potential need to update training as well as operator and maintainer documentation). Additionally, the more that software is modified the more its complexity is likely to increase. Increased software complexity substantially increases the overall sustainment cost and effort. Like hardware, you must plan for fixing software; unlike hardware, modifying dominates software support activities and "fixing" typically does not.

Per the Defense Acquisition Guidebook (DAG) CH 4–3.2.1.2.2 Software Sustainment, the PM plans for software sustainment in two general categories: post-deployment software support and post-production software support. The PM develops a sustainment strategy and potential source(s) of software support based on analyses of the system's operational and support requirements, as well as the operational concept. In developing the program's software sustainment strategy, the PM considers the extent of COTS and/or GOTS software; new software development; security classification; certification; and accreditation, including authorities to operate.

The PM also considers test and integration needs, transition of operational software and support tools from the developer to the post-deployment support organizations, help-desk requirements, and safety critical requirements. Properly phasing or programming for the software maintenance cost allows early budget planning for program support. Estimated costs for post-deployment software support include system patches, technology refresh, system help desk support, licenses, cybersecurity/information assurance vulnerability assessments, certification, initial field and depot software maintenance, and manning required for sustainment. Planning for technology refresh includes identifying the initial refresh year and the frequency of refresh.

IT resources support strategy is documented in the Life Cycle Sustainment Plan (LCSP)/Product Support Strategy. For major acquisition, the LCSP/Product Support Strategy is initially prepared for Milestone A and updated for the Development Request for Proposal (RFP) Release Decision Point, Milestone B, Milestone C, Full-Rate Production Decision Review (FRPDR) and at least every 5 years after a system's Initial Operational Capability (IOC). It documents life cycle sustainment planning initialized during the Materiel Solution Analysis (MSA) Phase and the evolution of sustainment planning through the other acquisition phases (Technology Maturation and Risk Reduction (TMRR), Engineering and Manufacturing Development (EMD), Production and Deployment (P&D)) and throughout the system's life cycle to disposal. The LCSP/Product Support Strategy addresses how the Program Manager (PM) and other organizations will acquire and maintain oversight of the fielded system.

Life Cycle Sustainment Plan (LCSP)/Product Support Strategy and the Information Technology Systems Continuous Support IPS Element

The logistician should identify the requirements and funding needed to develop, update, and maintain the Life Cycle Sustainment Plan (LCSP) /Product Support Strategy for the software program early in the life cycle.

The following should be considered in the LCSP/Product Support Strategy:

- Mission critical computer hardware/software operation and support

- Management reports development and maintenance
- Disaster recovery planning and execution
- Computer resource working group standup and management
- Computer programs and software baselines management
- Computer programs and software modifications management
- Software licenses management
- Software and hardware obsolescence management
- Defense Information Switch Network (DISN) or other network connectivity requirements determination and management
- Specifications determination
- Flow/logic diagrams determination
- Computer Software Configuration Item (CSCI) definitions determination
    - CSCI test descriptions
    - CSCI operating environments
    - CSCI user/maintainer manuals
    - CSCI computer code
- Automated Identification Technology management
- Electronic Data Interchange (EDI) management
- Service Level Agreements (SLA) management

The Life Cycle Sustainment Plan (LCSP) sections include:

- Section 1: summarize use of COTS, licenses, data rights, cost drivers etc.
- Section 2: identify the sustainment performance measures –vendor and SSA.
- Section 3: provide details about SSAs role and responsibility, specific licenses, help desk procedures/trouble resolution process, and the agreements that articulate them.
- Section 7: itemize the cost drivers and offer plans for how to influence them.
- Section 9: discuss the analytical methods that were used to optimize sustainment (e.g., defect tracking). What tools and processes are used to track performance and gather user feedback?

See also the Product Support Management IPS Element chapter, section 1.10.3, LCSP Development and Management, in this guidebook.

Logistics Assessment (LA)

Computer Resources and Software Support should be reviewed early in the program for specific logistics assessment criteria relative to computer and software support. Logistics Assessments should be performed at Milestones B and C, prior to Full Rate Production (FRP) decisions, at Post-IOC reviews, or at least every five years. These assessments will ensure that there is adequate supportability planning, management, resource identification, and risk mitigation for each program at different phases of its life cycle.

For applicability of Logistics Assessments to each pathway in the DoD AAF, see the DoD AAF Overarching Policies.

See also the Product Support Management IPS Element chapter, section 1.10.2, ILA Management, in this guidebook.

12.1.4. COTS/NDI/GOTs Factors

Per the Technical Data and Computer Software Rights Handbook 9th Edition , FAR 2.101 defines the term "COTS" as any item of supply that (1) is a "commercial item," (2) is sold in substantial quantities in the commercial marketplace and is offered to the Government without modification in the same form in which it is sold in the commercial marketplace, and (3) does not include bulk cargo (e.g., agricultural products, petroleum products). FAR 2.101 defines the term "commercial item" as any item of a type customarily used by the general public or by non-governmental entities for purposes other than governmental purposes that (1) has been sold, leased or licensed to the general public, (2) has been offered for sale, lease or license to the general public, (3) evolved from that item and will be available in the commercial marketplace in time to satisfy the Government's delivery requirements, or (4) any item described above but for modifications of a type customarily available in the commercial marketplace or *minor* modifications not customarily available in the commercial marketplace made to meet federal Government requirements.

DFARS 252.227-7014(a)(1) defines the term "commercial computer software" as software developed or regularly used for non-governmental purposes which (1) has been sold, leased or licensed to the public, (2) has been offered for sale, lease or license to the public, (3) will be available for commercial sale, lease or license in time to satisfy the delivery requirements of the contract, or (4) satisfies any of the criteria specified above and would require only *minor* modifications to meet the requirements of the contract.

Per the DAG CH 3–2.3.1 Software, weapon system acquisitions often contain a mix of GOTS SW with complete technical data and software rights, other SW items (e.g., COTS) with restricted Government purpose rights and SW with virtually no rights other than the commercial license to use or access the SW (see FAR (Subpart 27.4)). The PM should be aware of the implications of these differences regarding acquisition and sustainment costs, performance and the consequences on change control and sustainment of deployed systems; this is also particularly relevant in the areas of security and SW assurance. The Systems Engineer should understand the system concept of operations /operational mode summary/mission profile, any maintenance plans, and the expected users of COTS/GOTS SW applications including their level of training. This understanding is necessary to effectively balance cost, scheduling and potential risks in maintenance, training, and documentation.

Per the DAG CH 3–2.3.1 Software, for an integration-intensive system that relies substantially if not completely on NDI/COTS/GOTS software, trade-space analysis can provide important information to understand the feasibility of capability and mission requirements. Consider software and system alternatives to refine the system concept and prevent vendor "lock-in." To mitigate risks, consider materiel solutions opportunities for early software development prototyping, integration, and reuse of NDI/COTS/GOTS software. To the extent possible, ensure MSA contracts reduce technical and programmatic risk related to software, particularly for high-risk components. MSA phase should factor software sustainment considerations to inform cost and acquisition strategy, to include government technical data rights.

Internal Use Software (IUS) and IUS Valuation/Accountability
Internal Use Software (IUS) is a class of assets that consists of software and applications that are used in day to day business and not created or acquired with the intent to sell the asset. IUS can be acquired in a number of different ways, from which the purchase of Commercial Off the Shelf (COTS), development of the software by a contractor, development of software by government, and modification of acquired COTS products are the most common.

The DoD Instruction for Accountability of IUS, DoDI 5000.76, outlines the requirements for accountability of IUS and defines IUS as software that is:

- Acquired or developed to meet the entity's internal or operational needs (intended purpose)
- A standalone application, or the combined software components of an IT system that can consist of multiple applications, modules, or other software components integrated and used to fulfill the entity's internal or operational needs (software type)
- Used to operate an entity's programs (e.g., financial and administrative software, including that used for project management)
- Used to produce the entity's goods and to provide services (e.g., maintenance work order management, loan servicing)
- Developed or obtained for internal use and subsequently provided to other federal entities with or without reimbursement
- **Not** software that is integrated into and necessary to operate property, plant, and equipment rather than perform an application.

Software Intellectual Property and Data Rights
Data Management (DM) includes information about DoD data rights (IP Strategy), data elements, data sharing, Big Data (Data Analytics) and Data used during the Operations and Support (O&S) acquisition phase.

The Defense Acquisition Guidebook (DAG) Chapter 3, Systems Engineering, provides guidance for software data management and technical data rights. Rights associated with commercial products are defined in licenses (license rights) that may impose limits on product use, such as restricting the buyer's ability to alter the product or the number of copies the buyer can make. In many cases, commercial vendors offer their products on a completely "as-is" basis, making no assurance of suitability for intended purposes and offering the buyer no recourse in the event of problems.

Open-source software, sometimes referred to as “freeware,” may not actually be free; it may also have restrictions or carry embedded modules that are more restrictive than the overall package. The PM, Systems Engineer, software engineer, and contracting officer should be familiar with the restrictions placed on each software item used in the contract or deliverable to the Government.

The Program Office should ensure that necessary intellectual property rights to software are determined in advance of the RFP and contract award, and that they are acquired as needed; these rights can include such things as:

- All requirements tools and data sets
- All test software and supporting information necessary to build and execute the tests
- All other software test tools such as interface simulators and test data analyzers whether custom-developed or not
- All information for defects remaining in the software upon delivery to the Government.

See the Technical Data IPS Element chapter, section 7.9, Data Rights Management, in this guidebook.

What is Software Intellectual Property?
Per the Defense Acquisition Guidebook (DAG) CH 1–4.2.18**,** Intellectual Property (IP) is an expression of a useful concept that is legally protected such that the originator (e.g., inventor, author) is granted certain exclusive rights. The most commonly known forms of IP protection are patents, copyrights, trade secrets, and trademarks. Any or all of these may arise in DoD programs.

Intellectual Property (IP) Strategy
Per the Defense Acquisition Guidebook (DAG) CH 1–4.2.18.1, The Program Manager establishes and maintains an IP Strategy to identify and manage the full spectrum of IP and related issues including technical data, computer software deliverables, patented technologies, and appropriate license rights associated with these forms of IP, from the inception of a program through the complete life cycle.

The IP Strategy is the PM’s approach to managing the IP needs that will affect the program’s cost, schedule, and performance. The strategy needs to be captured as part of the program documentation. There are at least five questions PMs ought to consider regarding development of an IP Strategy:

- What data do I need to support my short- and long-term production, and the operations and sustainment strategy?
- What data do I already have (and what rights/licenses do I have to such data)?
- When do I need the data?

- What are the risks and opportunities associated with the lack of, or availability of, data?
- What will it cost (on the existing contract and to the total life-cycle cost)?

12.1.6. Hardware/Software Operation and Support

Software sustainment includes software maintenance as well as other key sustainment areas such as documentation, operations, deployment, security, configuration management, training (users and sustainment personnel), help desk, COTS product management, and technology refresh. Software sustainment consists of more than modifying and updating source code. It also depends on the experience of the sustainment organization, the skills of the sustainment team, the adaptability of the customer, and the operational domain of the team.

Per DoDI 4151.20, Depot Maintenance Core Capabilities Determination Process, software maintenance includes actions that change the software baseline (adaptive, corrective, perfective, and preventative) as well as modification or upgrade that add capability or functionality. Encompasses requirements development, architecture and design, coding, and integration and test activities.

DoD Directive 4151.18, Maintenance of Military Materiel provides overall policy framework for the accomplishment of DoD maintenance. It does not specifically identify what work should be accomplished at the field-level. It should be noted that while the Office of the Secretary of Defense is responsible for establishing overarching DoD maintenance policy, the three Service Secretaries are ultimately responsible for equipping their forces and maintaining their equipment (per 10 U.S.C. 3013 [Army], 10 U.S.C. 5013 [Navy] and 10 U.S.C. 8013 [Air Force]).

See also the Maintenance Planning & Management IPS Element chapter for more information on field level maintenance.

Depot Level Maintenance/Sustainment and Core Software Determination

Per DoDI 4151.20, Depot Maintenance Core Capabilities Determination Process, the depot maintenance core capability requirements determination methodology is used to determine essential DoD depot maintenance core capabilities for each Military Service, and the workloads needed to sustain those capabilities. This determination includes software for the weapon system and support equipment.

See also the Maintenance Planning & Management IPS Element chapter, section 5.2, Core capability management, in this guidebook.

Post-Deployment Software Support (PDSS)

Per the Defense Acquisition Guidebook (DAG) Chapter 3, Systems Engineering, Post-Deployment Software Support (PDSS) establishes plans and budgets for life cycle software support:

- Address SW supportability, the SW test environment, and other equipment, material, and documentation, including data rights that are required to provide PDSS for those end users identified in the SDP or documents similar to the Computer Resources Life Cycle Management Plan and LCSP/Product Support Strategy.

- Estimate costs of development and run-time licenses over the system's life cycle.
- Consider product line practices for leveraging resources across related programs.

See also the Sustaining Engineering IPS Element chapter, section 3.4.4 in this Guidebook.

12.1.7. Disaster recovery planning and execution
Critical infrastructure Protection (CIP) requires a unity of effort among stakeholders to strengthen and maintain secure, functioning, and resilient critical infrastructure that is able to withstand and rapidly recover from all hazards-physical and cyber. Achieving this requires integration with multiple systems, agencies and organizations that span prevention, protection, mitigation, response, and recovery. The resources in this section provide basic information CIP models and best practices for general and sector specific concerns. The DoD Cybersecurity Policy Chart provides many references addressing information planning, protection, and recovery.

Storage and Archiving
Per DoDI 5015.02, DoD Records Management Program, it is DoD policy that the information and intellectual capital contained in DoD records will be managed as national assets. Effective and efficient management of records provides the information foundation for decision making at all levels, mission planning and operations, personnel and veteran services, legal inquiries, business continuity, and preservation of U.S. history. Readers should review this regulation for more policy and information on DoD records management.

See also the Technical Data IPS Element chapter, section 7.13, Data storage and backup, in this guidebook.

NARA
The National Archives and Records Administration (NARA) is the nation's record keeper. Of all documents and materials created in the course of business conducted by the United States Federal government, only 1%-3% are so important for legal or historical reasons that they are kept by the DoD forever.

Defense Information Switch Network (DISN) or Other Network Connectivity Requirements Determination and Management
The Defense Information Systems Agency (DISA) Network Connections services provide the networked communication for a collection of computers, printers, routers, switches, and other devices over various transmission medium.

Per DoDI 8410.01, Network Management (NM), It is DoD policy that:

a. All NM systems shall be capable of distributed network control and facilitate net-centric sharing of network configuration, status, security, performance, utilization, and mission impact data with authorized users in accordance with (IAW) section 2 of Enclosure 3 of this Instruction.

b. Systems that use Simple Network Management Protocol (SNMP) shall use the latest version as the target protocol version IAW section 3 of Enclosure 3.
c. DoD Components operating NM systems shall develop service level agreements (SLA) or similar agreements to ensure quality of service, interoperability, and availability of NM data exchanged between NM systems and with any authorized user IAW section 4 of Enclosure 3.
d. NM systems shall incorporate mechanisms or processes that ensure resiliency and continuity of operations in the event of a failure, loss, or disruption of NM capabilities due to a cyber-attack or other manmade or natural occurrence.
e. NM systems shall have and use integrated automated CM and Performance Based Network Management (PBNM) capabilities to improve DoD's ability to rapidly and consistently respond to information assurance (IA) cybersecurity events and maintain network availability and performance.
f. NM and SM systems shall be integrated, as appropriate, to create information technology (IT) resource management capabilities that provide the warfighter with enhanced situational awareness (SA) to support common understanding, planning, and monitoring; distributed network and spectrum control; and reduce life cycle costs.
g. NM interfaces to DoD mission partners (e.g., coalition and industrial suppliers) shall leverage and employ industry and commercial data standards, architectures, models, and exchange mechanisms to the maximum extent possible.

12.1.8. Working Group Standup and Management

Working groups typically are established to accomplish the necessary planning and management of a set of important goals or issues. Examples of tasks which a computer resources working group may address include:

- Prepare risk assessments, analyses, studies, recommendations, documents, and updates to documents associated with configuration management.
- Prepare configuration control documentation.
- Reviewing and approving standards for use.
- Provide support for any other IT Systems Continuous Support related task, as required.

See also the Product Support Management IPS Element chapter, section 1.10.1, IPT Management, in this guidebook.

12.1.9. Product Support Management considerations within Agile Software Development

Agile software development is a set of methods and practices based upon the values and principles of the Agile Manifesto. Through self-organizing, cross functional teams, software is rapidly and iteratively developed in response to evolving requirements.

PSM shall ensure the 'Definition of Done' includes supportability equities (e.g. required training updates, required documentation updates, potential impacts to manpower due to changed functionality, etc.) to support delivery to the warfighter.

Also see DAU CLE 076 Introduction to Agile Software Acquisition .

12.1.10. Product Support Management considerations within Development Security Operations

DevSecOps is an organizational software engineering culture and practice that aims at unifying software development (Dev), security (Sec) and operations (Ops). The main characteristic of DevSecOps is to automate, monitor, and apply security at all phases of the software lifecycle: plan, develop, build, test, release, deliver, deploy, operate, and monitor.

In DevSecOps, testing and security are shifted to the left through automated unit, functional, integration, and security testing – this is a key DevSecOps differentiator since security and functional capabilities are tested and built simultaneously.

The benefits of adopting DevSecOps include:

- Reduced mean time to production: the average time it takes from when new software features are required until they are running in production.
- Increased deployment frequency: how often a new release can be deployed into the production environment.
- Fully automated risk characterization, monitoring, and mitigation across the application lifecycle.
- Software updates and patching at "the speed of operations."

Also see the DAU Community of Practice, Information Technology/Software.

12.1.11. Software Configuration Management

Per DAU CLL 027, Introduction to DoD Software Life Cycle Management, many factors result in the requirement to perform software maintenance, to include modifications. The following are eight fundamental drivers of this change:

1. Defect corrections – Fixing errors in design and coding
2. Threats – Modifying the software to react to new threats
3. Policy and doctrine – Modifying the software as a result of changes to policy and doctrine
4. Safety – Modifying the software to improve safety
5. Interoperability – Modifying interfaces to stay interoperable with associated systems
6. Hardware changes – Modifying software to interface or work with hardware upgrades
7. Technology insertion – Improving software to incorporate new technologies

8. Functional changes – Modifying the functionality of the software based on user requests.

Readers should check the MIL-HDBK 61, Configuration Management Guidance, for specific guidance related to software configuration management and modifications that may occur during any phase of the acquisition life cycle. For example, DoD policy requires planning for and resourcing cybersecurity test and evaluation in order to identify and eliminate as many cybersecurity shortfalls as early in the program as possible to help avoid costly and difficult system modifications late in the acquisition life cycle. Also, the functional sponsor, in coordination with the Component CIO and Program Manager, is responsible for developing a plan and conducting a PIR for all fully deployed IT.

See also the Product Support Management IPS Element chapter, section 1.13, Configuration Management, in this guidebook.

12.1.12. Software Continuous Engineering Capabilities (Software Transition Plan (STrP) to include disposal)

Software-enabled capabilities have unique technical properties that enable frequent change, unlike any other system components. As noted in the May 2019 Defense Innovation Board Software Acquisition and Practices report on reforming DoD software practices: "Software is never 'done' and must be managed as an enduring capability that is treated differently than hardware." Recognizing this, OSD is leading a set of inter-related initiatives to develop policy, guidance, training, and enterprise resources that will transform the way that the Department acquires software.

The new software policy incorporates principles from the Lean Startup methodology, and commercial and Agile software development. Among these is a focus on demonstrating progress and value via more frequent, and continuous deliveries of working software, which enables the users and other stakeholders to examine and provide feedback on early capabilities of the system.

A key enabling culture and technology for this approach is DevSecOps, an ecosystem-based approach and set of tool-supported practices that allow considerations from development, security, and operations to be addressed early and continuously in an integrated fashion. DevSecOps helps achieve the speed necessary to deliver meaningful versions of code more frequently than ever before. It also ensures that this increase in speed does not come at the expense of good engineering practice – to the contrary, it can improve software quality. For example, it can enable rapid fixes for software vulnerabilities in minutes or hours, instead of months or years. Additionally, by automating testing and security checks on small batches of new software, these activities are done constantly rather than as separate activities that occur at the end of the lifecycle.

See the DAU Community of Practice, Information Technology/Software, for more information.

The Software Transition Plan (STrP) identifies the hardware, software, and other resources needed for life cycle support of deliverable software and describes the developer's plans for transitioning deliverable items to the support agency. The STrP is developed if the software support concept calls for transition of responsibility from the developer to a separate support agency.

12.1.13. Software Product Support Integration Planning

DoDI 5000.87, Operation of the Software Acquisition Pathway, specifies policy for software product support integration planning that encompasses lifecycle objectives, cyber security requirements, continuous engineering, interoperability, early involvement of test and evaluation, metrics and assessments, intellectual property, technical manual development, and applicable laws and regulations.

Per the DoD Enterprise DevSecOps Reference Design, V 1.0, the software development lifecycle is not a monolithic linear process. The “big bang” style delivery of the Waterfall process is replaced with small but more frequent deliveries, so that it is easier to change course, as necessary. Each small delivery is accomplished through a fully automated process or semi-automated process with minimal human intervention to accelerate continuous integration and delivery. The DevSecOps lifecycle is adaptable and has many feedback loops for continuous improvement.

The Integrated Data Environment (IDE)

Per the Technical Data and Computer Software Rights Handbook 9th Edition, an IDE is a data storage and information management system. Its purpose is to create an environment of connected knowledge workers, in which the preferred approach to performing work involves instantaneously accessing data (including work-in-process data) required to accomplish the necessary tasks and then outputting the results into an instantaneously accessible form. It is the infrastructure that permits implementation of Product Life Cycle Management as it integrates the people, processes, business systems, and information associated with the design, development, production, deployment, maintenance, sustainment, and disposal of a weapon system over its entire lifecycle. The IDE can either be a program-unique repository run by Government personnel on a Government server, a program-unique repository run by a contractor on its own servers, or an existing Government enterprise repository on a Government server (e.g., Military Engineering Data Asset Locator System [MEDALS], or Joint Engineering Data Management Information and Control System [JEDMICS]).

Joint Information Environment

Per the Defense Acquisition Guidebook (DAG) Chapter 6, Information Technology and Business Systems, the DoD, through the CIO’s Strategy for Implementing the Joint Information Environment (JIE) is transitioning to a single, joint, secure, reliable and agile command, control, communications and computing (C4) enterprise information environment. The JIE is a construct that facilitates the convergence of the DoD’s multiple networks into one common and shared global network. The intent is to provide enterprise services such as email, Internet/Web access, common software applications, and cloud computing. Primary objectives behind this transition are increased operational efficiency, enhanced network security and cost savings through reduced infrastructure and manpower.

Digital Engineering
Digital engineering is an integrated digital approach using authoritative sources of system data and models as a continuum throughout the development and life of a system. Digital engineering updates traditional systems engineering practices to take advantage of computational technology, modeling, analytics, and data sciences.

As evidenced across the Services and industry, digital engineering is a necessary practice to support acquisition in an environment of increasing global challenges and dynamic threat environments.

Artificial Intelligence (AI)
AI refers to the ability of machines to perform tasks that normally require human intelligence – for example, recognizing patterns, learning from experience, drawing conclusions, making predictions, or taking action – whether digitally or as the smart software behind autonomous physical systems. The Department of Defense's (DoD) Artificial Intelligence (AI) Strategy directs the DoD to accelerate the adoption of AI.

12.1.14. Software Reuse Including Use of COTS and Open Source Software
Per the Defense Acquisition Guidebook (DAG) CH 3–2.3.1 Software, any reuse of any system, hardware, firmware or software throughout the acquisition life cycle should be addressed in multiple plans and processes, including the SEP, Software Development Plan (SDP), firmware development plan, configuration management plan, Test and Evaluation Master Plan (TEMP), Software Test Plan (STP), Independent Verification and Validation (IV&V) Plan) and quality assurance plans (system and software). (Note**:** Software reuse has traditionally been overestimated in the beginning of programs. PMs and Systems Engineers should monitor software reuse as a potential risk.) For more discussion of software reuse, see DAG CH 3–2.4.1. Modular Open Systems Approach.

12.1.15. Software Life Cycle Cost Estimation

Software Sustainment Cost Estimation
Per DAU CLL 027, Introduction to DoD Software Life Cycle Management, section 7 of the Life Cycle Sustainment Plan (LCSP)/Product Support Strategy provides an overview of the cost estimate and identifies primary cost drivers. PMOs should also identify any potential cost mitigations. Considerations in this section include identifying:

- Software License cost estimates for the lifecycle
- The use of software cost estimation tools (e.g., COCOMO II)
- MOU/MOA/SLA renewal activities
- Software releases
- Training activities that might be driven by software releases

- Any potential disposal costs related to software reliant systems, including the destruction/degaussing of hard drives as well as secure data archiving
- Any planned activities to reduce disposal costs.

See also the Product Support Management IPS Element chapter, section 1.8, Product Support Budgeting and Funding, in this guidebook.

Software Valuation

The Defense Acquisition Guidebook (DAG) Chapter 3, System Engineering, the software engineering best practice, “Establish high-confidence cost, effort and schedule estimates,” contains the following elements:

- Estimate the cost, effort, and schedule (planning) as a yardstick for measuring progress and performance (executing)
- Use at least two methods: the methods include, e.g., Wideband Delphi, Analogy, Parametric, Bottoms-Up; SW parametric statistical analysis is a best practice
- Reconcile multiple estimate methods and derive the estimate confidence level
- Frequently monitor, reassess, and update initial SW estimates and schedules given the uncertainty with initial assumptions (e.g., sizing and staffing estimates)
- Benchmark estimates against similar DoD projects, industry norms, and most importantly with the developer’s historical performance (e.g., productivity)
- Update estimates and confidence based on SW metrics collected during execution
- Present updated estimates-to-complete at every major program review to identify deviations from the original effort/schedule baselines and risk likelihood.

DoD Enterprise Software Initiative (ESI)

The DoD Enterprise Software Initiative (ESI) has developed, due to the significant and increasing costs for annual software maintenance, this Software Maintenance Cost Tracking Guide, in combination with its accompanying Excel Workbook, provides the reader a roadmap to identify, manage, and document Software Maintenance spending by capturing data. This information is then analyzed so that spending may be addressed from many different views, with the goal of potentially reducing these costs.

12.1.16. Software Licenses Management

Information on commercial software licensing is set forth in DFARS 252.227-7014(a) as software developed or regularly used for non-governmental purposes and either 1) sold, leased, or licensed to the public; 2) offered for sale, lease, or license to the public; 3) doesn't meet the two prior conditions but will be available for commercial sale, lease, or license in time to satisfy the delivery requirements of this contract; or 4) meets any of the prior three conditions and would require only minor modification to meet the requirements of the contract.

Per the Defense Acquisition Guidebook (DAG), Chapter 6, Commercial Computer Software Licenses, a subset of the broader category of data rights, applies to any commercial computer software or software documentation and are managed as specified in the commercial license offered to the public. Program Managers must ensure that all Technical Data and Computer Software and related license rights required for procurement and sustainment of a system are available throughout a system's life cycle.

12.1.17. Software Deployment Planning

Necessary activities prior to transitioning to sustainment:

• Determination of who will conduct software life cycle management
• Adequate Test & Evaluation
• Stable Software Baseline
• Documentation sufficient to support software lifecycle management
• Authority to Operate
• Software Transition Plan
• Staffing and Training Plan

The Software Transition Plan identifies the resources needed to support delivered software and describes the developer's plans for transitioning delivered software to the support agency. Readers should see DI PSC-81429, Software Transition Plan (STrP) for more information.

See also the Product Support Management IPS Element chapter, section 1.12, Logistics Policy Implementation, in this guidebook.

12.1.18. Information Support Plan (PSM coordinates with the Systems and Software Engineers to ensure the ISP is tied back to the Service overarching communications ISP in order to reduce duplication, ensure backwards capability and interoperability).

Per the DoDI 5000.02T, Operation of the Defense Acquisition System, an ISP is regulatory for Acquisition Category (ACAT) programs that connect in any way to the communications and information infrastructure including both Information Technology (IT) and National Security System (NSS) programs. The ISP is used by program authorities to document IT and NSS needs, objectives, and interface requirements in sufficient detail to enable testing and verification of requirements. The ISP also contains interface descriptions, infrastructure and support requirements, standards profiles, measures of performance, and interoperability shortfalls. The DAU Tools Catalog provides a template supplied by the Air Force for developing an Information Support Plan.

Per Defense Acquisition Guidebook (DAG) CH 6–3.8 Interoperability, supportability for Information Technology (IT) systems and National Security Systems (NSS) is the ability of systems and infrastructure components, external to a specific IT or NSS, to aid, protect, complement, or sustain the design, development, testing, training, or operations of the IT or NSS to achieve its required operational and functional capabilities. IT and NSS interoperability and supportability needs, for a given capability, are identified through:

- The Defense Acquisition System (as defined in DoDI 5000.02 and DoDD 5000.01)
- The Joint Capabilities Integration and Development System (JCIDS) process

- The Business Capability Acquisition Cycle (BCAC) process for business systems
- The Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel and Facilities (DOTMLP-F) change recommendation process.

12.1.19. Obsolescence and Diminishing Manufacturing Sources and Material Shortages (DMSMS)

Per SD-22, Diminishing Manufacturing Sources and Material Shortages (DMSMS), companies (industry) generally do not find it sufficiently profitable to apply resources to support old versions of software; they prefer that customers upgrade to the most recent products. A program's ability to use software is inextricably linked to obtaining a license or being able to purchase the software from a reliable source. Consequently, diminished ability to use software may occur when newer versions of the software are available or there is no longer an ability to read the digital media on which the software is delivered. In addition, there is a diminished ability to use software when its support terminates.

Software support includes product enhancements to increase capability or to decrease vulnerability to malicious attacks, error correction, and general support for its application in particular environments. If support is no longer obtainable, updated security patches will not be available, bugs cannot be fixed, routine maintenance cannot occur, and modifications can no longer be made. For example, current software may not satisfy an emerging information assurance policy requirement or a cybersecurity protection requirement.

See also the Sustaining Engineering IPS Element chapter, section 3.7, DMSMS mitigation, in this Guidebook.

12.1.20. Technology Refreshment (or for the Software Acquisition Pathway this is now Minimum Viable Product And Minimum Viable Capability Release).

Technology refreshment is a broad subject, since it is a factor that must be considered during all phases of the lifecycle. During both pre-acquisition and acquisition phases, decisions are made that will determine long-term requirements for technology refreshment. Obsolescence, poor technical performance, new requirements, and technological advances may necessitate technology upgrades or refreshments in legacy systems.

For more information on tech refresh financing considerations, see DoD 7000.14-R Financial Management Regulation, Volume 2B, Chapter 18 and Volume 2A, Chapter 1, section 010201.D.3.c.

Per SD-22, Diminishing Manufacturing Sources and Material Shortages (DMSMS), technology refreshment has been characterized by "the periodic replacement of COTS items … to assure continued supportability of that system through an indefinite service life. Technology Refreshes can be strategically applied to prevent the occurrence of DMSMS issues preemptively or to minimize them significantly." Within DoD, the limitation to apply technology refreshment only to COTS items is not applicable. It can apply to custom electronics as well.

See also the Sustaining Engineering IPS Element chapter, section 3.7.2, Technology refresh, in this Guidebook.

Per DoDI 5000.87, Operation of the Software Acquisition Pathway, the PM and the sponsor will use an iterative, human-centered design process to define the minimum viable product (MVP) recognizing that an MVP's definition may evolve as user needs become better understood. Insights from MVPs help shape scope, requirements, and design. Subsequent capability releases will be delivered at least annually. Software updates to address cybersecurity vulnerabilities will be released in a timely manner, potentially including out of release cycle as needed, per the program's risk based lifecycle management approach.

The PM shall ensure that software teams demonstrate that the architecture complies with good design principles including but not limited to modular open systems architecture and supports frequent iterative capability releases.

12.1.21. Government-Industry Data Exchange Program (GIDEP)

GIDEP (Government-Industry Data Exchange Program) is a cooperative activity between government and industry participants seeking to reduce or eliminate expenditures of resources by sharing technical information essential during research, design, development, production, and operational phases of the life cycle of systems, facilities, and equipment. Since 1959, over $2.1 Billion in prevention of unplanned expenditures has been reported.

12.1.22. Cloud Computing Sustainment Considerations

Per the Defense Acquisition Guidebook (DAG) CH 6–3.9.2 Cloud Computing, commercial cloud vendors provide commercial virtual data storage and computing capabilities which are typically more efficient and innovative solutions when compared to traditional approaches; consequently, cloud (either commercial or government) should be considered and employed when found to be cost effective and secure. Cloud is a service and is delivered by Cloud Service Providers (CSP) who provide a set of capabilities referred to as cloud service offerings (CSO).

A formal definition of Cloud is provided in the National Institute of Standards and Technology (NIST) in their special publication (SP) 800-145, which states: "Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction." SP 800-145 also describes three "service models," four "deployment models," and five "essential characteristics" a Service should exhibit in order to be considered a cloud service.

12.1.23. Post Production Software Sustainment Considerations (or post minimum viable capability release for the Software Acquisition Pathway)

Post-Production Software Support (PPSS) is a key software support concept that includes the activities necessary to ensure that Systems Engineering and sustainment principles, processes and practices are applied to software. While the title indicates a focus on deployed software, the nature of software support is that critical activities occur throughout the acquisition process, in terms of planning, development of a support capability, and the effective deployment and maintenance of software resources. A related term is "Post Deployment Software Sustainment."

Software Support Activity (SSA)
The Software Support Activity assumes the role of providing post-deployment life cycle support for modifications or upgrades made to a system's software following the system's initial fielding. System modifications and upgrades include multi-system changes, block changes, preplanned product improvements, repair of deficiencies reported by the user, and other types of system change packages. The SSA organization typically compiles these needed updates into formal software releases to avoid disrupting the fielded system. Software development activities performed by an SSA in providing life cycle support are the same as those carried out during the development effort that led to the first fielding. They are tailored, as appropriate, to reflect the effort required to implement each change package, update pertinent documentation, verify the changes, and distribute the changes to users.

Privacy, Ethics and Laws Regarding Information Technology
Per DoDD 5400.11, DoD Privacy Program, the DoD will protect information privacy and provide other protections relating to civil liberties and legal rights in the development and use of the information sharing environment.

Electromagnetic Interference (EMI), Electromagnetic Pulse (EMP)
Per the DoD Dictionary of Military and Associated Terms, February 2019, the following definitions are provided:

- Electromagnetic interference—Any electromagnetic disturbance, induced intentionally or unintentionally, that interrupts, obstructs, or otherwise degrades or limits the effective performance of electronics and electrical equipment. Also called EMI.
- Electromagnetic environmental effects—The impact of the electromagnetic environment upon the operational capability of military forces, equipment, systems, and platforms. Also called E3.
- Electromagnetic compatibility—The ability of systems, equipment, and devices that use the electromagnetic spectrum to operate in their intended environments without causing or suffering unacceptable or unintentional degradation because of electromagnetic radiation or response. Also called EMC.
- Electromagnetic pulse—The electromagnetic radiation from a strong electronic pulse, most commonly caused by a nuclear explosion that may couple with electrical or electronic systems to produce damaging current and voltage surges. Also called EMP.

DoDI 3222.03, DoD Electromagnetic Environmental Effects (E3) Program establishes policy, assigns responsibilities, and provides instructions for the management and implementation of the DoD E3 Program to ensure mutual electromagnetic compatibility (EMC) and effective E3 control among ground-, air-, maritime-, and space-based platforms, electronic and electrical systems, subsystems, and equipment, and with the existing natural and man-made electromagnetic environment (EME).

See also the Design Interface IPS Element chapter, section 2.9, Environmental Management, in this Guidebook.

DoD Information Technology Portfolio Repository
Section 2223, title 10, United States Code (10 U.S.C. § 2223 [2011]) requires Federal agencies to maintain a consolidated inventory of mission-critical and mission-essential information technology systems. The DoD defines mission -critical information technology systems as systems that, if lost or compromised, would stop warfighter operations or direct mission support of warfighter operations. Mission-essential information technology systems are defined as systems that are basic and necessary to accomplish an organization's mission. To meet the 10 U.S.C. § 2223 (2011) requirement, the DoD Chief Information Officer (CIO) established the DoD Information Technology Portfolio Repository (DITPR) and Secret Internet Protocol Router Network (SIPRNET) Information Technology Registry (SITR) as the authoritative inventories for DoD mission-critical and mission-essential information technology systems.

Mission Critical Computer Hardware and Software
Per DoDI 5200.44, Protection of Mission Critical Functions to Achieve Trusted Systems and Networks (TSN), mission critical functions include any function, the compromise of which would degrade the system effectiveness in achieving the core mission for which it was designed. It is DoD policy that mission critical functions and critical components within applicable systems shall be provided with assurance consistent with criticality of the system, and with their role within the system.

A critical component is any component which is or contains ICT, including hardware, software, and firmware, whether custom, commercial, or otherwise developed, and which delivers or protects mission critical functionality of a system or which, because of the system's design, may introduce vulnerability to the mission critical functions of an applicable system.

Information and Communications Technology (ICT) includes all categories of ubiquitous technology used for the gathering, storing, transmitting, retrieving, or processing of information (e.g., microelectronics, printed circuit boards, computing systems, software, signal processors, mobile telephony, satellite communications, and networks). ICT is not limited to information technology (IT), as defined in section 11101 of title 40, U.S.C. Rather, this term reflects the convergence of IT and communications.

12.1.24. Automated Identification Technology (AIT) Management
Per MIL-STD-129: Military Marking for Shipment and Storage, Radio Frequency Identification (RFID) is an automatic identification and data capture technology comprised of one or more reader/interrogators and one or more RF transponders in which data transfer is achieved by means of suitably modulated inductive or radiating electromagnetic carriers.

RFID Reference Documents:

- MIL-STD-129, Military Marking for Shipment and Storage
- DoD Suppliers' Passive RFID Information Guide
- Supplier Info and FAQs

See also the Supply Support IPS Element chapter, section 4.17, Total Asset Visibility/AIT, in this Guidebook.

12.1.25. Logistics Information Systems

Logistics information systems provide the infrastructure to receive, store, process, analyze and communicate information to enable system sustainment. Across the DoD there are multiple logistics information systems focused on specific functions and system platforms.

The DLA Web Federal Logistics Information System (WebFLIS) provides essential information about supply items including the National Stock Number, the item name, manufacturers and suppliers (including part numbers), through a web interface connected to FLIS data. This information will be primarily used by DLA, military services, and United States Government sponsored contractors doing business with the U.S. Government.

12.1.26. Item Unique Identification (IUID)

- Unique Identifier (UI): A character string, number, or sequence of bits assigned to a discrete entity or its associated attribute which serves to uniquely distinguish it from other like and unlike entities. Each unique identifier has only one occurrence within its defined scope of use. (Ref: DoD Directive 8320.03)
- Unique identification (UID): A system of establishing globally unique and unambiguous identifiers within the Department of Defense, which serve to distinguish a discrete entity or relationship from other like and unlike entities or relationships. (Ref: MIL-STD-130N Change 1)
- Unique item identifier (UII): A globally unique and unambiguous identifier that distinguishes an item from all other like and unlike items. The UII is derived from a UII data set of one or more data elements. (Ref: MIL-STD-130N Change 1)
- Item unique identification (IUID): A system of establishing unique item identifiers (UII) within the DoD by assigning a machine-readable character string or number to a discrete item, which serves to distinguish it from other like and unlike items.

The DoD Defense Pricing and Contracting Item Unique Identification (IUID) website contains policy and guidance on this topic.

See also the Supply Support IPS Element chapter, section 4.17.2, Item Unique Identification (IUID), in this Guidebook.

12.1.27. IT Asset Management for Hardware and Tactical Software Tracking and Accountability

Per DoDI 5000.64, Accountability and Management of DoD-Owned Equipment and Other Accountable Property, it is DoD policy that comprehensive financial and material management of all accountable government property contributes to operational readiness and supports requirements for sustained auditability.

12.1.28. Electronic Data Interchange (EDI) Management

Electronic Data Interchange (EDI) is the exchange of standardized information between computer systems. Per the DoDD 8190.01, Defense Logistics Management Standards (DLMS), it is DoD policy that DLMS is the DoD standard for EDI (transactional information exchanges) among the AISs that comprise assigned business processes of the global supply chain management system.

12.1.29. Interface Management

Per the Defense Acquisition Guidebook (DAG) Chapter 6, Information Technology and Business Systems, one of the most challenging aspect of IT system development in DoD deals with system interfaces. In a net-centric environment, the shift is to a "many-to-many" exchange of data, enabling many users and applications to leverage the same data-extending beyond the previous focus on standardized, predefined, point-to-point interfaces. Hence, the objectives are to ensure that all data are visible, available, and usable-when needed and where needed-to accelerate decision cycles. Many-to-many exchanges of data occur between systems, through interfaces that are sometimes predefined or sometimes unanticipated. Metadata is available to allow mediation or translation of data between interfaces, as needed.

PMs should have written agreements (e.g., service-level agreements (SLA) and interface control agreements [ICA]) with any interface partners (i.e., such as between DFAS-DLA, or among the Air Force, Army, Navy, and DFAS) that indicate the agreement made and to document the requirements for the subject program and those programs necessary for information support. These agreements need to be published/registered in the DoD-approved registry as outlined in the Department of Defense Net-Centric Services Strategy, DoDI 8320.02, and DoDI 8320.07). See CH 3 Section 2.3 for more information. Per MIL-HDBK-61, Configuration Management Guidebook, the complexity of configuration item interfaces in a system should be minimized. Complexity often results in increased risk and cost. Note: MIL-HDBK 61 contains multiple checklists regarding interface management.

See also the Design Interface IPS Element chapter, section 2.10, Warfighter/Machine /Software/Interface/Usability Management, in this Guidebook.

12.1.30. Modular Open System Architectures (MOSA)

The Department of Defense's (DoD) modular open systems approach (MOSA) is to design systems with highly cohesive, loosely coupled, and severable modules that can be competed separately and acquired from independent vendors. This approach allows the Department to acquire warfighting capabilities, including systems, subsystems, software components, and services, with more flexibility and competition. MOSA employs the use of modular open systems architecture, a structure in which system interfaces share common, widely accepted standards, with which conformance can be verified. The website of the Office of the Secretary of Defense (R&E) provides many references for more information on this topic.

See also the Design Interface IPS Element chapter, section 2.13, Modularity and Open Systems Architecture (MOSA), in this Guidebook.

Software architecture Development and Documentation

Per the Defense Acquisition Guidebook (DAG) CH 3–2.3.1 Software, architecture is the bridge between mission drivers and system design, focused on planning, analyzing, organizing and integrating current and emerging operational and system capabilities to achieve desired warfighting mission effects. These outcomes are documented in quality attributes (ranging from "-ilities" to system performance), which are then evolved to system requirements and lower-level design.

Architecture should consider external interface definition, support growing scale and functionality, and accommodate technology insertion opportunities. SW architecture balances trade-offs (e.g., system modularity with very high performance), by frequently using techniques such as system modeling and mission simulation to evaluate solution alternatives. Implementing MOSA as part of the SW design and development can increase design flexibility, support incremental deliveries, allow for opportunities to use COTS SW and OSS, facilitate future upgrades and modifications and support technology insertion (see Defense Acquisition Guidebook (DAG) CH 3–4.3.4. Commercial-Off-the-Shelf and CH 3–2.4.1. Modular Open Systems approach).

Enterprise Architecture

Per the Defense Acquisition Guidebook (DAG) Chapter 6, Information Technology and Business Systems, all DoD architectures, including warfighter, intelligence, business, and component enterprise architectures, are part of the DoD Enterprise Architecture (EA).

The DoD EA is defined as a federation of descriptions that provide context and rules for accomplishing the mission of the Department. These descriptions are developed and maintained at the Department, Capability Area, and Component levels and collectively define the people, processes, and technology required in the "current" and "target" environments, and the roadmap for transition to the target environment. As the Secretary of Defense's principal staff assistant for IT and information resources management, the DoD Chief Information Officer (DoD CIO) develops, maintains, and facilitates the use of the DoD EA to guide and oversee the evolution of the Department's IT-related investments to meet operational needs.

12.1.31. Deficiency Reporting and Tracking

Each DoD Component provides regulations regarding deficiency reporting and tracking. Readers should contact their respective organizations for applicable documents. For example, the U.S.

Air Force, T.O. 00-35D-54, USAF Deficiency Reporting, Investigation, and Resolution, implements Air Force Policy Directive (AFPD) 63-1, Integrated Life Cycle Management, Air Force Instruction (AFI) 63-501, Air Force Acquisition Quality Program, and Air Force Materiel Command Instruction (AFMCI) 63-510, Deficiency Reporting, Investigation and Resolution. The processes of this Technical Order (TO) ensure compliance with federal acquisition requirements in accordance with Title 41, Code of Federal Regulations, Subpart 101-26-8, discrepancies or deficiencies in General Service Administration (GSA) or Department of Defense (DoD) shipments, material, or billings and supports Defense Logistics Agency Regulation (DLAR)4155.24, Product Quality Deficiency Report (PQDR) Program.

See also the Sustaining Engineering IPS Element chapter, section 3.4.4 in this Guidebook.

12.1.32 Joint Deficiency reporting and tracking

DLAR 4155.24/AR 702- 7/SECNAVINST 4855.5BC/ AF Technical Order 00-35D-54 AFI 21-115/DCMA INST 305, Product Quality Deficiency Report (PQDR) Program, establishes policy, assigns responsibility and implements procedures for a standard DoD Product Quality Deficiency Reporting method to identify, report, and resolve conditions affecting the warfighter.

12.1.33. Software and Software Intensive Support Equipment

In general, support software and software support equipment may include standard and non-standard desktops, servers, network infrastructure equipment, peripherals, and related software (operating systems, virtualization, firmware, applications, firewalls, anti-malware, utilities, etc.).

Per DoDI 4151.20, Depot Maintenance Core Capabilities Determination Process, it is DoD policy:

- To ensure access to support and support-related technical information is consistent with the planned support concept to cost effectively maintain fielded systems and foster competition for sources of support throughout the life of the fielded systems.
- Minimize requirements for support equipment including test, measurement, and diagnostic equipment. When the use of support equipment may not be eliminated, standardize support equipment design for the broadest possible range of applications, consistent with maintenance concepts.
- Maintenance programs for military materiel shall utilize diagnostics, prognostics, and health management techniques in embedded and off-equipment applications when feasible and cost-effective.
- Maintenance programs shall provide the organic maintenance workforce with the range of technological tools necessary to enhance capabilities (e.g., interactive technical manuals, portable maintenance aids, access to technical information), properly equip the workforce and provide adequate technical and managerial training.

See also the Support Equipment IPS Element chapter in this guidebook.

12.2. Program Protection Planning (PPP)

Program protection provides the processes, methodologies, and techniques to enable program offices to identify information, components, and technologies, as well as determine the most appropriate mix of measures to protect the information, components, and technologies from known security threats and attacks. These protection measures impact the development of the system being acquired, the operations of the program office, and the means by which the items are acquired.

Per the Defense Acquisition Guidebook (DAG), CH 9-2.3, the Program Protection Plan (PPP) is a living plan to guide efforts to manage the risks to Critical Program Information (CPI) and mission-critical functions and components, as well as program and system information. This milestone acquisition document captures both Systems Security Engineering (SSE) and security activities and the results of the analyses as the program and system become more defined.

12.2.1. Cybersecurity

DoDI 8500.01, Cybersecurity, adopts the term "cybersecurity" as it is defined in National Security Presidential Directive-54/Homeland Security Presidential Directive-23 (Reference (m)) to be used throughout DoD instead of the term "Information Assurance (IA)."

The DoD Cybersecurity Reference and Resource Guide 2018 provides a useful reference, of both U.S. and International resources, to help develop cybersecurity programs and in building and maintaining strong network defenses.

Per the Defense Acquisition Guidebook (DAG) Chapter 6, Information Technology and Business Systems, all acquisitions of systems containing IT, including NSS, must produce a Cybersecurity Strategy. The Cybersecurity Strategy is attached as an appendix to the Program Protection Plan (PPP) for submittal. See also the Defense Acquisition Guidebook (DAG) CH 8 Section 3.5.7.

The Risk Management Framework (RMF) is a key concept with Cybersecurity. See the ACQuipedia article: Risk Management Framework (RMF) for DoD Information Technology (IT).

12.2.1.1. Cybersecurity Supply Chain Risk Management (SCRM)

Supply chain risk management is a systematic process for managing supply chain risk by identifying susceptibilities, vulnerabilities, and threats throughout DoD's "supply chain" and developing mitigation strategies to combat those threats whether presented by the supplier, the supplied product and its subcomponents, or the supply chain (e.g., initial production, packaging, handling, storage, transport, mission operation, and disposal).

See also the Supply Support IPS Element chapter, section 4.21, Supply Chain Assurance, in this Guidebook.

12.2.1.2. Cybersecurity Maturity Model Certification (CMMC)

OUSD(A&S) is working with DoD stakeholders, University Affiliated Research Centers (UARC), Federally Funded Research and Development Centers (FFRDC), and industry to develop the Cybersecurity Maturity Model Certification (CMMC).

- The CMMC will review and combine various cybersecurity standards and best practices and map these controls and processes across several maturity levels that range from basic cyber hygiene to advanced. For a given CMMC level, the associated controls and processes, when implemented, will reduce risk against a specific set of cyber threats.
- The CMMC effort builds upon existing regulation (DFARS 252.204-7012) that is based on trust by adding a verification component with respect to cybersecurity requirements.
- The goal is for CMMC to be cost-effective and affordable for small businesses to implement at the lower CMMC levels.
- The intent is for certified independent 3rd party organizations to conduct audits and inform risk.

12.2.2. Standards for Software Development, Validation and Verification

The overall framework in which software is conceived, developed, and maintained is known as the Software Development Life Cycle (SDLC). A lifecycle model defines the phases, milestones, deliverables, and evaluation criteria of the software development process. Any one model does not fit all projects. Readers should check with their respective organizations for access to IEEE 12207-2017 - ISO/IEC/IEEE International Standard - Systems and software engineering -- Software life cycle processes. This International Standard applies to the acquisition of software systems, products, and services, to the supply, development, operation, maintenance, and disposal of software products and the software portion of any system, whether performed internally or externally to an organization. Software includes the software portion of firmware.

See also the Design Interface IPS Element chapter, section 2.1, Standardization and Interoperability, in this guidebook.

See also the Technical Data IPS Element chapter, section 7.3, Standards management, in this guidebook.

The reader should also review the website of the Defense Standardization Program for more references and information.

12.2.3. Anti-Tamper

Per DoDD 5200.47, Anti-Tamper, the term, “anti-tamper” refers to systems engineering activities intended to prevent or delay exploitation of Critical Program Information (CPI) in U.S. defense systems in domestic and export configurations to impede countermeasure development, unintended technology transfer, or alteration of a system due to reverse engineering. It is DoD policy to:

a. Deter, impede, detect, and respond to the exploitation of CPI based on the consequence of CPI compromise and the anticipated system exposure through the application of cost-effective, risk-based protections, to include AT when warranted, in accordance with DoD Instruction 5200.39, “Critical Program Information (CPI) Identification and Protection Within Research, Development, Test, and Evaluation (RDT&E),” May 28, 2015.

b. Support the sale or transfer of certain defense articles to foreign governments and their participating contractors while preserving U.S. and foreign investments in CPI through the implementation of AT, in accordance with DoD Instruction 5200.39.

See also the Supply Support IPS Element chapter, section 4.21, Supply Chain Assurance, in this Guidebook.

12.2.3.1. Data Protection

Storage and Archiving
Per DoDI 5015.02, DoD Records Management Program, it is DoD policy that the information and intellectual capital contained in DoD records will be managed as national assets. Effective and efficient management of records provides the information foundation for decision making at all levels, mission planning and operations, personnel and veteran services, legal inquiries, business continuity, and preservation of U.S. history. Readers should review this regulation for more policy and information on DoD records management.

See also the Technical Data IPS Element chapter, section 7.13, Data storage and backup, in this guidebook.

NARA
The National Archives and Records Administration (NARA) is the nation's record keeper. Of all documents and materials created in the course of business conducted by the United States Federal government, only 1%-3% are so important for legal or historical reasons that they are kept by the DoD forever.

12.2.3.2. Software Assurance.
Per DoDI 5200.44, Protection of Mission Critical Functions to Achieve Trusted Systems and Networks (TSN) and DAG, CH 9-3.2.5, software assurance is the level of confidence that software functions as intended and is free of vulnerabilities, either intentionally or unintentionally designed or inserted as part of the software throughout the lifecycle. Also see Public Law 112-239-Jan 2013, Section 933, “Improvements in assurance of computer software procured by the Department of Defense.”

DoD systems incorporate an extensive amount of software; therefore, defense programs must conduct early planning to integrate software assurance protection measures to counter adversarial threats that may target that software. Of interest are software assurance protection measures:

- Undertaken during development, integration, and test
- Designed to mitigate attacks against the operational system (the fielded system)

- Address threats to the development environment.

Malware/Malicious Code
Per the Defense Acquisition Guidebook (DAG), CH 9-3.2.5, malicious code and coding defects make systems vulnerable to attacks that may cause software to fail and thus pose a significant risk to DoD warfighting missions and national security interests. These vulnerabilities in software may be difficult and even impossible to detect; adversaries actively seek to identify and use these vulnerabilities as a means of attack.

Adversaries may: (1) exploit vulnerabilities inadvertently built into software; (2) exploit flaws in the architecture and design that render the system more vulnerable; (3) insert malicious logic during development, test, and operation: or (4) introduce malicious inserts into the software supply chain. Any software, most importantly those that perform mission critical functions, can be targeted.

See also the Supply Support IPS Element chapter, section 4.21, Supply Chain Assurance, in this Guidebook.

12.3. Testing, Assessment, and Certification
Per the Defense Acquisition Guidebook (DAG) CH 8-3.17, Software T&E, the DoD acquisition process delivers systems providing secure, resilient capabilities in the expected operational environment. Software is a major driver of the functionality of components of DoD systems. Software T&E, particularly for business and communication systems, is distinct from traditional T&E, predominantly because there is no manufacturing involved. Software is developed and deployed, as opposed to being developed, manufactured, and deployed, in accordance with DoDI 5000.87, Operation of the Software Acquisition Pathway. Software T&E examines system performance from the perspectives of functionality, sustainability, and cybersecurity.

See also the Product Support Management IPS Element chapter, section 1.4, Supportability Test and Evaluation, in this Guidebook.

12.3.1. Capability Maturity Model Integration
CMMI practices were originally created for the U.S. DoD to assess the quality and capability of their software contractors. CMMI models help organizations understand their current level of capability and performance and offer a guide to optimize business results.

12.3.2. DT&E and OT&E Test Planning
Per the DoDI 5000.87, Operation of the Software Acquisition Pathway, the acquisition strategy must clearly identify test and evaluation requirements that have been fully coordinated with the test community. The PM, in collaboration with developmental and operational test organizations, shall seek to streamline, automate, and integrate contractor test, Developmental Test and Evaluation (DT&E), and Operational Test (OT).

It is DoD policy that the Deputy Assistant Secretary of Defense for Developmental Test and Evaluation (DASD(DT&E)) shall be the focal point for all policy, practice, procedures, and acquisition workforce issues relating to developmental test and evaluation (DT&E) within the DoD.

See DoDI 5000.89, Test and Evaluation and DoDD 5141.02, Director of Operational Test and Evaluation (DOT&E) plus other relevant issuance at the DoD Issuances website.

12.3.3. ATO Process and Certification

Per the DoDI 5000.87, Operation of the Software Acquisition Pathway, the core concept of continuous Authority to Operate (ATO) is to build software security into the software development methodology so that the ATO process (as with the testing process) is done alongside development. If done correctly, an ATO is nearly guaranteed once the software is release ready.

PMs shall establish the conditions to enable a continuous Authority to Operate (ATO) where appropriate. Ensuring software security includes secure development (coding, test, identity/access management, supply chain risk management), secure capabilities (software patching, encryption, runtime monitoring, and logging) and secure lifecycle management (vulnerability management and configuration control).

Automated build scripts and test results shall be available to the test community so that critical verification functions (e.g., performance, reliability, etc.), validation functions (e.g., effectiveness, suitability, and survivability) can be assessed iteratively and incrementally. The automated cyber testing shall be designed to support a continuous ATO if possible or an aggressive accreditation process otherwise; and shall be augmented with additional testing where appropriate in accordance with the DoD Cybersecurity Guidelines.

12.3.4. Test-Driven Development

"Test-driven development" refers to a style of programming in which three activities are tightly interwoven: coding, testing (in the form of writing unit tests) and design. It can be succinctly described by the following set of rules:

- Write a "single" unit test describing an aspect of the program,
- Run the test, which should fail because the program lacks that feature,
- Write "just enough" code, the simplest possible, to make the test pass,
- "Refactor" the code until it conforms to the simplicity criteria,
- Repeat, "accumulating" unit tests over time

Test driven development is an integral part of the DevOps process.

12.4. Defense Business Systems (DBS)

Per the DAG Chapter 6, Information Technology and Business Systems, as defined in Title 10 U.S.C. section 2222, a DBS is an IS that is operated by, for, or on behalf of the Department of Defense, including any of the following:

(i) a financial system;
(ii) a financial data feeder system;
(iii) a contracting system;
(iv) a logistics system;
(v) a planning and budgeting system;
(vi) an installations management system;
(vii) a human resources management system;
(viii) a training and readiness system.

DBS are covered by the new DoDI 5000.75, Business Systems Requirements and Acquisition, which describes a process called the Business Capability Acquisition Cycle (BCAC). DBS are also generally referred to as "business systems" throughout this chapter.

12.4.1. Business Capability Acquisition Cycle (BCAC)

A business capability is the core ability the organization needs to deliver requisite products and services and provide value. DoDI 5000.75, Business Systems Requirements and Acquisition, establishes policy for the use of the business capability acquisition cycle (BCAC) for business systems requirements and acquisition.

Within the Business Capability Acquisition Cycle **(**BCAC):

- PSM/Planners should participate in each of the phases, in particular, during Market research (assessing the sustainability factors for each of the potential offerings) and during Business Process Reengineering to ensure that sustainment related steps in the evolving process are considered and optimized.
- The Functional Sponsor leads these endeavors but is supported by the PMO.
- Leading up to the Acquisition ATP, sustainment equities should be identified and included in the acquisition activities and supporting contracts.
- TLCSM does not apply to DBS.
- Responsibility shifts between Sponsor and PO throughout.
- PSM/Planners should closely collaborate with and support the Functional Lead in phases they lead to ensure sustainment is considered early (DoDI 5000.75, para 4.2.b).
- PSM/Planners should also ensure sustainment is included in the acquisition process and related contracts where the PMO is lead. (para 4.2.c/d)
- Identify and plan for appropriate sustainment measures to ensure DBS performance is cost effectively attained. (para 4.2.c/d)

- PSM/Planners should support the Functional during the final Support phase by continuing to monitor system performance and proactively identifying and resolving sustainment issues identified by appropriate performance metrics (para 4.2.e).

12.4.2. Capability Support Plan (CSP)

DoDI 5000.75, Business Systems Requirements and Acquisition describes the capability support plan documents the roles, responsibilities for sustainment activities.

The capability support plan must include:
1. A governance structure that provides resources, prioritizes changes, and approves implementation plans for changes that fall within scope of the original capability requirements.
2. A threshold for changes to determine whether or not the change requires a new BCAC initiative. Major capability changes that do not fall within the scope of the original capability requirements will require re-initiation of the process.
3. Plans for conducting a post implementation review.

Note that there is NO LCSP but use a CSP instead. PSM/Planners should create the CSP to meet the guidance in DoDI5000.75. Sustainment Reviews (Post Implementation Review) should include performance and customer satisfaction metrics.

12.5. Information Technology Service Management (ITSM)

Per DoDI 8440.01, DoD Information Technology (IT) Service Management (ITSM) , it is DoD policy that:

a. The DoD will promote the effective use of enterprise standards for the management of IT services across the DoD in accordance with the “Department of Defense (DoD) Information Technology (IT) Enterprise Strategy and Roadmap” (Reference (g)) and the DoD Enterprise Service Management Framework (DESMF).

b. Service quality and integrated service management capabilities for DoD IT services will be measured and evaluated based on DoD ITSM standards as articulated in the DESMF. The DoD ITSM standards will be developed and maintained within the DESMF.

c. IT services will be defined, categorized, published, and measured based on the DESMF.

d. DoD Components will conform to the DESMF at the conformance level prescribed by the Chief Information Officer of the Department of Defense (DoD CIO).

e. The DESMF describes the manner in which ITSM is to be performed in the Joint Information Environment (JIE) in accordance with the JIE White Paper (Reference (h)).

f. Conformance to DESMF should be considered in all portfolio management decisions by the portfolio owners identified in DoDI 8115.02, Information Technology Portfolio Management Implementation.

12.5.1. Enterprise Level ITSM Strategy Development

Per the DoD Enterprise Service Management Framework (DESMF), depending on an organization’s ITSM goals and guidance from the relevant tiered governance entity, some DoD organizations may elect to establish formal structures such as a centralized office, i.e., an IT

Service Management Office (ITSMO), to execute or oversee their ITSM initiatives and ensure alignment of their IT service management approach to the DESMF.

The decision to establish an ITSMO should be based on a specific determination of what the desired outcomes such an office would be expected to achieve and contribute to the DoD organization. Outcomes might include improved customer service, reduced costs, innovation adoption, or increased storage virtualization.

Regardless of the desired outcome, prior to establishing an ITSMO, how success will be measured for achievement of the desired outcome (e.g., cost savings, customer relationship improvement, consolidation or elimination of duplicate IT services, increased implementation of common ITSM processes) should be determined and formally endorsed by the applicable tiered ITSM governance entity.

12.5.2. Help Desk Support and Trend Analysis

Generally, a help desk is a resource intended to provide the customer with information and support related to an organization’s products and services. Help desk support is usually provided to customers through various channels such as toll-free numbers, websites, instant messaging, or email. More information on DoD help desk support is found on the website for the DoD Chief Information Officer (CIO).

Researching trends is a component of evaluating performance which includes the capture of information on the relationship with other domains and/or process areas, and the suitability of procedures and training necessary to ensure continued success. This provides for a continuous improvement loop ensuring that the process remains fit for purpose and identifies where changes to the process might be required. Evaluating process performance is a facet of Continual Service Improvement.

12.5.3. Service Quality Management measures and metrics

Per the DoD Enterprise Service Management Framework (DESMF), Service Quality is defined as a measure of how well the service delivered matches customer expectations. Service Quality and Performance Management foster an enterprise approach to govern service quality measurement. This includes evaluating, directing, and monitoring service quality measurement methods, approaches, techniques and results along with recommending corrective actions. Evaluation activities ensure there is an effective quality management approach and that measurements support customer and stakeholder requirements to include the identification of measurement gaps and a plan of action for closing those gaps to support decision making.

Service quality management is based on a four-phase approach that enables consistent visibility into the missions/business perspective of IT performance, with the mechanisms in place to inform service management and support future IT investment decisions. This approach is an adaptation of the Deming cycle to specifically address IT service quality, customized by the Navy ITSMO.

The PM shall identify, collect, and use management, cost, schedule, and performance metrics to enable effective program execution by the PM and other stakeholders. Metrics collection should leverage automated tools to the maximum extent practicable. The minimum set of metrics used to manage the program should include process efficiency, software quality, software development progress, cost, and capability delivery (i.e., value). Programs using this pathway shall report a minimal set of data to OUSD (A&S) on a quarterly basis as defined in the Software Acquisition Pathway Guidance.

Metrics Plan: The metrics plan identifies key metrics that allow the PM and other stakeholders to manage cost, schedule, and performance. It also organizes metrics by common types (or classes) and provides guidance on how to read and interpret each metric. Each program shall tailor the set of metrics for the unique considerations of the program. All software acquisition programs must have a set of core metrics in addition to the existing requirements outlined in the Software Resources Data Report (SRDR).

12.5.4. IT Performance Management Measures And Metrics

Per the DoD Enterprise Service Management Framework (DESMF), IT Performance Management is the use of performance information through monitoring and measuring relevant IT performance metrics. The information obtained from metrics enhances the organization's ability to gauge performance results. Actual performance can be compared with expected outcomes defined in organization goals and objectives in quantitative and qualitative terms.

Measures of performance must be designed to accurately capture the execution of relevant, measurable objectives. Establishing a baseline to assess against is crucial to performance management. Without an effective performance management program, key leaders are faced with taking corrective actions after performance issues impact the organization. Performance management as a management tool is the alternative to damage control and crisis management which impacts organizational plans, goals and objectives, customer satisfaction, productivity, expenditures, and confidence in the IT service provider.

12.5.5. DoD Enterprise Service Management Framework (DESMF)

DoDI 8440.01, DoD Information Technology (IT) Service Management (ITSM) states that the DESMF is the single service management framework for the DoD. The DESMF provides a service management reference model, objectively assessable service management practices, and conformance requirements for measuring service quality, together enabling an integrated service management capability in DoD.

The DoD Enterprise Service Management Framework, Edition III, has five domains to aggregate and integrate processes in order to more easily manage and communicate progress. The domains are areas of decision support and represent five stages of the service lifecycle: Service Strategy, Service Design, Service Transition, Service Operations, and Continuous Service Improvement.

12.5.6. Service Level Agreements (SLA) and Interface Control Agreements (ICA) Management Interface Control Agreements (ICA)

Per the DAG CH 3–2.3.1 Software, in programs for which software capability is procured as a service, the Service-Level Agreement(s) (SLA) should reflect operational or fielded performance requirements, including all path constraints, such as satellite time delays, low data rate access, and intermittent service, as part of the operational environmental constraints and potential security requirements. SLA provisions are important because service providers may not be willing to disclose details of their operations and staffing (such as overseas data centers or help desks).

The execution of a contract marks the starting point of services to be provided from either a new service provider or from an existing service provider. Whether these services are being provided during the formation of a new supplier relationship or within the framework of an existing supplier relationship, you are relying upon the supplier for your service needs. This reliance creates a risk exposure that can be mitigated by having a robust Service Level Agreement (SLA) in place. A contract may not be detailed enough concerning the tactical items you expect to encounter once operations and services begin. Therefore, it is best to negotiate and fully understand key expectations for all service components upfront.

A Service Level Agreement (SLA) template was developed by DoD ESI for DoD customers when negotiating, establishing, and managing Service Level Agreements (SLA) with software providers.

Per the DAU ACQuipedia article, Interface Management, contractual relationships are a vehicle for definition and control of interfaces. The interface definition is included in the contractual agreement as part of a defined catalog item or use of a control drawing and/or specification. If no relationship exists, an interface agreement may be necessary to provide the obligations between the parties. The interface agreement defines the interface process, protects intellectual property, and identifies procedures for defining and maintaining the interface and coordination proposed changes. It may establish an Interface Control Working Group (ICWG) or Integrated Product Team (IPT) to address interface issues. These processes extend to elements within a company as well as subcontractor, vendors, and suppliers. The interface definition includes performance, functional, and physical attributes. It is detailed in an interface control document/drawing, or a version-controlled database, and is included in the functional and allocated baselines for interfacing products.

A. Information Technology Systems Continuous Support Major Activities

Activities of the Information Technology Systems Continuous Support IPS Element
Each activity of the Information Technology Systems Continuous Support IPS Element, as listed in the PSM Guidebook Appendix A, is under the responsibility of the Program Manager, the Product Support Manager, and the lead stakeholder from other areas as applicable, i.e.,

configuration management, engineering, environment, manufacturing, etc. Relevant proponent DoD offices are listed in this chapter below in Section C, Proponency.

Input to the LCSP/Product Support Strategy
Detailed guidance on development of the Life Cycle Sustainment Plan (LCSP)/Product Support Strategy states that "The purpose of this annotated outline is to improve sustainment planning for Department of Defense (DoD) weapon systems. This may be achieved when programs make design decisions that achieve operational performance requirements and reduce demand for sustainment."

While information from Information Technology Systems Continuous Support activities will impact many areas of the LCSP, the below LCSP sections specifically address this IPS Element:
3.1 Sustainment Strategy Considerations
3.2 Sustainment Relationships
3.3 Product Support Arrangements
7.1 O&S Cost
8.1.2 Product Support Team

As Information Technology Systems Continuous Support activities continue through the life cycle, their impacts will both directly and indirectly impact the system's KPP, KSA and APA parameters. The PSM and LCL should start these activities early in the system lifecycle for greatest impact.

When Is Information Technology Systems Continuous Support Delivered and Managed in the Lifecycle?
The activities within the Information Technology Systems Continuous Support IPS Element are best visualized in the DoD Product Support Implementation Roadmap Tool. This tool allows the User to check the box highlighting information specifically linked to the Information Technology Systems Continuous Support Integrated Product Support Element.

Once the Information Technology Systems Continuous Support IPS Element box is checked, the timeline expands to show the detailed activities and respective outputs for each activity by phase, as show in a partial illustration in Figure 12-1 below.

Each activity and output is then hyperlinked to a pop-up window that displays specific data related to that respective activity as shown in the screenshot below in Figure 12-2. The specific data is in-turn hyperlinked to allow the user to subsequently search for detailed information regarding any specific activity.

B. Data Item Description (DID) Deliverables

A Data Item Description (DID) is a completed document, typically identified in a Contract Data Requirements List (CDRL) that defines the data required of a contractor. The document specifically defines the data content, format, and intended use of the data. DIDs are found on the DLA Assist Database.

Helpful Search Hint: All DID's start with the letters "DI-." Once your search results are shown, click on the column header "Document ID" to sort by alphabetical order. The "DI-" items will be easier to find. You can also insert "DI-" into the Document ID field. For the Status field, be sure to use the "Active" category from the drop-down list.

The below DIDs are a representative listing and is not inclusive of all Information Technology Systems Continuous Support related DIDs.

- DI-IPSC-81427, Software Development Plan (SDP)
- DI PSC-81429, Software Transition Plan (STrP)
- DI-IPSC-81438, Software Test Plan (STP)
- DI-IPSC-81756, Software Documentation
- DI-IPSC-82134, Software Sustainability Package
- DI-MGMT-81803, Item Unique Identification (IUID) Marking Plan
- DI-MGMT-82191, Cybersecurity Vulnerability Report
- DI-MGMT-082035, Software Resources Data Reporting: Development, Maintenance and Enterprise Resource Planning Development Reports, and Data Dictionary
- DI-MGMT-82246, Enterprise Information Technology (IT) Performance Metrics Report
- DI-SESS-82044, System/Software Integration Plan

C. Proponency

Please note that DoD organizational changes may result in changes to Office designations and Proponency responsibilities that may not match the content in this Guidebook.

Information Technology, Information Resources Management, Cybersecurity, information Systems, Electronic Data Interchange (EDI), Defense Business Systems

The DoD CIO is the principal staff assistant and senior advisor to the Secretary of Defense and Deputy Secretary of Defense for information technology (IT) (including national security systems and defense business systems), information resources management (IRM), and efficiencies.

Research and Engineering

The Office of the Secretary of Defense for Research and Engineering mission as Chief Technology Officer is to foster technological dominance across the Department of Defense and ensure the advantage of the American warfighter.

Automatic Identification Technology (AIT)

The Office of the Assistant Secretary of Defense for Sustainment is responsible for leading the implementation of a modern and integrated materiel supply chain process that fully supports military operational requirements.

Radio Frequency Identification (RFID)
Radio Frequency Identification (RFID) technology addresses key DoD challenges of lacking asset visibility and transportation process inefficiency between nodes in the DoD supply chain. Alone and when combined with other AIT capabilities, RFID will become a key technology enabler for the DoD logistics business transformation by facilitating accurate, hands-free data capture within an integrated end-to-end supply chain enterprise.

Item Unique identification (IUID)
The Office for Defense Pricing and Contracting (DPC) is responsible for all Pricing, Contracting, and Procurement policy matters, including e-Business, in the Department of Defense (DoD). DPC executes policy through the timely update of the DFARS and PGI.

Obsolescence Management
The DMSMS Program Office is within the Office of the Defense Standardization Program. A Diminishing Manufacturing Sources and Material Shortages (DMSMS) issue is the loss, or impending loss, of manufacturers or suppliers of items, raw materials, or software.

Rights and Licensing for Commercial Software
DFARS 252.227-70XX sections provide DoD-specific acquisition regulations that DoD government acquisition officials – and those contractors doing business with DoD – must follow in the procurement process for goods and services. Readers should also research other DFAR sections (clauses) that may be relevant to a specific topic.

Life Cycle Sustainment Plan (LCSP)/Product Support Strategy
The Office of the Assistant Secretary of Defense for Sustainment is the OSD proponent for life cycle product support.

DoD Anti-Tamper Executive Agent
The objectives of the DoD Anti-Tamper Executive Agent are to:

- Educate DoD community on 'AT process' and threat.
- Develop and maintain a strong technology base.
- Prevent, deter, or delay U.S. technologies from being exploited.
- Increase opportunities for safe export of U.S. technologies.
- Extend the effective operational life of U.S. weapons systems.

Also, see DAU CLE 022 Program Managers Introduction to Anti-Tamper.

DoD Enterprise Software Initiative (ESI)
DoD ESI is an official DoD initiative sponsored by the DoD Chief Information Officer (CIO) to lead in the establishment and management of enterprise COTS IT agreements, assets, and policies. DoD ESI lowers the total cost of ownership across the DoD, Coast Guard and Intelligence Communities for commercial software, IT hardware, and services.

D. U.S. Government Statute, Regulations, DoD Policy and Guidance

The below policy and guidance are suggested as a core set of references. Note that this list does not contain policy and guidance from the DoD Components/Services. Please note that due to the high rate of change occurring in policy and guidance, the letter designations found as part of a reference will be removed in this guide. Readers are encouraged to check the DoD reference source on a frequent basis to ensure they are using the current reference version.

Readers should check with their respective organizations for additional policy and guidance specific to their program and product support requirements.

- DoD Directive 5000.01, The Defense Acquisition System
- DoDI 5000.02, Operation of the Adaptive Acquisition Framework
- Other policy located on the DoD AAF website and DoD Issuances website
- DoDI 5000.87, Operation of the Software Acquisition Pathway
- Defense Acquisition Guidebook (DAG) (Chapters 3, 4 and 6)
- OMB Circular A-130, Managing Federal Information as a Strategic Resource
- Federal Information Security Management Act (FISMA)
- DoDD 5200.47, Anti-Tamper (AT)
- DoDD 8000.01, Management of the Department of Defense Information Enterprise
- DoDI 3222.03 Electromagnetic Environmental Effects (E3) Program
- DoDI 4650.01, Policy and Procedures for Management and Use of the Electromagnetic Spectrum
- DoDI 5200.44, Protection of Mission Critical Functions to Achieve Trusted Systems and Networks (TSN)
- DoDI 5205.13, Defense Industrial Base (DIB) Cyber Security/Information Assurance (CS/IA)
- DoDI 8320.03: Unique Identification (UID) Standards for Supporting the DoD Information Enterprise
- DoDI 8310.01, Information Technology Standards in the DoD
- DoDI 8330.01, Interoperability of Information Technology (IT), Including National Security Systems
- DoDI 8500.01, Cybersecurity
- DoDI 8510.01, Risk Management Framework (RMF) for DoD Information Technology (IT)

E. Communities of Practice and Interest

The topic of design interface covers such a vast scope of equipment that there is no one community of practice. Typically, design interface communities focus on the supportability of a type of system, for example, ships and aircraft, or of a type of DoD mission.

The Preface of this IPS Elements Guidebook provides a listing of "golden references," many of which provide libraries, research portals and other resources for finding additional information on specific topics of design interface.

Many OSD offices (listed under the Proponency section above) maintain a comprehensive website with links to DoD partner organizations, policy and guidance, plus many other resources. Readers are encouraged to check the relevant proponent website for additional information. Readers should check with their respective organizations for the communities of practice that focus on the area of design interface most relevant to their interests.

The DAU Community Hub is a website that consolidates the links to approximately 50 communities of practice related to DoD acquisition practices.

- Commercial Off the Shelf Products and Commercial Services
- Cybersecurity
- Data Management
- DMSMS Knowledge Sharing Portal
- Enterprise Software Initiative (ESI)
- Information Technology/Software
- Life Cycle Logistics
- Spectrum & E3 Compliance
- Systems Engineering
- Test and Evaluation

Also see the DDR&E Advanced Capabilities, Software Engineering Homepage

Guidance and Best Practices Sources

- Integrated Product Support (IPS) Element Guidebook
- Logistics Assessment Guidebook
- Product Support Analytical Tools Database
- OSD Agile Contracting Guide
- Program Protection Plan Template
- Transforming the Engineering Enterprise: Applications of Digital Engineering and Modular Open Systems Approach, Kristen Baldwin, The Journal of Defense Modeling and Simulation Special Issue, February 2018
- Digital Engineering Strategy, June 2018
- GAO Best Practices and Leading Practices in Acquisition Management
- DoD Enterprise Service Management Framework (DESMF)
- Adaptive Acquisition Framework (AAF) Homepage

F. Training Resources

Workforce Competencies
The DoD is required to submit to Congress a strategic workforce plan identifying critical skills and competencies needed in the future within the civilian employee workforce to support national security requirements and manage the Department.

Below is a listing of workforce competencies to support the IT Services Continuing Support IPS Element:
- Identify, plan resource, and acquire facilities, hardware, software, firmware, documentation, manpower and personnel necessary for planning management of mission critical computer hardware and software systems.
- Coordinate and implement agreements necessary to manage technical interfaces, and to manage work performed by continuous software engineering activities.
- Establish and update plans for automated and continuous test and certification activities required throughout the life cycle.
- Participate in the engineering and continuous development process from program inception to ensure software engineers, systems engineers, users, and product support managers are integrated and collaborating continuously in order to accomplish the necessary planning and management of IT systems continuous support.
- Manage weapon system information assurance across the system life cycle.
- Manage the technical data (e.g., information systems, electronics, and software) that define the current and future configuration baseline of the system necessary to develop safe and effective procedures for continued operation the system. Note: software technical data comes in many forms to include, but not limited to, specifications, flow/logic diagrams, Computer Software Configuration Item (CSCI) definitions, test descriptions, operating environments, user/maintainer manuals and computer code.
- Manage and coordinate IT systems interface with the Global Information Grid (GIG) via the defense Information Switch Network (DISN), or other network connectivity, throughout the life cycle to assure mission critical connectivity.
- Periodically evaluate and test Electromagnetic Compatibility/Interference (EMC/EMI) requirements as weapon systems and mission scenarios evolve.
- Periodically evaluate and test Electromagnetic Pulse (EMP) and other survivability requirements at specific intervals over the system life cycle.
- Manage Security/Information Assurance throughout the life cycle to address a constantly evolving cyber threat.
- Manage cybersecurity and supply chain risk throughout the lifecycle to reduce vulnerabilities.

- Plan and execute disaster recovery for mission critical systems to assure continuity of operations and plans of the using organizations.
- Implement Automated Identification Technology (AIT) for systems that deploy or components that are transported through standard supply channels for distribution, maintenance, and repair.
- Manage Electronic Data Interchange (EDI) methods and standards during the operational life of a weapon system.
- Coordinate, at program inception, with an organic software engineering entity in order to identify intellectual property and data rights for inclusion in subsequent contracts.
- Collaborate with the software engineers in order to tailor data/license rights acquisition and ensure it is aligned with the acquisition and product support strategies.
- Ensure the data rights and license management strategies are documented within the IP strategy.
- Coordinate with the software engineers to develop a holistic business case analysis to determine a best value product support strategy that considers all aspects of hardware and software.

DAU Courseware
A complete list of DAU training resources can be found in the DAU iCatalog. Courses are classified as Training Courses (Regular (certification and assignment specific) training courses), Continuous Learning, and Targeted Training (Alternate means to meet training requirements).

The below list of DAU courses is relevant to the Information Technology Systems Continuous Support IPS Element:

- ENG 260 Program Protection for Practitioners
- ISA 101 Basic Information System Acquisition (Information Resource Management [IRM])
- ISA 201 Intermediate Systems Acquisition
- ISA 301 Advanced Systems Acquisition
- ISA 320 Advanced Software Acquisition
- LOG 100 Life Cycle Logistics Fundamentals
- LOG 211 Supportability Analysis
- LOG 215 Technical Data Management
- CLE 018 E3 and Spectrum Supportability for Acquisition Professionals
- CLE 068 Intellectual Property and Data Rights
- CLE 074 Cybersecurity Throughout DoD Acquisition
- CLE 060 Practical Software and Systems Measurement
- CLL 011 Performance Based Logistics (PBL)
- CLL 015 Product Support Business Case Analysis (BCA)

- CLL 020 Independent Logistics Assessments
- CLL 027 Introduction to DoD Software Life Cycle Management
- CLL 201 Diminishing Manufacturing Sources and Material Shortages (DMSMS) Fundamentals
- CLM 025 Commercial-Off-The-Shelf (COTS) Acquisition for Program Managers
- SAM 301 Advanced Software Acquisition Management

DAU ACQuipedia Articles

ACQuipedia serves as an online encyclopedia of common defense acquisition topics. Each topic is identified as an article. Each article contains a definition, a brief narrative that provides context, and includes links to the most pertinent policy, guidance, tools, practices, and training which further augment understanding and expand depth. Article content aggregates the relevant references and learning assets to quickly provide high value information.

Below is a listing of linked ACQuipedia articles relevant to the Information Technology Systems Continuous Support IPS Element. The reader is encouraged to visit the ACQuipedia homepage.

- Architecture Data
  - Cloud Computing: A Primer
  - Configuration Management
  - Cybersecurity & the DoD Acquisition Lifecycle
  - Data Rights
  - Diminishing Manufacturing Sources and Material Shortages (DMSMS)
  - DoD Architecture Framework (DoDAF)
  - Independent Logistics Assessment (ILA)
  - Integrated Product Support (IPS) Element – Information Technology Systems Continuous Support
  - Intellectual Property Strategy
  - IT Box Capabilities Documents: IS ICD & IS CDD
  - Item Unique Identification (IUID)
  - Life Cycle Management (LCM)
  - Life Cycle Sustainment Plan (LCSP)
  - Life Cycle Mission Data Plan
  - Major Automated Information System (MAIS) Programs - Sustainment
  - Net-Ready Key Performance Parameter (KPP)
  - Obsolescence Management
  - Post-Production Software Support (PPSS)
  - Risk Management Framework (RMF) for DoD Information Technology (IT)
  - Software Sustainment

Annex A. Integration of IPS Elements

Approaches to IPS Element Integration

The Integrated Product Support (IPS) Elements have the word "integrated" specifically included in the name to reinforce the approach of constructing the product support infrastructure to ensure all functional areas are mutually supporting and non-duplicative in terms of funding, usage of resources (both personnel and materiel), capability and outcomes. Each of the Elements should become a "force multiplier" to add value (either through improving outcomes or reducing life cycle costs) across the entire scope of weapon system support.

Consider the different approaches to IPS Element integration in terms of:

I. Which DoD policy and guidance documentation supports the Life Cycle Sustainment Plan (LCSP) development?
II. How does an action or decision related to one IPS Element impact processes and outcomes related to other IPS Elements?
III. How are product support plans, processes and deliverables interrelated to each other?

DoD Policy and Guidance Documentation to Support LCSP/Product Support Strategy Development

There are thirteen DoD guidance documents which should be in the acquisition professional's library for supporting development of the LCSP/Product Support Strategy, a required acquisition document for DoD major defense acquisition programs. The DoD has developed and maintains an integrated suite of multidisciplinary product support guidebooks. These guidebooks assist Life Cycle Logisticians, Product Support Managers, Systems Engineers and Program Managers with developing product support strategies to meet Warfighter requirements for readiness, availability, suitability and affordability.

The overarching policy for these guidance documents is the DoDI 5000.02, Operation of the Adaptive Acquisition Framework and the Manual for the Operations of the Joint Capabilities Integration and Development System (JCIDS). The thirteen product support guidebooks align with one another to ultimately document product support strategies, arrangements and implementation plans into the Life Cycle Sustainment Plan (LCSP)/Product Support Strategy.

These thirteen guidebooks are hosted at the DAU Tools Catalog under the heading "Integrated Product Support Guidebook Suite." The thirteen DoD guidance documents include:

- Defense Acquisition Guidebook (DAG)
- Performance Based Logistics (PBL) Guidebook
- Public-Private Partnering (PPP) for Product Support Guidebook
- Logistics Assessment (LA) Guidebook
- Condition Based Maintenance Plus (CBM+) Guidebook
- Reliability, Availability, Maintainability and Cost (RAM-C) Rationale Report Outline Guidance
- MIL-HDBK-502, Product Support Analysis

- Integrated Product Support (IPS) Element Guidebook
- SD-22 DMSMS Guidebook
- Product Support Business Case Analysis (BCA) Guidebook
- Operations & Support (O&S) Cost Management Guidebook
- Product Support Manager (PSM) Guidebook
- Life Cycle Sustainment Plan Outline

Interrelationships of IPS Elements

Product Support Management
Per the PSM Guidebook, Program Managers, supported by the Product Support Manager pursue two primary support objectives. First, the weapon system must be designed to deliver the required warfighting capability and be affordable. Second, the product support solution must be efficient and effective, and it must reduce the demand for product support while meeting Warfighter requirements. When developing and implementing a product support strategy, the goal is to balance and integrate the support activities necessary to meet these two objectives.

Product support management is based on integrating all activities across the IPS elements in order to achieve the program's KPPs and KSAs. The integration starts during Milestone A (before the PSM is officially designated for the program) as part of requirements and metrics determination.

Requirements will drive emphasis towards specific approaches. As the program matures through the acquisition life cycle phases, the Product Support Manager will develop the product support concept, plan and package to optimize availability, reliability and reduced cost. Selection of the type, quantity, complexity, and affordability will require trade-offs among different support options.

For example, a system expected to be operated primarily in remote locations will need higher reliability with emphasis on unit level maintenance or maintenance capabilities within a geographical proximity. Available facilities infrastructure may be unsophisticated and regular resupply of large, heavy and/or environmentally sensitive components may be unaffordable. In this case, the PSM will emphasize design interface and sustaining engineering activities to optimize maintainability and supply support requirements.

Design Interface
Design interface focuses on involvement of product support within the systems engineering process to impact the design to reduce the burden and cost of product support on the weapon system and on the existing DoD logistics infrastructure. Life cycle logisticians will seek system designs that optimize maintainability, require few if any unique tools or support equipment, utilize existing personnel skill sets, contain modular interfaces to allow for upgrades and modifications using the existing platform configuration, and have long life spans. In order to

achieve product support optimized system designs, logisticians will need to model, test and demonstrate the proposed system within the context of existing DoD and industry product support capabilities for each IPS Element.

For example, the Life Cycle Logistician should create a supportability demonstration during test & evaluation to determine parameters such as:

- whether the current DoD personnel skill categories are sufficient to perform the tasks to maintain the system or can be trained in the required tasks;
- if current DoD organic capability (facilities and infrastructure) can repair the system;
- which spare parts and support equipment are already provisioned in DoD systems or are new, unique items requiring new infrastructure to be acquired;
- is the weapon system transportable to the intended operational sites;
- and is resupply carried out effectively and affordably.

Sustaining Engineering

Sustaining engineering supports in-service systems in their respective operational environments to ensure continued operation and maintenance of a system with managed (i.e., known) risk. The integration activities are focused on how to minimize the downtime of the weapon system while also lowering the risk for downtime. Sustaining engineering outcomes can range from recommendations for weapon system design changes to plans for modification of the facilities and infrastructure and also to other changes within any of the IPS Element areas.

For example, root cause analysis of in-service problems (including operational hazards, deficiency reports, parts obsolescence, corrosion effects, and reliability degradation) often results in recommendations for design changes to:

- Eliminate components requiring frequent maintenance.
- Minimize or eliminate maintenance tasks.
- Maximize commonality with existing infrastructure such as type of fuel, available support equipment, etc.
- Allow greater modularity for upgrades.

Supply Support

While the focus of supply support is on the provisioning and delivery of repair parts, it is a major area within the field of supply chain management. Supply chain management, as described in the PSM Guidebook, integrates sustaining engineering, maintenance, PHS&T, support equipment and technical data. The system's supply chain is an integrated network that extends from the supplier's supplier to the customer's customer and back through a return cycle.

For example, a poor provisioning list will result in either missing or incorrect spare parts being procured, stored and delivered to the Warfighter. Missing or incorrect parts result in higher equipment downtime, higher costs for procuring the wrong item, and higher maintenance failure rates if the wrong, or a counterfeit, part is installed on the weapon system. In some cases, a defective component can result in system failure causing loss of life.

Maintenance Planning and Management
Maintenance planning and management is the prevention or correction of weapon system failure or the failure of its support equipment. The goal of the PSM is to influence design to minimize or eliminate the need for maintenance on the weapon system. For those maintenance actions that cannot be eliminated, the next priority is to implement preventative or condition-based maintenance and operator training to minimize the type, severity and cost for maintenance procedures.

For example, a new engine of a high-performance aircraft has been designed that requires depot level skills and specialized support equipment. The PSM may be able to influence design to develop engine diagnostic equipment that can be run at the organizational level of maintenance to check on engine performance, thus reducing the frequency of returning the engine to the depot for major service work.

Packaging, Handling, Storage, and Transportation (PHS&T)
PHS&T's four activity areas should be closely integrated among themselves with the other IPS Elements. Examples of PHS&T requirements include storage of materiel in extreme environments for long periods of time, transport into and out of remote regions where commercial carriers are not present, international customs and inspection requirements, and the routine shipping of dangerous and hazardous items. These requirements are high value opportunities to use the benefits of IPS Element integration to minimize program risk and cost.

Specific examples of integration of PHS&T with Design Interface include:

- Designing an item, such as a battery, for a longer shelf-life to minimize risk of the Warfighter receiving an inoperable product;
- Designing to remove hazardous materials or components to eliminate the need for special transportation requirements. Often hazardous items cannot be carried on a cargo aircraft but must be transported via surface ground or sea, thus increasing the time for delivery;
- Incorporating RFID technology to reduce risk of item loss or delay during shipment.

Example of the Importance of Integration of Packaging with other IPS Elements
Spare part packaging requirements are developed during the early acquisition life cycle phases for the Warfighter to receive parts that are in usable, i.e., "A" condition. The packaging requirements are developed based on two primary factors: 1) the nature of the item e.g., fragility, weight, dimensions, material composition, and ESD sensitivity, and 2) the anticipated storage and distribution scenario. This initial information becomes the default packaging data in the logistics database that will support the weapon system for its lifespan. During production and deployment, initial parts are installed onto the system in a benign environment e.g., a CONUS assembly plant, aircraft manufacturer or shipbuilder, typically in the continental United States. Shipping of initial parts is also often within the United States in an "environmentally

friendly" distribution system that is not subjected to extreme weather or temperature conditions. Once the system is fielded, the conditions during storage, handling and transport can become adverse and exceed the required packaging specifications. The result may be parts arriving at the Warfighter location that are broken, corroded and unserviceable.

The integration of PHS&T with Product Support Management, Design Interface, Supply Support and Technical Data is important to ensure that:

- Packaging requirements and specifications are correctly developed.
- Concept of Operations (CONOPS) and Operational Mode Summary (OMS) and Mission Profile (MP) (OMS/MP) requirements are identified
- Information is used in the prediction of PHS&T external conditions.
- Engineers and logisticians correctly identify the necessary technical data unique to each part to be shipped.
- Planned storage, handling, and transport locations and conditions meet requirements.
- Design of spare parts includes PHS&T considerations.
- Contracting and supply support procedures can be quickly modified if a spare part procurement request deviates from the original anticipated distribution scenario, e.g., air shipment versus standard delivery.

Technical Data

Technical data pervades all IPS elements in virtually everything that is done to sustain a weapon system. All plans, processes, and products have technical data associated with them, i.e., engineering data, product data, contract data, and logistics data.

The integration of technical data into all aspects of the weapon system program occurs due to the efforts of program managers and technical experts. The challenge is to ensure that technical data is appropriately and correctly acquired, shared, used, and disposed of.

Examples of recommended technical data integration efforts include:

- The development of a technical data rights strategy;
- Attention to security and access of technical data – both to prevent unauthorized usage and to ensure program personnel with the need for access correctly have it;
- Processes to integrate engineering data with logistics data to allow for feedback on operational and support information;
- Procedures to integrate the program's performance-based life cycle metrics to the appropriate technical data which can be used to improve outcomes.

Support Equipment

Support equipment, consisting of all equipment (mobile or fixed) required to support the operation and maintenance of a system, has inherently various points of integration with the weapon system platform as well as each of the IPS element components of the supportability infrastructure. The goal of the design engineers and the life cycle logisticians during early acquisition is to minimize or eliminate the requirements for support equipment, especially that equipment which would be unique to the weapon system.

Early support equipment minimization will drive IPS Element integration and the maximization of system characteristics in areas such as:

- Reliability (use of Design Interface),
- Built-in diagnostics (use of Sustaining Engineering & Computer Resources capabilities to reduce time and equipment for maintenance),
- Usage of existing maintenance procedures and personnel skill sets (reducing the need for Manpower & Personnel),
- Commonality of maintenance facilities (reducing the need for new or specialized Facilities and Infrastructure).

Training and Training Support

Training is one of the IPS Elements that has a very high return on investment when integrated with the other IPS Elements but is often not used due to program managers not being fully aware of its benefits. Training is often considered a cost to the program and requires the trainees to be absent from their daily duties during training. This investment in skills improvement is a long-term investment.

Specific examples of the return on investment by integrating training include:

- Maintenance failures may be due to operational error. A good operator training program will reduce equipment failure, reduce accidents, and allow for higher system availability at reduced cost (cost avoidance in this case).
- The skill level of the maintainer is critical to a quick and effective repair process.
- Item managers and procurement specialists need to be trained on the automated supply systems (often part of an enterprise resource program) in order to correctly enter information, understand reports, and be able to diagnose supply deficiencies. Even minor errors or misunderstanding of the system can result in significant spare part shortages, incorrect items ordered, or mismanagement of the supply base.
- Design engineers should be trained on product support approaches and how system design influences (both positively and negatively) the availability, reliability and ownership cost of the weapon system.

Manpower & Personnel

Manpower and Personnel involves the identification and acquisition of personnel (military and civilian) with the skills and grades required to operate, maintain, and support systems over their lifetime. Early requirements for weapon system operation often establish manpower goals which in turn have a strong influence on design of the system. The life cycle logistician in turn drives support strategies which flow down from these early manpower requirements.

In the current environment of cost reduction, minimizing the manpower workload and simplifying tasks to avoid costly and complex training requirements is important. From a support perspective, integrating manpower and personnel requirements into the product support strategy is the only way to achieve program goals.

Integration activities may include minimizing and simplifying unit level maintenance tasks, eliminating repair part requirements, automating previously manpower intensive tasks such as submitting data reports, maintenance diagnostics, and converting classroom training into computer-based instruction, all contribute to improved manpower usage and lower weapon system ownership costs.

Facilities & Infrastructure

The Facilities & Infrastructure IPS Element has traditionally been a more “stand-alone” than the others regarding integration. Requirements and strategies are now changing due to technologies and global defense strategies. Technologies and processes are also changing the requirements for facilities and infrastructure: the advent of on-line parts ordering, on-line meetings and conferences, interactive electronic technical manuals, greater emphasis on temporary or semi-permanent facilities to support a shorter logistics tail for the Warfighter, and greater awareness of environmental impacts.

For example, the Defense Logistics Agency‘s usage of the War-Stopper Program minimizes and optimizes the usage of facilities and infrastructure by collecting data on supplier capabilities, matching these capabilities to Warfighter requirements and then applying business case analysis and best practices to effectively managing the entire life cycle from commodity provider through manufacturing to distribution of the required items.

Information Technology (IT) Systems Continuous Support

The scope of this IPS Element is rapidly changing from primarily maintaining off-board computer hardware and software to an integrated information technology and software community of which everyone, including the Warfighter, plays a role.

Product support now extensively uses computer technologies (hardware and software) both on-board and off-board weapons platforms to perform a myriad of activities from predicting failures to diagnosing the problems and automatically requesting parts and creating maintenance work orders.

Integration Across the Acquisition Lifecycle

Each IPS Element or combination of elements supports the production of a plan, process or specific product which in term contributes to the successful acquisition, operation and support of the weapon system.

Per the PSM Guidebook, the system’s Product Support Package is comprised of the logistics elements and any sustainment process contracts or agreements used to attain and sustain the maintenance and support concepts needed for materiel readiness. The product support package is initially provided during the EMD acquisition phase to support the various system and subsystem tests and demonstrations. Upon fielding, the product support package is complete to include all products and services from the twelve IPS Elements needed to support the system's operation and sustainment.

Figure A-1 illustrates the major IPS Element products which the PSM is responsible for during each phase of the weapon system's acquisition life cycle. All twelve of the IPS Elements are represented by products. The reader will note, however, that this chart deliberately does not assign each product to a specific Element because typically the resources and capabilities of more than one Element are required to complete each product.

The products are represented in this diagram only once for simplicity of the model and products may be developed in either earlier or later phases as program requirements dictate. The arrows which connect the products are intended to show how information developed for one product serves as a base of information for the development of future products during the life cycle. The arrows are intended as representative of information flow but should not be considered as all-inclusive or exclusive.

The R&M Analysis block in the TMRR phase, along with the Fault Tree Analysis (FTA) and RAM-C Rationale Report is intended to be a comprehensive source of information feeding information into multiple other products during all acquisition phases. For simplicity, although the RAM-C Rationale Report is initially developed for Milestone A and subsequently updated for Milestones B and C, it is shown only once in the TMRR phase.

Note that all products will support the Life Cycle Sustainment Plan (LCSP)/Product Support Strategy initiated for Milestone A and subsequently updated for each Milestone, Operating Capability and during Operations and Sustainment. All products also are assessed for the development of the Business Case Analysis (BCA) and Logistics Assessments.

Interrelationships of Product Support Plans, Processes and Products

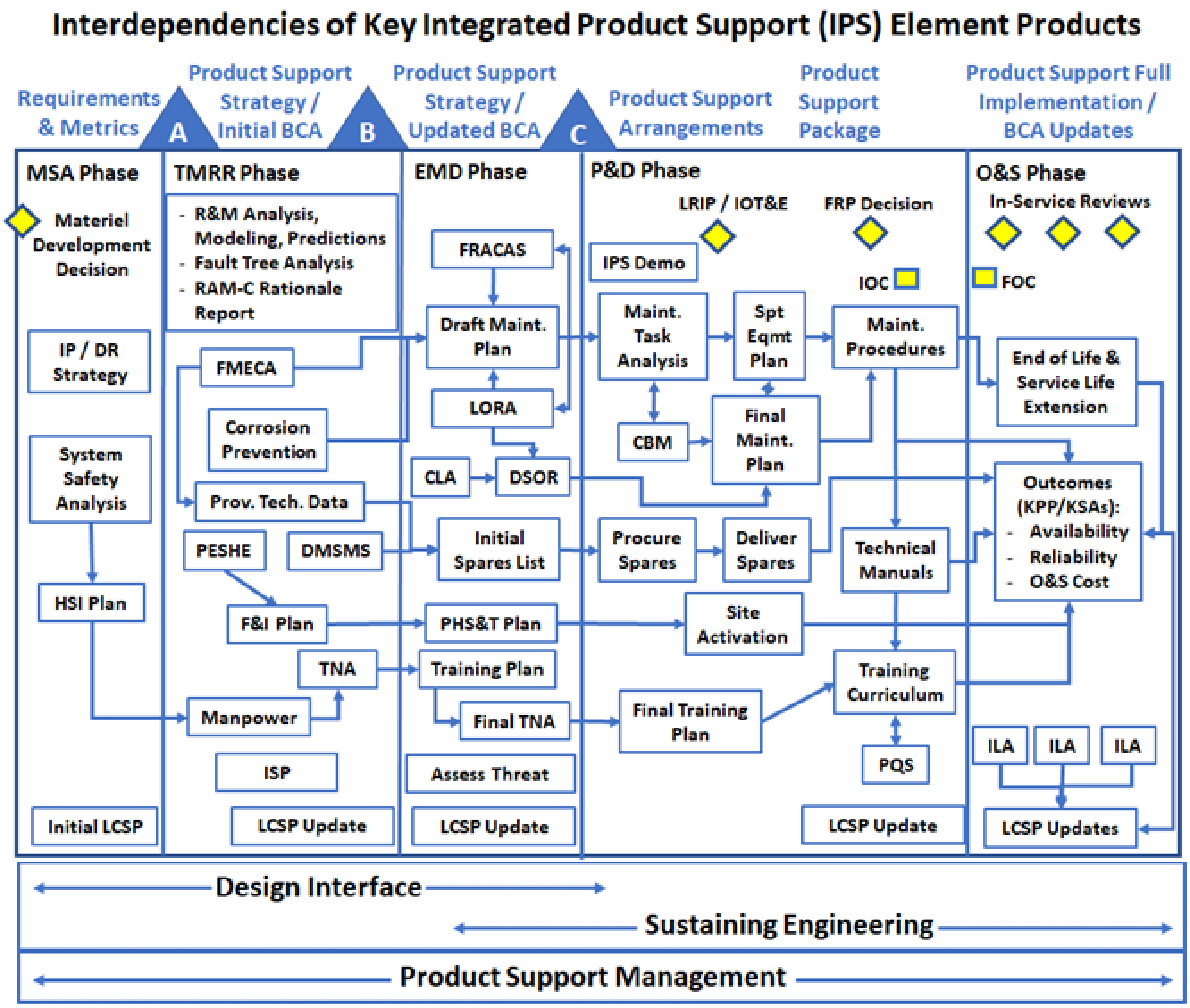


Figure A-1. Integration of IPS Elements Product Deliverables

Integrated Product Support (IPS) Element Product Terms and Definitions

- **Availability (Ao)** – The sustainment KPP: materiel availability & operational availability;
- **Business Case Analysis (BCA)** – considers cost, quantifiable and non-quantifiable factors supporting investment and determining the optimal product support strategy;
- **Information Support Plan (ISP)** – a comprehensive plan addressing computer resources and information technology;
- **Core Logistics Analysis (CLA)** – defines the degree to which the program meets 10USC 2460, 2464, 2466, and 2474;
- **Depot Source of Repair (DSOR**) decision process – addresses effective use of commercial and organic depot maintenance resources; maintains core depot capabilities;

- **Diminishing Manufacturing Sources and Material Shortages (DMSMS) Plan** – proactive practices for managing risk of obsolescence and a diminishing supply base;
- **Facilities and Infrastructure Sustainment Plan** – a comprehensive plan for facilities, real property, related infrastructure, and facility equipment, technology and telecommunications;
- **Failure Reporting, Analysis and Corrective Action System (FRACAS)** – reports, classifies, analyzes failures and plans corrective actions in response to failures;
- **Fault Tree Analysis (FTA)** – analyzes high-level failures and identifies all lower-level (sub-system) failures that cause it. Generally, the undesired event constitutes the highest level (top) event in a fault tree diagram and represents a complete or catastrophic failure of the system;
- **Human Systems Integration (HSI) Plan** – addresses the synergistic interaction between the human, the weapon system and the support environment;
- **In-Service Reviews** –assessment of technical and operational health of the deployed system to substantiate in-service support and budget priorities;
- **Integrated Product Support (IPS) Demonstration (Demo)** – (also see “M-Demo” or “Log-Demo”) is a demonstration in a simulated operational environment to determine achievement of maintenance and/or support requirements;
- **Key Performance Parameters (KPP)** – system attributes or characteristics most critical or essential for an effective military capability. The sustainment KPP is Availability (A_o);
- **Key System Attribute (KSA)** – Measures to provide an additional level of capability prioritization below the KPP level. Sustainment KSA’s: Reliability and Ownership Cost;
- **Life Cycle Sustainment Plan (LCSP)/Product Support Strategy** – a comprehensive plan for programs to effectively and affordably satisfy life cycle sustainment requirements;
- **Independent Logistics Assessment (ILA)** – analysis of a program’s supportability planning conducted by an independent and impartial subject matter expert team;
- **Manpower** – signifies estimates developed for the proposed manpower & personnel weapon system force structure;
- **Corrosion Prevention** – addresses corrosion-related issues;
- **Failure Modes and Effects Criticality Analysis (FMECA)** - an inductive analytical method plus a criticality analysis to chart probability of failure against severity of consequences;
- **Intellectual Property and Data Rights (IP/DR) Strategy** - addresses acquisition of and the rights to use, modify, reproduce, release, perform, display, or disclose technical data;
- **Level of Repair Analysis (LORA)** – optimizes location selection for repair;
- **Maintenance Plan** – identifies maintenance requirements and resources;
- **Maintenance Procedures** – actions and resources to complete required maintenance tasks;
- **Maintenance Task Analysis (MTA)** – identification of IPS element inputs plus elapsed time for performance of each maintenance task;
- **Ownership Cost** – ensuring the O&S costs are associated with availability decision-making–also used in Life Cycle Cost, Total Ownership Cost, Affordability planning;

- **Packaging, Handling, Storage and Transportation (PHS&T) Plan** – comprehensive plan to identify and meet PHS&T requirements for system operation and support;
- **Personnel Qualification Standards (PQS)** – program personnel requirements to validate and improve job performance qualifications;
- **Procure and Deliver Spares** – spares process for initial fielding & on-going operations;
- **Product Support Arrangements** – a binding agreement (may be non-contractual) between organizations to implement weapon system sustainment;
- **Product Support Plan** – describes detailed product support implementation;
- **Product Support Package** – the product support functions necessary to achieve the program's performance-based metrics;
- **Product Support Strategy** – the documented approach describing the process to achieve performance-based metrics;
- **Programmatic Environmental, Safety and Occupational Health (ESOH) Evaluation (PESHE)** – communicates status of ESOH efforts and system risk management;
- **Provisioning Technical Documentation (PTD)** – compilation of scope and quantity of support items to operate and maintain a system for an initial time period;
- **Reliability** – measuring probability that the system performs without failure over time;
- **Reliability & Maintainability (R&M) Analysis/Modeling/Predictions** – apply reliability and maintainability strategies and processes to meet requirements;
- **Reliability Centered Maintenance (RCM)** – systemic approach to identifying preventative or scheduled maintenance tasks and task intervals;
- **Requirements and Metrics** – early development of product support requirements and outcome-based metrics (KPPs, KSAs and subordinate metrics);
- **Site Activation** – rendering operational those facilities required to house, service, and launch prime mission equipment;
- **Spares List** – identifies spare and replacement parts required for system support;
- **System Safety Analysis** - a method for evaluating the hazards and risks posed by a system and ways to minimize them;
- **Technical Manuals** – instructions for installation, operation, maintenance, training and support of weapon systems and its support equipment;
- **Support Equipment Plan** – comprehensive plan addressing the acquisition, fielding and support of a weapon system's support equipment;
- **Training Curriculum** – defines the scope of the training course;
- **Training Needs Analysis (TNA)** – identification of skill s to complete required tasks;
- **Training Plan**- identifies the skills, most effective approach and cost efficiencies to meet training requirements.

Annex B. Product Support/Sustainment Metrics

Overview

Metrics are used by the DoD to support the development of program planning, to monitor program execution and evaluate risk. Metrics are used in communications to inform DoD leadership of risks, opportunities and impacts (both actual and predicted) to system performance.

Per the DAU Performance Based Logistics Guidebook, metrics are used to track, measure, and assess the implementation and effectiveness of the performance-based logistics arrangement as executed by the PSI or PSP. Metrics are the means by which the PM and PSM gain understanding of the product support solution and identify any gaps between required and actual performance. Understanding enables adjustments to the support solution to optimize product support operations and Warfighter outcome.

Metrics should be selected or constructed to encourage performance improvement, effectiveness, efficiency, and innovation. There is no perfect metric but selecting an appropriate complementary set of metrics will promote the desired behavior and outcome while minimizing unintended consequences. Effective metrics ensure PSI and PSP activities are aligned with the Warfighter mission, contribute to meeting Warfighter requirements, deliver an on-time, quality product, and reduce (or avoid) cost.

What is a Metric?

Per the DAG 3-4.1.3.1, Technical Performance Measures, technical performance measures and metrics (TPM) are the method of collecting and providing information to Program Managers (PM) and Systems Engineers at routine intervals for decision making. Metrics are measures collected over time for the purpose of seeing trends and forecasting program progress to plan. TPMs encompass the quantifiable attributes of both the system's development processes and status, as well as the system's product performance and maturity.

Early in the life cycle the TPMs may be estimated based on numerous assumptions and modeling and simulation. As the life cycle proceeds, actual demonstrated data replaces estimates and adds to the fidelity of the information. The insight gained can be at any level: the entire system, sub- system elements, and other contributing mission (e.g. SoS) elements, as well as all of the SE processes and SE disciplines in use across the program.

Often the terms "parameter," "measure," and "metric" are used interchangeably.

- A parameter is defined as a set of physical properties whose values determine the characteristics or behavior of something. Parameters may also be defined as a rule or limit that controls what something is or how something should be done. For example, Operational Availability is the measure of the percentage of time that a system or group of systems within a unit are operationally capable of performing an assigned mission and can be expressed as (uptime/ (uptime + downtime)). Operational Availability is usually specified for a given scenario or type of unit. Determining the optimum value for Operational Availability requires a comprehensive analysis of the system and its planned CONOPS and/or OMS/MP, including the planned operating environment, operating tempo, reliability and maintenance concepts, and supply chain solutions.

- Technical performance measures form the basis to assess readiness for Milestone decisions, IMP criteria, and contract incentives/actions. For example, Maintenance Burden may be used as a measure of the maintainability parameter related to item demand for maintenance manpower.
- A metric is defined to be a standard of measurement. Programs use metrics to measure and report progress. For example, the metric to assess Maintenance Burden could be the sum directed maintenance man hours (corrective and preventive) divided by the total number of operating hours.

DoD References for Product Support Metrics

The below DoD policy and guidance should be considered as recommendations of "start points" for further research and understanding of product support metric identification and definitions. Further metrics identification and usage for each of the 12 IPS Elements beyond these references may be necessary and should be aligned to system reporting requirements.

The below listing of DoD policy and guidance is a good start for researching DoD product support metrics.

- The Manual for the Operation of the Joint Capabilities Integration and Development System (JCIDS Manual), Annex D to Appendix G to Enclosure B, Sustainment KPP Guide
- DoDI 5000.02, Operation of the Adaptive Acquisition Framework
- Other policy located on the DoD AAF website and DoD Issuances website
- DoDI 5000.87, Operation of the Software Acquisition Pathway
- Defense Acquisition Guidebook (DAG)
- DoDI 4140.01, DoD Supply Chain Materiel Management Policy (12 volumes)
  See Volume 10, DoD Supply Chain Materiel Management Procedures: Supply Chain Inventory Reporting and Metrics
- MIL-HDBK 260, Reference Data for Logistics Metrics, September 10, 2014
- Product Support Manager's Guidebook, See Chapter 3.3, Metrics
- Performance Based Logistics Guidebook, See Appendix, F: PBL Metrics
- DoD Supply Chain Metrics Guide, March 3, 2016
- SD-22, Diminishing Manufacture Sources and Material Shortages (DMSMS)
  See Appendix I.2, Metrics
- Operating and Support (O&S) Cost Management Guidebook, 2016.

See Appendix D – The Sustainment Quad Chart

- Reliability, Availability, Maintainability, And Cost (RAM-C) Rationale Report Outline Guidance
- Systems Engineering Plan Outline

  See Section 3.4, Technical Performance Measures and Metrics

Annex C. IPS Element Consolidated Reference List

Part 1. Reference List with Suggested Mapping by IPS Element

PSM – Product Support Management
DI – Design Interface
Sus Eng – Sustaining Engineering
SS – Supply Support
MPM – Maintenance Planning and Management
PHS&T – Packaging, Handling, Storage and Transportation
TD – Technical Data
Spt Eqmt – Support Equipment
TTS – Training and Training Support
M&P – Manpower and Personnel
F&I – Facilities and Infrastructure
IT – Information Technology (IT) Systems Continuous Support

Reference	PSM	DI	Sus Eng	SS	MPM	PHS&T	TD	Spt Eqmt	TTS	M&P	F&I	IT
The Manual for the Operation of the Joint Capabilities Integration and Development System (JCIDS Manual)	X	X	X	X	X	X	X	X	X	X	X	X
DoDI 5000.02, Operation of the Adaptive Acquisition Framework	X	X	X	X	X	X	X	X	X	X	X	X
Defense Acquisition Guidebook (DAG)	X	X	X	X	X	X	X	X	X	X	X	X
DoD Directive 5000.01, The Defense Acquisition System	X	X	X	X	X	X	X	X	X	X	X	X
MIL-HDBK 260, Reference Data for Logistics Metrics	X	X	X	X	X	X	X	X	X	X	X	X
Product Support Manager Guidebook	X	X	X	X	X	X	X	X	X	X	X	X
Performance Based Logistics Guidebook	X	X	X	X	X	X	X	X	X	X	X	X
DoD Supply Chain Metrics Guide	X			X								
SD-22, Diminishing Manufacture Sources and Material Shortages (DMSMS)	X	X	X	X	X	X	X	X	X	X	X	X
Operating and Support (O&S) Cost Management Guidebook	X	X	X	X	X	X	X	X	X	X	X	X
Reliability, Availability, Maintainability, And Cost (RAM-C) Rationale Report Outline Guidance, Version 1.0	X	X	X	X	X	X	X	X	X	X	X	X
Systems Engineering Plan Outline	X	X	X	X	X	X	X	X	X	X	X	X

Reference	PSM	DI	Sus Eng	SS	MPM	PHS&T	TD	Spt Eqmt	TTS	M&P	F&I	IT
Adaptive Acquisition Framework (AAF)	X	X	X	X	X	X	X	X	X	X	X	X
SAE EIA-649-1, Configuration Management Requirements for Defense Contracts	X											
DAU ACQuipedia	X	X	X	X	X	X	X	X	X	X	X	X
DAU Community Hub	X	X	X	X	X	X	X	X	X	X	X	X
DoD Joint Doctrine Library	X	X	X	X	X	X	X	X	X	X	X	X
DAU Glossary	X	X	X	X	X	X	X	X	X	X	X	X
Joint Publication 1-02, DoD Dictionary of Military and Associated Terms	X	X	X	X	X	X	X	X	X	X	X	X
DAU Logistics Functional Area Gateway	X	X	X	X	X	X	X	X	X	X	X	X
Defense Acquisition Management Information Retrieval (DAMIR)	X											
Security Assistance Management Manual (SAMM), DoD 5105.38-M	X											
DoDI 4140.01, DoD Supply Chain Materiel Management Policy	X		X	X		X					X	X
International Traffic in Arms Regulations (ITAR)	X	X	X	X	X	X	X	X	X	X	X	X
ISO 9000	X											
International Quality Standard ISO 21247	X											
DoDI 5000.89, Test and Evaluation	X											
Test and Evaluation Management Guidebook	X											
DAU iCatalog	X	X	X	X	X	X	X	X	X	X	X	X
DoDI 5000.73, Cost Analysis Guidance and Procedures	X											
DAU Life Cycle Logistics Blogs	X	X	X	X	X	X	X	X	X	X	X	X
Product Support Business Model (PSBM)	X											
DoD Environment, Safety & Occupational Health Network, and Information Exchange (DENIX)		X	X				X			X	X	
Defense Innovation Marketplace		X										
Value Engineering: A Guidebook of Best Practices and Tools (SD-24)	X	X	X									
DMSMS Knowledge Sharing Portal (DKSP)		X	X	X	X		X					X
DoD Guidebook for Acquiring Commercial Items				X								
DoDI 5000.83, Technology and Program Protection to Maintain Technological Advantage	X			X								

Reference	PSM	DI	Sus Eng	SS	MPM	PHS&T	TD	Spt Eqmt	TTS	M&P	F&I	IT
10 U.S.C. 2337. Life-Cycle Management and Product Support	X											
Life Cycle Sustainment Plan (LCSP) Outline Guidance	X	X	X	X	X	X	X	X	X	X	X	X
DoDI 5010.43, Implementation and Management of the DoD-Wide Continuous Process Improvement/Lean Six Sigma (CPI/LSS) Program	X											
Joint Publication 4-0, Joint Logistics	X	X	X	X	X	X	X	X		X	X	X
Joint Publication 4-04, Contingency Basing	X	X	X	X	X	X	X	X		X	X	X
U.S. Army Materiel Command Logistics Data Analysis Center (LDAC) Tools Suite	X	X	X	X	X	X	X	X	X	X	X	X
Acquisition Requirements Roadmap Tool (ARRT) Suite	X											
Milestone Documentation Identification (MDID) Tool	X											
Product Support Implementation Roadmap	X	X	X	X	X	X	X	X	X	X	X	X
Product Support Strategy Development Tool	X	X	X	X	X	X	X	X	X	X	X	X
MIL-HDBK-61, Configuration Management Guidance	X											
DLA Assist Database	X	X	X	X	X	X	X	X	X	X	X	X
EIA-649-1, Configuration Management Requirements for Defense Contracts	X											
10 U.S.C. 2572, Documents, historical artifacts, and condemned or obsolete combat materiel: loan, gift, or exchange	X											
DoDI 5220.22, National Industrial Security Program (NISP)	X											
DoDM 4160.28, Volume 1 Defense Demilitarization: Program Administration	X											
DLA Disposition Services	X			X								
DoDM 4160.21 Defense Materiel Disposition: Disposal Guidance and Procedures	X			X								
Logistics Assessment (LA) Guidebook	X	X	X	X	X	X	X	X	X	X	X	X
Technology Transfer	X											
Portfolio transfer	X											

Reference	P S M	D I	Sus Eng	S S	M P M	PH S&T	T D	Spt Eq mt	T T S	M & P	F & I	I T
Government Accountability Office (GAO) Reports and Testimonies	X	X	X	X	X	X	X	X	X	X	X	X
DoD Integrated Master Plan and Integrated Master Schedule Preparation and Use Guide	X											
DoD Operating and Support Cost Estimating Guide	X	X	X	X	X	X	X	X	X	X	X	X
Life Cycle Cost	X	X	X	X	X	X	X	X	X	X	X	X
Future Years Defense Program (FYDP)	X											
Defense Working Capital Fund (WCF)	X			X	X						X	
Planning, Programming, Budgeting and Execution (PPBE) Process	X	X	X	X	X	X	X	X	X	X	X	X
MIL-STD-1916, DoD Preferred Methods for Acceptance of Product	X							X				
National Defense Authorization Act	X											
MIL-HDBK 502, Product Support Analysis		X	X				X	X				
Test and Evaluation Management Plan (TEMP)	X	X	X	X	X	X	X	X	X	X	X	X
Logistics Demonstration (LOG-Demo)	X	X	X	X	X	X	X	X	X	X	X	X
Maintainability Demonstration (M-Demo)	X	X	X	X	X	X	X	X	X	X	X	X
Supportability Test and Evaluation (ST&E)	X	X	X				X					
SD-2, DoD Acquisitions – Buying Commercial Items and Nondevelopmental Items	X			X				X				X
DoDI 5000.74, Acquisition of Services	X			X	X	X	X	X	X	X	X	X
DoDI 4000.10, Support Agreements	X	X	X	X	X	X	X	X	X	X	X	X
MIL-HDBK-245, Handbook for Preparation of Statement of Work (SOW)	X											
Independent Cost Estimate (ICE)	X											
MIL-STD-961, Defense and Program-Unique Specifications Format and Content	X						X					X
Public Private Partnering for Product Support Guidebook	X			X	X						X	
U.S. House of Representatives Office of the Law Revision Counsel United States Code	X	X	X	X	X	X	X	X	X	X	X	X
White House Services Executive Services Directorate	X	X	X	X	X	X	X	X	X	X	X	X

Reference	PSM	DI	Sus Eng	SS	MPM	PHS&T	TD	Spt Eqmt	TTS	M&P	F&I	IT
DoDM 4120.24, Enclosure 4, Defense Standardization Program (DSP) Procedures	X	X	X	X	X	X	X	X	X	X	X	X
MIL-HDBK-338, Electronic Reliability Design Handbook		X	X		X		X	X				X
Failure Modes & Effects Analysis (FMEA) and Failure Modes, Effects & Criticality Analysis (FMECA)		X	X		X		X	X				X
Fault Tree Analysis (FTA)		X	X		X		X					
DoDI 4540.07, Operation of the DoD Engineering for Transportability and Deployability Program		X				X	X					
MIL-STD-1366, Interface Standard for Transportability Criteria		X				X	X					
Net-Ready Key Performance Parameter		X										X
Reliability and Maintainability (R&M) Engineering		X	X	X	X	X	X	X	X	X	X	X
Supportability Design Objectives		X	X									
Sustainability		X	X									
Materiel Fielding Plan (MFP)	X	X	X	X	X	X	X	X	X	X	X	X
DoDD 4510.11, DoD Transportation Engineering		X				X						
Total Package Fielding	X	X	X	X	X	X	X	X	X	X	X	X
System Fielding and Site Activation	X	X	X	X	X	X	X	X	X	X	X	X
Provisioning		X	X	X								
MIL-STD-1472, Human Engineering	X	X	X	X	X	X	X	X	X	X	X	X
MIL-STD-46855 (Human Engineering Requirements for Military Systems, Equipment and Facilities)	X	X	X	X	X	X	X	X	X	X	X	X
DoDI 6055.01, DoD Safety and Occupational Health (SOH) Program	X	X	X		X	X	X	X		X	X	X
DoD Environment, Safety & Occupational Health Network and Information Exchange		X			X			X		X	X	X
MIL-STD-810 (Environmental Engineering Considerations and Laboratory Tests)		X	X		X					X	X	
MIL-STD-461 (Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment)		X	X		X			X		X	X	X

Reference	PSM	DI	Sus Eng	SS	MPM	PHS&T	TD	Spt Eqmt	TTS	M&P	F&I	IT
MIL-STD-464 Electromagnetic Environmental Effects Requirements		X	X		X			X		X	X	X
Affordability Analysis	X	X	X	X	X	X	X	X	X	X	X	X
Modular Open Systems Approach (MOSA)	X	X	X	X	X		X	X				X
DoD Corrosion Prevention and Control Planning Guidebook		X	X	X	X	X	X	X				X
Corrosion Control and Prevention		X	X	X	X	X	X	X				X
Operational Energy		X										
Installation Energy		X									X	
SAE GEIA-STD-0007 Logistics Product Data	X	X	X	X	X	X	X	X	X	X	X	X
SAE GEIA-HB-0007B Logistics Product Data Handbook	X	X	X	X	X	X	X	X	X	X	X	X
ANSI/GEIA-STD-0009 Reliability Program Standard for Systems Design Development and Manufacturing		X	X	X	X	X	X	X				X
Product Support Business Case Analysis (BCA) Guidebook	X	X	X	X	X	X	X	X	X	X	X	X
Product Support Analysis (PSA)		X	X				X	X				
MIL-HDBK 189C, Reliability Growth Management		X	X				X					X
DoDI 6055.05, Occupational and Environmental Health (OEH)		X	X		X	X	X	X		X	X	X
DoDI 5000.67, Prevention and Mitigation of Corrosion on DoD Military Equipment and Infrastructure		X	X	X	X	X	X	X				X
Reliability Growth	X	X	X	X	X		X	X				X
Reliability Centered Maintenance (RCM)		X	X	X	X		X	X				X
Reliability Key System Attribute (KSA)		X	X		X		X	X				X
Software Sustainment		X	X	X	X		X	X		X		X
Service Life Extension Program (SLEP) & Service Life Assessment Program (SLAP)			X	X	X		X	X				X
Engineering Change Proposals (ECP)	X	X	X	X	X		X	X				
Value Engineering (VE) and Value Engineering Change Proposals (VECP)	X	X	X	X	X		X	X				
Congressional Budget Office (CBO)	X											
Digital Engineering		X	X									X
Facilities											X	
10 U.S.C. 2244a, Equipment scheduled for retirement or disposal			X		X							X

Reference	PSM	DI	Sus Eng	SS	MPM	PH S&T	TD	Spt Eqmt	TTS	M&P	F&I	IT
Army Regulation 750–1, Army Materiel Maintenance Policy			X		X							
DoDI 4245.14, DoD Value Engineering (VE) Program	X	X	X	X	X		X	X				
41 USC 1711: Value engineering	X	X	X	X	X		X	X				
Office of Management and Budget Circular No. A-131, Value Engineering	X	X	X	X	X		X	X				
MIL-STD-3018, Parts Management				X								
SD-19, Parts Management Guide				X								
Technology Refreshment	X	X	X	X	X	X	X	X	X	X	X	X
Technology Insertion (TI)	X	X	X	X	X	X	X	X	X	X	X	X
DoDD 4151.18, Maintenance of Military Materiel					X							
Failure Reporting, Analysis, and Corrective Action System (FRACAS)		X	X		X		X					
DLA Manual 4000.25, Ch. 24. Chapter 24 Product Quality Deficiency Report Program			X				X					
DoDI 6055.07, Mishap Notification, Investigation, Reporting and Record Keeping	X		X				X					
MIL-HDBK-2155 Failure Reporting, Analysis and Corrective Action Taken		X	X		X		X					
MIL-STD-882, Standard Practice for System Safety	X											
JP 4-09, "Distribution Operations"				X		X						
Supply Chain Management (SCM)				X		X						
Supply Classes				X		X						
Readiness-Based Sparing (RBS)				X								
Market Research	X			X								
Bill of Materials (BOM)				X								
Cataloging				X								
National Stock Number (NSN)				X								
Inventory Management				X								
DoD 4000.25-1, Military Standard Requisitioning and Issue Procedures (MILSTRIP)				X								

Reference	PSM	DI	Sus Eng	SS	MPM	PHS&T	TD	Spt Eqmt	TTS	M&P	F&I	IT
Item Unique Identification (IUID)				X		X	X					
DoD Instruction 8320.04, Item Unique Identification (IUID) Standards for Tangible Personal Property				X			X					
Radio Frequency Identification (RFID)				X			X					
Shelf-Life Extension System (SLES)				X		X	X					
Warranty			X	X	X		X					X
DoD Instruction 5200.44, Protection of Mission Critical Functions to Achieve Trusted Systems & Networks (TSN)		X	X	X			X					X
NAVSO P-7000, Counterfeit Materiel Process Guidebook,		X	X	X			X					X
Counterfeit Parts		X	X	X			X					X
DAU's Tools and Resources Database	X	X	X	X	X	X	X	X	X	X	X	X
Life Cycle Logistics Community of Practice (LOGCoP)	X	X	X	X	X	X	X	X	X	X	X	X
10 USC 2441, Sustainment reviews	X	X	X	X	X	X	X	X	X	X	X	X
DFARS Part 208, Required Sources of Supplies and Services				X								
DoDI 4140.67, DoD Counterfeit Prevention				X								
DoDI 4151.19, Serialized Item Management (SIM) for Life-Cycle Management of Materiel				X								
DoDI 5200.39, Critical Program Information (CPI) Identification and Protection Within Research, Development, Test, and Evaluation (RDT&E)				X			X					
Enhanced Section 806 Procedures for Supply Chain Risk Management in Support of Department of Defense (DoD) Trusted Systems and Networks,"				X			X					
Acquisition Workforce Implementation of Enhanced Procedures for Supply Chain Risk Management in Support of Department of Defense Trusted Systems and Networks				X								
Maintenance Concept	X	X	X	X	X	X	X	X	X	X	X	X
Condition Based Maintenance Plus (CBM+)		X	X		X	X	X					
Maintenance Task Analysis (MTA)		X	X		X		X			X		

Reference	PSM	DI	Sus Eng	SS	MPM	PHS&T	TD	Spt Eqmt	TTS	M&P	F&I	IT
Maintenance Plan	X	X	X	X	X	X	X	X	X	X	X	X
DoDI 4151.20, Depot Maintenance Core Capabilities Determination Process	X				X							
Core Logistics Analysis	X				X							
Public Private Partnership	X			X	X						X	
Depot Level Maintenance			X		X			X			X	
Level of Repair Analysis (LORA)	X	X	X		X		X	X	X	X		
Computerized Optimization Model for Predicting and Analyzing Support Structures (COMPASS)	X	X	X		X		X	X	X	X		
Software Maintenance		X	X		X		X					X
CJCSI 3162.02, Methodology for Combat Assessment					X							
FM 4-30.31, Recovery and Battle Damage Assessment and Repair					X							
MIL-PRF-28800F, Test Equipment for Use with Electrical and Electronic Equipment			X		X		X	X				
DoDI 4151.22 Condition Based Maintenance Plus (CBM+)		X	X		X							
SAE JA1011, Evaluation Criteria for Reliability-Centered Maintenance (RCM) Processes		X	X		X							
SAE JA1012, A Guide to the Reliability-Centered Maintenance (RCM) Standard		X	X		X							
DoDI 4151.24, Depot Source of Repair (DSOR) Determination Process					X							
DoD Dictionary of Military and Associated Terms	X	X	X	X	X	X	X	X	X	X	X	X
10 U.S.C. §2208 Working Capital Funds	X											
10 U.S.C. §2460 Depot Maintenance					X							
10 U.S.C. §2464 Core					X							
10 U.S.C. §2466 "50-50 Rule"					X							
10 U.S.C. §2469 "$3M Rule"					X							
10 U.S.C. §2474 Partnering (CITE)					X							
10 U.S.C. §2563 Partnering (Sales)					X							
DoDI 4151.21 Public-Private Partnerships for Depot-Level Maintenance					X							
MIL-HDBK-472 Maintainability Prediction		X	X		X			X				

Reference	PSM	DI	Sus Eng	SS	MPM	PHS&T	TD	Spt Eqmt	TTS	M&P	F&I	IT
MIL-STD-3034 Reliability-Centered Maintenance (RCM) Process		X	X		X			X				
S4000M International Specification for Developing Scheduled Maintenance Programs		X	X		X		X					
S4000P International Specification for Developing and Continuously Improving Preventive Maintenance		X	X		X		X					
S5000F International Specification for Operational and Maintenance Data Feedback			X		X		X					
DoD Depot Maintenance Partnerships					X							
SAE JA6097 "Using a System Reliability Model to Optimize Maintenance Costs: A Best Practices Guide"	X	X	X		X							
SAE Standard AS1390 "Level of Repair Analysis (LORA)"	X	X	X		X	X	X	X		X	X	
MIL-STD-2073-1E, DoD Standard Practice for Military Packing						X						
DLAR (JP) 4155.37 AR 702-18 NAVSUPINST 4410.56A AFMAN 23-232 (IP) MCO 4450.13B, July 28, 2015, Department of Defense (DoD) Shelf-Life Materiel Quality Control Storage Standards (MQCSS)				X		X						
DTR 4500.9-R, Defense Transportation Regulation Individual Missions, Roles and Responsibilities						X						
DoDI 4500.57, Transportation and Traffic Management						X						
DoDM 4140.27, Volume 1, DoD Shelf-Life Management Program: Program Administration						X						
DoD 4100.39-M, Federal Logistics Information System (FLIS) Procedures						X						
DLAI 4145.11/TM 38-410/NAVSUP PUB 573/AFJMAN 23-209/MCO 4450.12A, Storage and Handling of Hazardous Materials, January 13, 1999				X		X						

Reference	PSM	DI	Sus Eng	SS	MPM	PHS&T	TD	Spt Eqmt	TTS	M&P	F&I	IT
DLAR 4145.41/AR 700-143/NAVSUPINST 4030.55D/AFMAN 24-210/MCO 4030.40C, Packaging of Hazardous Materials						X						
DLAR (JP) 4155.37 AR 702-18 NAVSUPINST 4410.56A AFMAN 23-232 (IP) MCO 4450.13B, DoD Shelf-Life Materiel Quality Control Storage Standards						X						
AFMAN 24-204/TM 38-250/NAVSUP PUB 505/DLAI 4145.3, Preparing Hazardous Materials for Military Air Shipments						X						
DoDM 6055.09 (Volumes 1-8), DoD Ammunition and Explosives Safety Standards, 29 February 2008						X						
Transportability						X						
DoDI 5158.06, Distribution Process Owner						X						
Joint Deployment and Distribution Enterprise (JDDE)						X						
Joint Publication 4-01, The Defense Transportation System (DTS)						X						
Defense Transportation Regulation – Part II, Cargo Movement						X						
49 CFR 173.2, Hazardous Materials Classes and Index to Hazard Class Definitions				X		X						
MIL-STD-1686C, Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices)		X	X	X	X	X	X					X
DoDM 5200.01, Volume 3, DoD Information Security Program: Protection of Classified Information	X					X	X					X
MIL-STD-130N, Identification Marking of U.S. Military Property				X		X	X					
MIL-STD-129R, Military Marking for Shipment and Storage				X		X	X					
DoDD 5160.65, Single Manager for Conventional Ammunition (SMCA)						X						
MIL-STD-290 Packaging and Marking of Petroleum and Related Products						X						

Reference	PSM	DI	Sus Eng	SS	MPM	PHS&T	TD	Spt Eqmt	TTS	M&P	F&I	IT
Technical data							X					
DoD 5010.12-M, Procedures for the Acquisition and Management of Technical Data							X					
DoDI 8320.07, Implementing the Sharing of Data, Information, and Information Technology (IT) Services in the Department of Defense							X					X
Data markings				X		X	X					X
MIL-STD-962, Defense Standards Format and Content							X					
SD-9, DoD Guidance on Participating in the Development and Use of Non-Government Standards							X					
STEP, the Standard for the Exchange of Product Model Data							X					
ISO 10303-239:2012, Industrial automation systems and integration							X					X
MIL-STD-963, Data Item Descriptions							X					
MIL-STD 3031, Army Business Rules for S1000D: International Specification for Technical Publications Utilizing a Common Source Data Base							X					
Data Rights, Identification and Assertion of use, release, or disclosure restrictions, DFARS 252.227-7017	X						X					
Technical Data Package (TDP)							X					
Material Safety Data Sheet							X					
DoDI 5230.24, Distribution Statements on Technical Documents							X					
DoDM 5200.02, DoD Information Security Program (4 Volumes)							X					X
Intellectual Property (IP) Strategy (formerly known as the Data Management Strategy and the Technical Data Rights Strategy)	X						X					
DoDI 8500.01, Cybersecurity							X					X
DoDI 8320.02, Dec 2, 2004, Data Sharing in a Net-Centric Department of Defense							X					

Reference	PSM	DI	Sus Eng	SS	MPM	PHS&T	TD	Spt Eqmt	TTS	M&P	F&I	IT
MIL-DTL-31000B, Technical Data Packages							X					
Army Data and Data Right (D&DR) Guide							X					
Army Regulation 25-1 Army Information Technology							X					
Dept of the Army Pamphlet 25-1-1 Army Information Technology Implementation Instructions							X					
Air Force Product Data Acquisition (PDAQ) guidance							X					
Air Force Technical Data and Computer Software Rights Handbook							X					X
DoDI 4165.14, Real Property Inventory (RPI) and Forecasting								X			X	
DoDI 5000.64, Accountability and Management of DoD Equipment and Other Accountable Property								X			X	
MIL-HDBK-2097A, Acquisition of Support Equipment and Associated Integrated Logistics Support	X	X	X	X	X	X	X	X	X	X	X	X
MIL-STD-1309, Definitions of Terms for Testing, Measurement and Diagnostics								X				
AR 70-12, “Research, Development, and Acquisition, Fuels and Lubricants Standardization Policy for Equipment Design, Operation, and Logistic Support	X			X				X				
MIL-S-8512D, Support Equipment, Aeronautical, Special General Specification for the Design Of		X					X	X				
MIL-STD-1839D, Standard Practice Calibration & Measurement Requirements		X						X				
Automatic Test Systems								X				
ATS Acquisition Guide								X				
ATS Selection Process Guide								X				
ATS Master Plan								X				
DoD Directive 4120.11, Mobile Electric Power Systems (MEPS)								X				
DoDD 1322.18, Military Training									X			
DoDI 1322.27, DoD Urban Training Facilities									X			
MIL-HDBK 29612-4A, Glossary for Training									X			

Reference	PSM	DI	Sus Eng	SS	MPM	PHS&T	TD	Spt Eqmt	TTS	M&P	F&I	IT
CJCSI 3500.01H, Joint Training Policy for the Armed Forces of the United States									X			
JP 3-16, Multinational Operations									X			
DoDI 1322.06, Fellowships, Legislative Fellowships, Internships, Scholarships, Training-With-Industry (TWI), and Grants Provided to DoD or DoD Personnel for Education and Training									X			
U.S. Army TRADOC Pamphlet 350-70-13, System Training Integration									X			
DoDI 1322.08, Voluntary Education Programs for Military Personnel									X	X		
DoDI 1322.26, Distributed Learning (DL)									X			
DoDI 1322.31, Common Military Training									X			
DoDI 8100.02, Use of Commercial Wireless Devices, Services, and Technologies in the Department of Defense (DoD) Global Information Grid (GIG)									X			X
MIL-HDBK 29612/1A, Guidance for Acquisition of Training Data Products and Services	X								X			
MIL-HDBK 29612/2A, Instructional Systems Development/Systems Approach to Training and Education									X			
AFI 36-2251, Management of Air Force Training Systems									X			
MIL-PRF 29612, Training Data Products									X			
MIL-HDBK-29612-5, Advanced Distributed Learning (ADL) Products and Systems									X			
DoDI 1400.25, Volume 410, DoD Civilian Personnel Management System: Training, Education, and Professional Development									X	X		
U.S. Army TRADOC Pamphlet 350-70-9, Training and Education Budgeting and Resourcing									X	X		
DoDD 1100.4, Guidance for Manpower Management										X		
DoDI 1100.22, Policy and Procedures for Determining Workforce Mix										X		

Reference	PSM	DI	Sus Eng	SS	MPM	PHS&T	TD	Spt Eqmt	TTS	M&P	F&I	IT
DoDI 1120.11, Programming and Accounting for Active Component (AC) Military Manpower										X		
DoDI 1145.01, Qualitative Distribution of Military Manpower										X		
DoDI 1312.01, DoD Occupational Information Collection and Reporting										X		
DoDI 1315.18, Procedures for Military Personnel Assignments										X		
DoDI 7041.04, Estimating and Comparing the Full Costs of Civilian and Active Duty Military Manpower and Contract Support										X		
DoDI 7730.64, Automated Extracts of Manpower and Unit Organizational Element Files										X		
United States Code, Title 10, Section 2667, Leases: non-excess property of military departments and Defense Agencies											X	
DoD Directive 3020.40, Defense Critical Infrastructure Program (DCIP)											X	
DoDD 3200.11, Major Range and Test Facility Base (MRTFB)											X	
DoDD 4165.06, Real Property											X	
DoDD 4270.5, Military Construction											X	
DoDD 4275.5, Acquisition and Management of Industrial Resources	X										X	
DoDD 5105.71, Department of Defense Test Resource Management Center											X	
DoDI 3200.18 - Management and Operation of the Major Range and Test Facility Base (MRTFB)											X	
DoDI 4165.03 - DoD Real Property Categorization											X	
DoDI 4165.14, Real Property Inventory and Forecasting											X	
DoDI 4165.56, Relocatable Buildings											X	
DoDI 4165.69 - Realignment of DoD Sites Overseas											X	
DoDI 4165.70 - Real Property Management											X	

Reference	PSM	DI	Sus Eng	SS	MPM	PHS&T	TD	Spt Eqmt	TTS	M&P	F&I	IT
DoDI 4165.71, Real Property Acquisition											X	
DoDI 4165.72, Real Property Disposal											X	
DoD Manual 5200.08, Volume 3, Physical Security Program: Access to DoD Installations											X	
MIL-STD 3007F, Standard Practice for Unified Facilities Criteria and Unified Facilities Guide Specifications											X	
JP 3-34, Joint Engineer Operations											X	
Unified Facilities Criteria (UFC)											X	
Technical Data and Computer Software Rights Handbook 9th Edition							X					X
DFARS Part 208 - Required Sources of Supplies and Services				X								X
DoDD 5200.47E, Anti-Tamper (AT)		X										X
DoDD 8000.01, Management of the Department of Defense Information Enterprise												X
DoDI 3222.03 Electromagnetic Environmental Effects (E3) Program		X										X
DoDI 4650.01, Policy and Procedures for Management and Use of the Electromagnetic Spectrum		X										X
DoDI 5205.13, Defense Industrial Base (DIB) Cyber Security/Information Assurance (CS/IA)												X
DoDI 8320.03: Unique Identification (UID) Standards for Supporting the DoD Information Enterprise												X
DoDI 8330.01, Interoperability of Information Technology (IT), Including National Security Systems												X
DoDI 8310.01, Information Technology Standards in the DoD												X
DoDI 8510.01, Risk Management Framework (RMF) for DoD Information Technology (IT)												X
Department of Defense Cybersecurity Activities for Cloud Service Offerings												X

Part 2. Consolidated Reference List by IPS Element

Product Support Management

DoD Directive 5000.01, The Defense Acquisition System
DoDI 5000.02, Operation of the Adaptive Acquisition Framework
The Manual for the Operation of the Joint Capabilities Integration and Development System (JCIDS Manual)
Defense Acquisition Guidebook (DAG)
MIL-HDBK 260, Reference Data for Logistics Metrics
Product Support Manager Guidebook
Performance Based Logistics Guidebook
DoD Supply Chain Metrics Guide
SD-22, Diminishing Manufacture Sources and Material Shortages (DMSMS)
Operating and Support (O&S) Cost Management Guidebook
Reliability, Availability, Maintainability, And Cost (RAM-C) Rationale Report Outline Guidance, Version 1.0
Systems Engineering Plan Outline
Adaptive Acquisition Framework (AAF)
SAE EIA-649-1, Configuration Management Requirements for Defense Contracts
DAU ACQuipedia
DAU Community Hub
DoD Joint Doctrine Library
DAU Glossary
Joint Publication 1-02, DoD Dictionary of Military and Associated Terms
DAU Logistics Functional Area Gateway
Defense Acquisition Management Information Retrieval (DAMIR)
Security Assistance Management Manual (SAMM), DoD 5105.38-M
DoDI 4140.01, DoD Supply Chain Materiel Management Policy
International Traffic in Arms Regulations (ITAR)
ISO 9000
International Quality Standard ISO 21247
DoDI 5000.89, Test and Evaluation
Test and Evaluation Management Guidebook
DAU iCatalog
DoDI 5000.73, Cost Analysis Guidance and Procedures
DAU Life Cycle Logistics Blogs
Product Support Business Model (PSBM)
Value Engineering: A Guidebook of Best Practices and Tools (SD-24)
DoDI 5000.83, Technology and Program Protection to Maintain Technological Advantage
10 U.S.C. 2337. Life-Cycle Management and Product Support
Life Cycle Sustainment Plan (LCSP) Outline Guidance

DoDI 5010.43, Implementation and Management of the DoD-Wide Continuous Process Improvement/Lean Six Sigma (CPI/LSS) Program
Joint Publication 4-0, Joint Logistics
Joint Publication 4-04, Contingency Basing
U.S. Army Materiel Command Logistics Data Analysis Center (LDAC) Tools Suite
Acquisition Requirements Roadmap Tool (ARRT) Suite
Milestone Documentation Identification (MDID) Tool
Product Support Implementation Roadmap
Product Support Strategy Development Tool
MIL-HDBK-61, Configuration Management Guidance
DLA Assist Database
EIA-649-1, Configuration Management Requirements for Defense Contracts
10 U.S.C. 2572, Documents, historical artifacts, and condemned or obsolete combat materiel: loan, gift, or exchange
DoDI 5220.22, National Industrial Security Program (NISP)
DoDM 4160.28, Volume 1 Defense Demilitarization: Program Administration
DLA Disposition Services
DoDM 4160.21 Defense Materiel Disposition: Disposal Guidance and Procedures
Logistics Assessment (LA) Guidebook
Technology Transfer
Portfolio transfer
Government Accountability Office (GAO) Reports and Testimonies
DoD Integrated Master Plan and Integrated Master Schedule Preparation and Use Guide
DoD Operating and Support Cost Estimating Guide
Life Cycle Cost
Future Years Defense Program (FYDP)
Defense Working Capital Fund (WCF)
Planning, Programming, Budgeting and Execution (PPBE) Process
MIL-STD-1916, DoD Preferred Methods for Acceptance of Product
National Defense Authorization Act
Test and Evaluation Management Plan (TEMP)
Logistics Demonstration (LOG-Demo)
Maintainability Demonstration (M-Demo)
Supportability Test and Evaluation (ST&E)
SD-2, DoD Acquisitions – Buying Commercial Items and Nondevelopmental Items
DoDI 5000.74, Acquisition of Services
DoDI 4000.10, Support Agreements
MIL-HDBK-245, Handbook for Preparation of Statement of Work (SOW)
Independent Cost Estimate (ICE)
MIL-STD-961, Defense and Program-Unique Specifications Format and Content
Public Private Partnering for Product Support Guidebook
U.S. House of Representatives Office of the Law Revision Counsel United States Code

White House Services Executive Services Directorate
DoDM 4120.24, Enclosure 4, Defense Standardization Program (DSP) Procedures
Materiel Fielding Plan (MFP)
Total Package Fielding
System Fielding and Site Activation
MIL-STD-1472, Human Engineering
MIL-STD-46855 (Human Engineering Requirements for Military Systems, Equipment and Facilities)
DoDI 6055.01, DoD Safety and Occupational Health (SOH) Program
Affordability Analysis
Modular Open Systems Approach (MOSA)
DoD Corrosion Prevention and Control Planning Guidebook
Corrosion Control and Prevention
SAE GEIA-STD-0007 Logistics Product Data
SAE GEIA-HB-0007B Logistics Product Data Handbook
Product Support Business Case Analysis (BCA) Guidebook
Reliability Growth
Engineering Change Proposals (ECP)
Value Engineering (VE) and Value Engineering Change Proposals (VECP)
Congressional Budget Office (CBO)
DoDI 4245.14, DoD Value Engineering (VE) Program
41 USC 1711: Value engineering
Office of Management and Budget Circular No. A-131, Value Engineering
Technology Refreshment
Technology Insertion (TI)
DoDI 6055.07, Mishap Notification, Investigation, Reporting and Record Keeping
MIL-STD-882, Standard Practice for System Safety
Market Research
DAU's Tools and Resources Database
Life Cycle Logistics Community of Practice (LOGCoP)
10 USC 2441, Sustainment reviews
Maintenance Concept
Maintenance Plan
DoDI 4151.20, Depot Maintenance Core Capabilities Determination Process
Core Logistics Analysis
Public Private Partnership
Level of Repair Analysis (LORA)
Computerized Optimization Model for Predicting and Analyzing Support Structures (COMPASS)
DoD Dictionary of Military and Associated Terms
10 U.S.C. §2208 Working Capital Funds

SAE JA6097 "Using a System Reliability Model to Optimize Maintenance Costs: A Best Practices Guide"
SAE Standard AS1390 "Level of Repair Analysis (LORA)"
DoDM 5200.01, Volume 3, DoD Information Security Program: Protection of Classified Information
Data Rights, Identification and Assertion of use, release, or disclosure restrictions, DFARS 252.227-7017
Intellectual Property (IP) Strategy (formerly known as the Data Management Strategy and the Technical Data Rights Strategy)
MIL-HDBK-2097A, Acquisition of Support Equipment and Associated Integrated Logistics Support
AR 70-12, "Research, Development, and Acquisition, Fuels and Lubricants Standardization Policy for Equipment Design, Operation, and Logistic Support
MIL-HDBK 29612/1A, Guidance for Acquisition of Training Data Products and Services
DoDD 4275.5, Acquisition and Management of Industrial Resources

Design Interface

DoD Directive 5000.01, The Defense Acquisition System
DoDI 5000.02, Operation of the Adaptive Acquisition Framework
The Manual for the Operation of the Joint Capabilities Integration and Development System (JCIDS Manual)
Defense Acquisition Guidebook (DAG)
MIL-HDBK 260, Reference Data for Logistics Metrics
Product Support Manager Guidebook
Performance Based Logistics Guidebook
SD-22, Diminishing Manufacture Sources and Material Shortages (DMSMS)
Operating and Support (O&S) Cost Management Guidebook
Reliability, Availability, Maintainability, And Cost (RAM-C) Rationale Report Outline Guidance, Version 1.0
Systems Engineering Plan Outline
Adaptive Acquisition Framework (AAF)
DAU ACQuipedia
DAU Community Hub
DoD Joint Doctrine Library
DAU Glossary
Joint Publication 1-02, DoD Dictionary of Military and Associated Terms
DAU Logistics Functional Area Gateway
International Traffic in Arms Regulations (ITAR)
DAU iCatalog
DAU Life Cycle Logistics Blogs
DoD Environment, Safety & Occupational Health Network and Information Exchange (DENIX)
Defense Innovation Marketplace
Value Engineering: A Guidebook of Best Practices and Tools (SD-24)
DMSMS Knowledge Sharing Portal (DKSP)
Life Cycle Sustainment Plan (LCSP) Outline Guidance
Joint Publication 4-0, Joint Logistics
Joint Publication 4-04, Contingency Basing
U.S. Army Materiel Command Logistics Data Analysis Center (LDAC) Tools Suite
Product Support Implementation Roadmap
Product Support Strategy Development Tool
DLA Assist Database
Logistics Assessment (LA) Guidebook
Government Accountability Office (GAO) Reports and Testimonies
DoD Operating and Support Cost Estimating Guide
Life Cycle Cost
Planning, Programming, Budgeting and Execution (PPBE) Process
MIL-HDBK 502, Product Support Analysis

Test and Evaluation Management Plan (TEMP)
Logistics Demonstration (LOG-Demo)
Maintainability Demonstration (M-Demo)
Supportability Test and Evaluation (ST&E)
DoDI 4000.10, Support Agreements
U.S. House of Representatives Office of the Law Revision Counsel United States Code
White House Services Executive Services Directorate
DoDM 4120.24, Enclosure 4, Defense Standardization Program (DSP) Procedures
MIL-HDBK-338, Electronic Reliability Design Handbook
Failure Modes & Effects Analysis (FMEA) and Failure Modes, Effects & Criticality Analysis (FMECA)
Fault Tree Analysis (FTA)
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MIL-STD-1366, Interface Standard for Transportability Criteria
Net-Ready Key Performance Parameter
Reliability and Maintainability (R&M) Engineering
Supportability Design Objectives
Sustainability
Materiel Fielding Plan (MFP)
DoDD 4510.11, DoD Transportation Engineering
Total Package Fielding
System Fielding and Site Activation
Provisioning
MIL-STD-1472, Human Engineering
MIL-STD-46855 (Human Engineering Requirements for Military Systems, Equipment and Facilities)
DoDI 6055.01, DoD Safety and Occupational Health (SOH) Program
DoD Environment, Safety & Occupational Health Network and Information Exchange
MIL-STD-810 (Environmental Engineering Considerations and Laboratory Tests)
MIL-STD-461 (Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment)
MIL-STD-464 Electromagnetic Environmental Effects Requirements
Affordability Analysis
Modular Open Systems Approach (MOSA)
DoD Corrosion Prevention and Control Planning Guidebook
Corrosion Control and Prevention
Operational Energy
Installation Energy
SAE GEIA-STD-0007 Logistics Product Data
SAE GEIA-HB-0007B Logistics Product Data Handbook

ANSI/GEIA-STD-0009 Reliability Program Standard for Systems Design Development and Manufacturing
Product Support Business Case Analysis (BCA) Guidebook
Product Support Analysis (PSA)
MIL-HDBK 189C, Reliability Growth Management
DoDI 6055.05, Occupational and Environmental Health (OEH)
DoDI 5000.67, Prevention and Mitigation of Corrosion on DoD Military Equipment and Infrastructure
Reliability Growth
Reliability Centered Maintenance (RCM)
Reliability Key System Attribute (KSA)
Software Sustainment
Engineering Change Proposals (ECP)
Value Engineering (VE) and Value Engineering Change Proposals (VECP)
Digital Engineering
DoDI 4245.14, DoD Value Engineering (VE) Program
41 USC 1711: Value engineering
Office of Management and Budget Circular No. A-131, Value Engineering
Technology Refreshment
Technology Insertion (TI)
Failure Reporting, Analysis, and Corrective Action System (FRACAS)
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DoD Instruction 5200.44, Protection of Mission Critical Functions to Achieve Trusted Systems & Networks (TSN)
NAVSO P-7000, Counterfeit Materiel Process Guidebook,
Counterfeit Parts
DAU's Tools and Resources Database
Life Cycle Logistics Community of Practice (LOGCoP)
10 USC 2441, Sustainment reviews
Maintenance Concept
Condition Based Maintenance Plus (CBM+)
Maintenance Task Analysis (MTA)
Maintenance Plan
Level of Repair Analysis (LORA)
Computerized Optimization Model for Predicting and Analyzing Support Structures (COMPASS)
Software Maintenance
DoDI 4151.22 Condition Based Maintenance Plus (CBM+)
SAE JA1011, Evaluation Criteria for Reliability-Centered Maintenance (RCM) Processes
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MIL-HDBK 260, Reference Data for Logistics Metrics
Product Support Manager Guidebook
Performance Based Logistics Guidebook
SD-22, Diminishing Manufacture Sources and Material Shortages (DMSMS)
Operating and Support (O&S) Cost Management Guidebook
Reliability, Availability, Maintainability, And Cost (RAM-C) Rationale Report Outline Guidance, Version 1.0
Systems Engineering Plan Outline
Adaptive Acquisition Framework (AAF)
DAU ACQuipedia
DAU Community Hub
DoD Joint Doctrine Library
DAU Glossary
Joint Publication 1-02, DoD Dictionary of Military and Associated Terms
DAU Logistics Functional Area Gateway
DoDI 4140.01, DoD Supply Chain Materiel Management Policy
International Traffic in Arms Regulations (ITAR)
DAU iCatalog
DAU Life Cycle Logistics Blogs
DoD Environment, Safety & Occupational Health Network and Information Exchange (DENIX)
Value Engineering: A Guidebook of Best Practices and Tools (SD-24)
DMSMS Knowledge Sharing Portal (DKSP)
Life Cycle Sustainment Plan (LCSP) Outline Guidance
Joint Publication 4-0, Joint Logistics
Joint Publication 4-04, Contingency Basing
U.S. Army Materiel Command Logistics Data Analysis Center (LDAC) Tools Suite
Product Support Implementation Roadmap
Product Support Strategy Development Tool
DLA Assist Database
Logistics Assessment (LA) Guidebook
Government Accountability Office (GAO) Reports and Testimonies
DoD Operating and Support Cost Estimating Guide
Life Cycle Cost
Planning, Programming, Budgeting and Execution (PPBE) Process
MIL-HDBK 502, Product Support Analysis

Test and Evaluation Management Plan (TEMP)
Logistics Demonstration (LOG-Demo)
Maintainability Demonstration (M-Demo)
Supportability Test and Evaluation (ST&E)
DoDI 4000.10, Support Agreements
U.S. House of Representatives Office of the Law Revision Counsel United States Code
White House Services Executive Services Directorate
DoDM 4120.24, Enclosure 4, Defense Standardization Program (DSP) Procedures
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Failure Modes & Effects Analysis (FMEA) and Failure Modes, Effects & Criticality Analysis (FMECA)
Fault Tree Analysis (FTA)
Reliability and Maintainability (R&M) Engineering
Supportability Design Objectives
Sustainability
Materiel Fielding Plan (MFP)
Total Package Fielding
System Fielding and Site Activation
Provisioning
MIL-STD-1472, Human Engineering
MIL-STD-46855 (Human Engineering Requirements for Military Systems, Equipment and Facilities)
DoDI 6055.01, DoD Safety and Occupational Health (SOH) Program
MIL-STD-810 (Environmental Engineering Considerations and Laboratory Tests)
MIL-STD-461 (Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment)
MIL-STD-464 Electromagnetic Environmental Effects Requirements
Affordability Analysis
Modular Open Systems Approach (MOSA)
DoD Corrosion Prevention and Control Planning Guidebook
Corrosion Control and Prevention
SAE GEIA-STD-0007 Logistics Product Data
SAE GEIA-HB-0007B Logistics Product Data Handbook
ANSI/GEIA-STD-0009 Reliability Program Standard for Systems Design Development and Manufacturing
Product Support Business Case Analysis (BCA) Guidebook
Product Support Analysis (PSA)
MIL-HDBK 189C, Reliability Growth Management
DoDI 6055.05, Occupational and Environmental Health (OEH)
DoDI 5000.67, Prevention and Mitigation of Corrosion on DoD Military Equipment and Infrastructure
Reliability Growth

Reliability Centered Maintenance (RCM)
Reliability Key System Attribute (KSA)
Software Sustainment
Service Life Extension Program (SLEP) & Service Life Assessment Program (SLAP)
Engineering Change Proposals (ECP)
Value Engineering (VE) and Value Engineering Change Proposals (VECP)
Digital Engineering
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Warranty
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NAVSO P-7000, Counterfeit Materiel Process Guidebook,
Counterfeit Parts
DAU's Tools and Resources Database
Life Cycle Logistics Community of Practice (LOGCoP)
10 USC 2441, Sustainment reviews
Maintenance Concept
Condition Based Maintenance Plus (CBM+)
Maintenance Task Analysis (MTA)
Maintenance Plan
Depot Level Maintenance
Level of Repair Analysis (LORA)
Computerized Optimization Model for Predicting and Analyzing Support Structures (COMPASS)
Software Maintenance
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DoD Dictionary of Military and Associated Terms
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S4000M International Specification for Developing Scheduled Maintenance Programs
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Supply Support

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The Manual for the Operation of the Joint Capabilities Integration and Development System (JCIDS Manual)
Defense Acquisition Guidebook (DAG)
MIL-HDBK 260, Reference Data for Logistics Metrics
Product Support Manager Guidebook
Performance Based Logistics Guidebook
SD-22, Diminishing Manufacture Sources and Material Shortages (DMSMS)
Operating and Support (O&S) Cost Management Guidebook
Reliability, Availability, Maintainability, And Cost (RAM-C) Rationale Report Outline Guidance, Version 1.0
Systems Engineering Plan Outline
Adaptive Acquisition Framework (AAF)
DAU ACQuipedia
DAU Community Hub
DoD Joint Doctrine Library
DAU Glossary
Joint Publication 1-02, DoD Dictionary of Military and Associated Terms
DAU Logistics Functional Area Gateway
DoDI 4140.01, DoD Supply Chain Materiel Management Policy
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DAU Life Cycle Logistics Blogs
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Joint Publication 4-04, Contingency Basing
U.S. Army Materiel Command Logistics Data Analysis Center (LDAC) Tools Suite
Product Support Implementation Roadmap
Product Support Strategy Development Tool
DLA Assist Database
DLA Disposition Services
DoDM 4160.21 Defense Materiel Disposition: Disposal Guidance and Procedures
Logistics Assessment (LA) Guidebook
Government Accountability Office (GAO) Reports and Testimonies
DoD Operating and Support Cost Estimating Guide
Life Cycle Cost

Defense Working Capital Fund (WCF)
Planning, Programming, Budgeting and Execution (PPBE) Process
Test and Evaluation Management Plan (TEMP)
Logistics Demonstration (LOG-Demo)
Maintainability Demonstration (M-Demo)
SD-2, DoD Acquisitions – Buying Commercial Items and Nondevelopmental Items
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U.S. House of Representatives Office of the Law Revision Counsel United States Code
White House Services Executive Services Directorate
DoDM 4120.24, Enclosure 4, Defense Standardization Program (DSP) Procedures
Reliability and Maintainability (R&M) Engineering
Materiel Fielding Plan (MFP)
Total Package Fielding
System Fielding and Site Activation
Provisioning
MIL-STD-1472, Human Engineering
MIL-STD-46855 (Human Engineering Requirements for Military Systems, Equipment and Facilities)
DoDI 6055.01, DoD Safety and Occupational Health (SOH) Program
Affordability Analysis
Modular Open Systems Approach (MOSA)
DoD Corrosion Prevention and Control Planning Guidebook
Corrosion Control and Prevention
SAE GEIA-STD-0007 Logistics Product Data
SAE GEIA-HB-0007B Logistics Product Data Handbook
ANSI/GEIA-STD-0009 Reliability Program Standard for Systems Design Development and Manufacturing
Product Support Business Case Analysis (BCA) Guidebook
DoDI 5000.67, Prevention and Mitigation of Corrosion on DoD Military Equipment and Infrastructure
Reliability Growth
Reliability Centered Maintenance (RCM)
Software Sustainment
Service Life Extension Program (SLEP) & Service Life Assessment Program (SLAP)
Engineering Change Proposals (ECP)
Value Engineering (VE) and Value Engineering Change Proposals (VECP)
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Technology Refreshment
Technology Insertion (TI)
JP 4-09, "Distribution Operations"
Supply Chain Management (SCM)
Supply Classes
Readiness-Based Sparing (RBS)
Market Research
Bill of Materials (BOM)
Cataloging
National Stock Number (NSN)
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Shelf-Life Extension System (SLES)
Warranty
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Counterfeit Parts
DAU's Tools and Resources Database
Life Cycle Logistics Community of Practice (LOGCoP)
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Maintenance Plan
Public Private Partnership
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Maintenance Planning and Management

DoD Directive 5000.01, The Defense Acquisition System
DoDI 5000.02, Operation of the Adaptive Acquisition Framework
The Manual for the Operation of the Joint Capabilities Integration and Development System (JCIDS Manual)
Defense Acquisition Guidebook (DAG)
MIL-HDBK 260, Reference Data for Logistics Metrics
Product Support Manager Guidebook
Performance Based Logistics Guidebook
SD-22, Diminishing Manufacture Sources and Material Shortages (DMSMS)
Operating and Support (O&S) Cost Management Guidebook
Reliability, Availability, Maintainability, And Cost (RAM-C) Rationale Report Outline Guidance, Version 1.0
Systems Engineering Plan Outline
Adaptive Acquisition Framework (AAF)
DAU ACQuipedia
DAU Community Hub
DoD Joint Doctrine Library
DAU Glossary
Joint Publication 1-02, DoD Dictionary of Military and Associated Terms
DAU Logistics Functional Area Gateway
International Traffic in Arms Regulations (ITAR)
DAU iCatalog
DAU Life Cycle Logistics Blogs
DMSMS Knowledge Sharing Portal (DKSP)
Life Cycle Sustainment Plan (LCSP) Outline Guidance
Joint Publication 4-0, Joint Logistics
Joint Publication 4-04, Contingency Basing
U.S. Army Materiel Command Logistics Data Analysis Center (LDAC) Tools Suite
Product Support Implementation Roadmap
Product Support Strategy Development Tool
DLA Assist Database
Logistics Assessment (LA) Guidebook
Government Accountability Office (GAO) Reports and Testimonies
DoD Operating and Support Cost Estimating Guide
Life Cycle Cost
Defense Working Capital Fund (WCF)
Planning, Programming, Budgeting and Execution (PPBE) Process
Test and Evaluation Management Plan (TEMP)
Logistics Demonstration (LOG-Demo)
Maintainability Demonstration (M-Demo)

DoDI 5000.74, Acquisition of Services
DoDI 4000.10, Support Agreements
Public Private Partnering for Product Support Guidebook
U.S. House of Representatives Office of the Law Revision Counsel United States Code
White House Services Executive Services Directorate
DoDM 4120.24, Enclosure 4, Defense Standardization Program (DSP) Procedures
MIL-HDBK-338, Electronic Reliability Design Handbook
Failure Modes & Effects Analysis (FMEA) and Failure Modes, Effects & Criticality Analysis (FMECA)
Fault Tree Analysis (FTA)
Reliability and Maintainability (R&M) Engineering
Materiel Fielding Plan (MFP)
Total Package Fielding
System Fielding and Site Activation
MIL-STD-1472, Human Engineering
MIL-STD-46855 (Human Engineering Requirements for Military Systems, Equipment and Facilities)
DoDI 6055.01, DoD Safety and Occupational Health (SOH) Program
DoD Environment, Safety & Occupational Health Network and Information Exchange
MIL-STD-810 (Environmental Engineering Considerations and Laboratory Tests)
MIL-STD-461 (Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment)
MIL-STD-464 Electromagnetic Environmental Effects Requirements
Affordability Analysis
Modular Open Systems Approach (MOSA)
DoD Corrosion Prevention and Control Planning Guidebook
Corrosion Control and Prevention
SAE GEIA-STD-0007 Logistics Product Data
SAE GEIA-HB-0007B Logistics Product Data Handbook
ANSI/GEIA-STD-0009 Reliability Program Standard for Systems Design Development and Manufacturing
Product Support Business Case Analysis (BCA) Guidebook
DoDI 6055.05, Occupational and Environmental Health (OEH)
DoDI 5000.67, Prevention and Mitigation of Corrosion on DoD Military Equipment and Infrastructure
Reliability Growth
Reliability Centered Maintenance (RCM)
Reliability Key System Attribute (KSA)
Software Sustainment
Service Life Extension Program (SLEP) & Service Life Assessment Program (SLAP)
Engineering Change Proposals (ECP)
Value Engineering (VE) and Value Engineering Change Proposals (VECP)

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Technology Refreshment
Technology Insertion (TI)
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Failure Reporting, Analysis, and Corrective Action System (FRACAS)
MIL-HDBK-2155 Failure Reporting, Analysis and Corrective Action Taken
Warranty
DAU's Tools and Resources Database
Life Cycle Logistics Community of Practice (LOGCoP)
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Maintenance Concept
Condition Based Maintenance Plus (CBM+)
Maintenance Task Analysis (MTA)
Maintenance Plan
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Public Private Partnership
Depot Level Maintenance
Level of Repair Analysis (LORA)
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Packaging, Handling, Storage, and Transportation

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Defense Acquisition Guidebook (DAG)
MIL-HDBK 260, Reference Data for Logistics Metrics
Product Support Manager Guidebook
Performance Based Logistics Guidebook
SD-22, Diminishing Manufacture Sources and Material Shortages (DMSMS)
Operating and Support (O&S) Cost Management Guidebook
Reliability, Availability, Maintainability, And Cost (RAM-C) Rationale Report Outline Guidance, Version 1.0
Systems Engineering Plan Outline
Adaptive Acquisition Framework (AAF)
DAU ACQuipedia
DAU Community Hub
DoD Joint Doctrine Library
DAU Glossary
Joint Publication 1-02, DoD Dictionary of Military and Associated Terms
DAU Logistics Functional Area Gateway
DoDI 4140.01, DoD Supply Chain Materiel Management Policy
International Traffic in Arms Regulations (ITAR)
DAU iCatalog
DAU Life Cycle Logistics Blogs
Life Cycle Sustainment Plan (LCSP) Outline Guidance
Joint Publication 4-0, Joint Logistics
Joint Publication 4-04, Contingency Basing
U.S. Army Materiel Command Logistics Data Analysis Center (LDAC) Tools Suite
Product Support Implementation Roadmap
Product Support Strategy Development Tool
DLA Assist Database
Logistics Assessment (LA) Guidebook
Government Accountability Office (GAO) Reports and Testimonies
DoD Operating and Support Cost Estimating Guide
Life Cycle Cost
Planning, Programming, Budgeting and Execution (PPBE) Process
Test and Evaluation Management Plan (TEMP)
Logistics Demonstration (LOG-Demo)
Maintainability Demonstration (M-Demo)
DoDI 5000.74, Acquisition of Services

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DoDI 4540.07, Operation of the DoD Engineering for Transportability and Deployability Program
MIL-STD-1366, Interface Standard for Transportability Criteria
Reliability and Maintainability (R&M) Engineering
Materiel Fielding Plan (MFP)
DoDD 4510.11, DoD Transportation Engineering
Total Package Fielding
System Fielding and Site Activation
MIL-STD-1472, Human Engineering
MIL-STD-46855 (Human Engineering Requirements for Military Systems, Equipment and Facilities)
DoDI 6055.01, DoD Safety and Occupational Health (SOH) Program
Affordability Analysis
DoD Corrosion Prevention and Control Planning Guidebook
Corrosion Control and Prevention
SAE GEIA-STD-0007 Logistics Product Data
SAE GEIA-HB-0007B Logistics Product Data Handbook
ANSI/GEIA-STD-0009 Reliability Program Standard for Systems Design Development and Manufacturing
Product Support Business Case Analysis (BCA) Guidebook
DoDI 6055.05, Occupational and Environmental Health (OEH)
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Technology Refreshment
Technology Insertion (TI)
JP 4-09, "Distribution Operations"
Supply Chain Management (SCM)
Supply Classes
Item Unique Identification (IUID)
Shelf-Life Extension System (SLES)
DAU’s Tools and Resources Database
Life Cycle Logistics Community of Practice (LOGCoP)
10 USC 2441, Sustainment reviews
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Technical Data

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DoDI 5000.02, Operation of the Adaptive Acquisition Framework
The Manual for the Operation of the Joint Capabilities Integration and Development System (JCIDS Manual)
Defense Acquisition Guidebook (DAG)
MIL-HDBK 260, Reference Data for Logistics Metrics
Product Support Manager Guidebook
Performance Based Logistics Guidebook
SD-22, Diminishing Manufacture Sources and Material Shortages (DMSMS)
Operating and Support (O&S) Cost Management Guidebook
Reliability, Availability, Maintainability, And Cost (RAM-C) Rationale Report Outline Guidance, Version 1.0
Systems Engineering Plan Outline
Adaptive Acquisition Framework (AAF)
DAU ACQuipedia
DAU Community Hub
DoD Joint Doctrine Library
DAU Glossary
Joint Publication 1-02, DoD Dictionary of Military and Associated Terms
DAU Logistics Functional Area Gateway
International Traffic in Arms Regulations (ITAR)
DAU iCatalog
DAU Life Cycle Logistics Blogs
DoD Environment, Safety & Occupational Health Network and Information Exchange (DENIX)
DMSMS Knowledge Sharing Portal (DKSP)
Life Cycle Sustainment Plan (LCSP) Outline Guidance
Joint Publication 4-0, Joint Logistics
Joint Publication 4-04, Contingency Basing
U.S. Army Materiel Command Logistics Data Analysis Center (LDAC) Tools Suite
Product Support Implementation Roadmap
Product Support Strategy Development Tool
DLA Assist Database
Logistics Assessment (LA) Guidebook
Government Accountability Office (GAO) Reports and Testimonies
DoD Operating and Support Cost Estimating Guide
Life Cycle Cost
Planning, Programming, Budgeting and Execution (PPBE) Process
MIL-HDBK 502, Product Support Analysis
Test and Evaluation Management Plan (TEMP)
Logistics Demonstration (LOG-Demo)

Maintainability Demonstration (M-Demo)
Supportability Test and Evaluation (ST&E)
DoDI 5000.74, Acquisition of Services
DoDI 4000.10, Support Agreements
MIL-STD-961, Defense and Program-Unique Specifications Format and Content
U.S. House of Representatives Office of the Law Revision Counsel United States Code
White House Services Executive Services Directorate
DoDM 4120.24, Enclosure 4, Defense Standardization Program (DSP) Procedures
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Reliability and Maintainability (R&M) Engineering
Materiel Fielding Plan (MFP)
Total Package Fielding
System Fielding and Site Activation
MIL-STD-1472, Human Engineering
MIL-STD-46855 (Human Engineering Requirements for Military Systems, Equipment and Facilities)
DoDI 6055.01, DoD Safety and Occupational Health (SOH) Program
Affordability Analysis
Modular Open Systems Approach (MOSA)
DoD Corrosion Prevention and Control Planning Guidebook
Corrosion Control and Prevention
SAE GEIA-STD-0007 Logistics Product Data
SAE GEIA-HB-0007B Logistics Product Data Handbook
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Reliability Growth
Reliability Centered Maintenance (RCM)
Reliability Key System Attribute (KSA)
Software Sustainment
Service Life Extension Program (SLEP) & Service Life Assessment Program (SLAP)

Engineering Change Proposals (ECP)
Value Engineering (VE) and Value Engineering Change Proposals (VECP)
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Technology Refreshment
Technology Insertion (TI)
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Maintenance Concept
Condition Based Maintenance Plus (CBM+)
Maintenance Task Analysis (MTA)
Maintenance Plan
Level of Repair Analysis (LORA)
Computerized Optimization Model for Predicting and Analyzing Support Structures (COMPASS)
Software Maintenance
MIL-PRF-28800F, Test Equipment for Use with Electrical and Electronic Equipment
DoD Dictionary of Military and Associated Terms
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DoD Directive 5000.01, The Defense Acquisition System
DoDI 5000.02, Operation of the Adaptive Acquisition Framework
The Manual for the Operation of the Joint Capabilities Integration and Development System (JCIDS Manual)
Defense Acquisition Guidebook (DAG)
MIL-HDBK 260, Reference Data for Logistics Metrics
Product Support Manager Guidebook
Performance Based Logistics Guidebook
SD-22, Diminishing Manufacture Sources and Material Shortages (DMSMS)
Operating and Support (O&S) Cost Management Guidebook
Reliability, Availability, Maintainability, And Cost (RAM-C) Rationale Report Outline Guidance, Version 1.0
Systems Engineering Plan Outline
Adaptive Acquisition Framework (AAF)
DAU ACQuipedia
DAU Community Hub
DoD Joint Doctrine Library
DAU Glossary
Joint Publication 1-02, DoD Dictionary of Military and Associated Terms
DAU Logistics Functional Area Gateway
International Traffic in Arms Regulations (ITAR)
DAU iCatalog
DAU Life Cycle Logistics Blogs
Life Cycle Sustainment Plan (LCSP) Outline Guidance
Joint Publication 4-0, Joint Logistics
Joint Publication 4-04, Contingency Basing
U.S. Army Materiel Command Logistics Data Analysis Center (LDAC) Tools Suite
Product Support Implementation Roadmap
Product Support Strategy Development Tool
DLA Assist Database
Logistics Assessment (LA) Guidebook
Government Accountability Office (GAO) Reports and Testimonies
DoD Operating and Support Cost Estimating Guide
Life Cycle Cost
Planning, Programming, Budgeting and Execution (PPBE) Process
MIL-STD-1916, DoD Preferred Methods for Acceptance of Product
MIL-HDBK 502, Product Support Analysis
Test and Evaluation Management Plan (TEMP)
Logistics Demonstration (LOG-Demo)
Maintainability Demonstration (M-Demo)

SD-2, DoD Acquisitions – Buying Commercial Items and Nondevelopmental Items
DoDI 5000.74, Acquisition of Services
DoDI 4000.10, Support Agreements
U.S. House of Representatives Office of the Law Revision Counsel United States Code
White House Services Executive Services Directorate
DoDM 4120.24, Enclosure 4, Defense Standardization Program (DSP) Procedures
MIL-HDBK-338, Electronic Reliability Design Handbook
Failure Modes & Effects Analysis (FMEA) and Failure Modes, Effects & Criticality Analysis (FMECA)
Reliability and Maintainability (R&M) Engineering
Materiel Fielding Plan (MFP)
Total Package Fielding
System Fielding and Site Activation
MIL-STD-1472, Human Engineering
MIL-STD-46855 (Human Engineering Requirements for Military Systems, Equipment and Facilities)
DoDI 6055.01, DoD Safety and Occupational Health (SOH) Program
DoD Environment, Safety & Occupational Health Network and Information Exchange
MIL-STD-461 (Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment)
MIL-STD-464 Electromagnetic Environmental Effects Requirements
Affordability Analysis
Modular Open Systems Approach (MOSA)
DoD Corrosion Prevention and Control Planning Guidebook
Corrosion Control and Prevention
SAE GEIA-STD-0007 Logistics Product Data
SAE GEIA-HB-0007B Logistics Product Data Handbook
ANSI/GEIA-STD-0009 Reliability Program Standard for Systems Design Development and Manufacturing
Product Support Business Case Analysis (BCA) Guidebook
Product Support Analysis (PSA)
DoDI 6055.05, Occupational and Environmental Health (OEH)
DoDI 5000.67, Prevention and Mitigation of Corrosion on DoD Military Equipment and Infrastructure
Reliability Growth
Reliability Centered Maintenance (RCM)
Reliability Key System Attribute (KSA)
Software Sustainment
Service Life Extension Program (SLEP) & Service Life Assessment Program (SLAP)
Engineering Change Proposals (ECP)
Value Engineering (VE) and Value Engineering Change Proposals (VECP)
DoDI 4245.14, DoD Value Engineering (VE) Program

41 USC 1711: Value engineering
Office of Management and Budget Circular No. A-131, Value Engineering
Technology Refreshment
Technology Insertion (TI)
DAU’s Tools and Resources Database
Life Cycle Logistics Community of Practice (LOGCoP)
10 USC 2441, Sustainment reviews
Maintenance Concept
Maintenance Plan
Depot Level Maintenance
Level of Repair Analysis (LORA)
Computerized Optimization Model for Predicting and Analyzing Support Structures (COMPASS)
MIL-PRF-28800F, Test Equipment for Use with Electrical and Electronic Equipment
DoD Dictionary of Military and Associated Terms
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ATS Selection Process Guide
ATS Master Plan
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DoD Directive 5000.01, The Defense Acquisition System
DoDI 5000.02, Operation of the Adaptive Acquisition Framework
The Manual for the Operation of the Joint Capabilities Integration and Development System (JCIDS Manual)
Defense Acquisition Guidebook (DAG)
MIL-HDBK 260, Reference Data for Logistics Metrics
Product Support Manager Guidebook
Performance Based Logistics Guidebook
SD-22, Diminishing Manufacture Sources and Material Shortages (DMSMS)
Operating and Support (O&S) Cost Management Guidebook
Reliability, Availability, Maintainability, And Cost (RAM-C) Rationale Report Outline Guidance, Version 1.0
Systems Engineering Plan Outline
Adaptive Acquisition Framework (AAF)
DAU ACQuipedia
DAU Community Hub
DoD Joint Doctrine Library
DAU Glossary
Joint Publication 1-02, DoD Dictionary of Military and Associated Terms
DAU Logistics Functional Area Gateway
International Traffic in Arms Regulations (ITAR)
DAU iCatalog
DAU Life Cycle Logistics Blogs
Life Cycle Sustainment Plan (LCSP) Outline Guidance
U.S. Army Materiel Command Logistics Data Analysis Center (LDAC) Tools Suite
Product Support Implementation Roadmap
Product Support Strategy Development Tool
DLA Assist Database
Logistics Assessment (LA) Guidebook
Government Accountability Office (GAO) Reports and Testimonies
DoD Operating and Support Cost Estimating Guide
Life Cycle Cost
Planning, Programming, Budgeting and Execution (PPBE) Process
Test and Evaluation Management Plan (TEMP)
Logistics Demonstration (LOG-Demo)
Maintainability Demonstration (M-Demo)
DoDI 5000.74, Acquisition of Services
DoDI 4000.10, Support Agreements
U.S. House of Representatives Office of the Law Revision Counsel United States Code
White House Services Executive Services Directorate

DoDM 4120.24, Enclosure 4, Defense Standardization Program (DSP) Procedures
Reliability and Maintainability (R&M) Engineering
Materiel Fielding Plan (MFP)
Total Package Fielding
System Fielding and Site Activation
MIL-STD-1472, Human Engineering
MIL-STD-46855 (Human Engineering Requirements for Military Systems, Equipment and Facilities)
Affordability Analysis
SAE GEIA-STD-0007 Logistics Product Data
SAE GEIA-HB-0007B Logistics Product Data Handbook
Product Support Business Case Analysis (BCA) Guidebook
Technology Refreshment
Technology Insertion (TI)
DAU's Tools and Resources Database
Life Cycle Logistics Community of Practice (LOGCoP)
10 USC 2441, Sustainment reviews
Maintenance Concept
Maintenance Plan
Level of Repair Analysis (LORA)
Computerized Optimization Model for Predicting and Analyzing Support Structures (COMPASS)
DoD Dictionary of Military and Associated Terms
MIL-HDBK-2097A, Acquisition of Support Equipment and Associated Integrated Logistics Support
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DoD Directive 5000.01, The Defense Acquisition System
DoDI 5000.02, Operation of the Adaptive Acquisition Framework
The Manual for the Operation of the Joint Capabilities Integration and Development System (JCIDS Manual)
Defense Acquisition Guidebook (DAG)
MIL-HDBK 260, Reference Data for Logistics Metrics
Product Support Manager Guidebook
Performance Based Logistics Guidebook
SD-22, Diminishing Manufacture Sources and Material Shortages (DMSMS)
Operating and Support (O&S) Cost Management Guidebook
Reliability, Availability, Maintainability, And Cost (RAM-C) Rationale Report Outline Guidance, Version 1.0
Systems Engineering Plan Outline
Adaptive Acquisition Framework (AAF)
DAU ACQuipedia
DAU Community Hub
DoD Joint Doctrine Library
DAU Glossary
Joint Publication 1-02, DoD Dictionary of Military and Associated Terms
DAU Logistics Functional Area Gateway
International Traffic in Arms Regulations (ITAR)
DAU iCatalog
DAU Life Cycle Logistics Blogs
DoD Environment, Safety & Occupational Health Network and Information Exchange (DENIX)
Life Cycle Sustainment Plan (LCSP) Outline Guidance
Joint Publication 4-0, Joint Logistics
Joint Publication 4-04, Contingency Basing
U.S. Army Materiel Command Logistics Data Analysis Center (LDAC) Tools Suite
Product Support Implementation Roadmap
Product Support Strategy Development Tool
DLA Assist Database
Logistics Assessment (LA) Guidebook
Government Accountability Office (GAO) Reports and Testimonies
DoD Operating and Support Cost Estimating Guide
Life Cycle Cost
Planning, Programming, Budgeting and Execution (PPBE) Process
Test and Evaluation Management Plan (TEMP)
Logistics Demonstration (LOG-Demo)
Maintainability Demonstration (M-Demo)
DoDI 5000.74, Acquisition of Services

DoDI 4000.10, Support Agreements
U.S. House of Representatives Office of the Law Revision Counsel United States Code
White House Services Executive Services Directorate
DoDM 4120.24, Enclosure 4, Defense Standardization Program (DSP) Procedures
Reliability and Maintainability (R&M) Engineering
Materiel Fielding Plan (MFP)
Total Package Fielding
System Fielding and Site Activation
MIL-STD-1472, Human Engineering
MIL-STD-46855 (Human Engineering Requirements for Military Systems, Equipment and Facilities)
DoDI 6055.01, DoD Safety and Occupational Health (SOH) Program
DoD Environment, Safety & Occupational Health Network and Information Exchange
MIL-STD-810 (Environmental Engineering Considerations and Laboratory Tests)
MIL-STD-461 (Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment)
MIL-STD-464 Electromagnetic Environmental Effects Requirements
Affordability Analysis
SAE GEIA-STD-0007 Logistics Product Data
SAE GEIA-HB-0007B Logistics Product Data Handbook
Product Support Business Case Analysis (BCA) Guidebook
DoDI 6055.05, Occupational and Environmental Health (OEH)
Software Sustainment
Technology Refreshment
Technology Insertion (TI)
DAU's Tools and Resources Database
Life Cycle Logistics Community of Practice (LOGCoP)
10 USC 2441, Sustainment reviews
Maintenance Concept
Maintenance Task Analysis (MTA)
Maintenance Plan
Level of Repair Analysis (LORA)
Computerized Optimization Model for Predicting and Analyzing Support Structures (COMPASS)
DoD Dictionary of Military and Associated Terms
SAE Standard AS1390 "Level of Repair Analysis (LORA)"
MIL-HDBK-2097A, Acquisition of Support Equipment and Associated Integrated Logistics Support
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DoD Directive 5000.01, The Defense Acquisition System
DoDI 5000.02, Operation of the Adaptive Acquisition Framework
The Manual for the Operation of the Joint Capabilities Integration and Development System (JCIDS Manual)
Defense Acquisition Guidebook (DAG)
MIL-HDBK 260, Reference Data for Logistics Metrics
Product Support Manager Guidebook
Performance Based Logistics Guidebook
SD-22, Diminishing Manufacture Sources and Material Shortages (DMSMS)
Operating and Support (O&S) Cost Management Guidebook
Reliability, Availability, Maintainability, And Cost (RAM-C) Rationale Report Outline Guidance, Version 1.0
Systems Engineering Plan Outline
Adaptive Acquisition Framework (AAF)
DAU ACQuipedia
DAU Community Hub
DoD Joint Doctrine Library
DAU Glossary
Joint Publication 1-02, DoD Dictionary of Military and Associated Terms
DAU Logistics Functional Area Gateway
DoDI 4140.01, DoD Supply Chain Materiel Management Policy
International Traffic in Arms Regulations (ITAR)
DAU iCatalog
DAU Life Cycle Logistics Blogs
DoD Environment, Safety & Occupational Health Network and Information Exchange (DENIX)
Life Cycle Sustainment Plan (LCSP) Outline Guidance
Joint Publication 4-0, Joint Logistics
Joint Publication 4-04, Contingency Basing
U.S. Army Materiel Command Logistics Data Analysis Center (LDAC) Tools Suite
Product Support Implementation Roadmap
Product Support Strategy Development Tool
DLA Assist Database
Logistics Assessment (LA) Guidebook
Government Accountability Office (GAO) Reports and Testimonies
DoD Operating and Support Cost Estimating Guide
Life Cycle Cost
Defense Working Capital Fund (WCF)
Planning, Programming, Budgeting and Execution (PPBE) Process
Test and Evaluation Management Plan (TEMP)
Logistics Demonstration (LOG-Demo)

Maintainability Demonstration (M-Demo)
DoDI 5000.74, Acquisition of Services
DoDI 4000.10, Support Agreements
Public Private Partnering for Product Support Guidebook
U.S. House of Representatives Office of the Law Revision Counsel United States Code
White House Services Executive Services Directorate
DoDM 4120.24, Enclosure 4, Defense Standardization Program (DSP) Procedures
Reliability and Maintainability (R&M) Engineering
Materiel Fielding Plan (MFP)
Total Package Fielding
System Fielding and Site Activation
MIL-STD-1472, Human Engineering
MIL-STD-46855 (Human Engineering Requirements for Military Systems, Equipment and Facilities)
DoDI 6055.01, DoD Safety and Occupational Health (SOH) Program
DoD Environment, Safety & Occupational Health Network and Information Exchange
MIL-STD-810 (Environmental Engineering Considerations and Laboratory Tests)
MIL-STD-461 (Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment)
MIL-STD-464 Electromagnetic Environmental Effects Requirements
Affordability Analysis
SAE GEIA-STD-0007 Logistics Product Data
SAE GEIA-HB-0007B Logistics Product Data Handbook
Product Support Business Case Analysis (BCA) Guidebook
DoDI 6055.05, Occupational and Environmental Health (OEH)
Facilities
Technology Refreshment
Technology Insertion (TI)
DAU's Tools and Resources Database
Life Cycle Logistics Community of Practice (LOGCoP)
10 USC 2441, Sustainment reviews
Maintenance Concept
Maintenance Plan
Public Private Partnership
Depot Level Maintenance
Level of Repair Analysis (LORA)
Computerized Optimization Model for Predicting and Analyzing Support Structures (COMPASS)
DoD Dictionary of Military and Associated Terms
SAE Standard AS1390 "Level of Repair Analysis (LORA)"
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DoDD 4270.5, Military Construction
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DoDI 4165.69 - Realignment of DoD Sites Overseas
DoDI 4165.70 - Real Property Management
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Unified Facilities Criteria (UFC)

Information Technology (IT) Systems Continuous Support

DoD Directive 5000.01, The Defense Acquisition System
DoDI 5000.02, Operation of the Adaptive Acquisition Framework
The Manual for the Operation of the Joint Capabilities Integration and Development System (JCIDS Manual)
Defense Acquisition Guidebook (DAG)
MIL-HDBK 260, Reference Data for Logistics Metrics
Product Support Manager Guidebook
Performance Based Logistics Guidebook
SD-22, Diminishing Manufacture Sources and Material Shortages (DMSMS)
Operating and Support (O&S) Cost Management Guidebook
Reliability, Availability, Maintainability, And Cost (RAM-C) Rationale Report Outline Guidance, Version 1.0
Systems Engineering Plan Outline
Adaptive Acquisition Framework (AAF)
DAU ACQuipedia
DAU Community Hub
DoD Joint Doctrine Library
DAU Glossary
Joint Publication 1-02, DoD Dictionary of Military and Associated Terms
DAU Logistics Functional Area Gateway
DoDI 4140.01, DoD Supply Chain Materiel Management Policy
International Traffic in Arms Regulations (ITAR)
DAU iCatalog
DAU Life Cycle Logistics Blogs
DMSMS Knowledge Sharing Portal (DKSP)
Life Cycle Sustainment Plan (LCSP) Outline Guidance
Joint Publication 4-0, Joint Logistics
Joint Publication 4-04, Contingency Basing
U.S. Army Materiel Command Logistics Data Analysis Center (LDAC) Tools Suite
Product Support Implementation Roadmap
Product Support Strategy Development Tool
DLA Assist Database
Logistics Assessment (LA) Guidebook
Government Accountability Office (GAO) Reports and Testimonies
DoD Operating and Support Cost Estimating Guide
Life Cycle Cost
Planning, Programming, Budgeting and Execution (PPBE) Process
Test and Evaluation Management Plan (TEMP)
Logistics Demonstration (LOG-Demo)
Maintainability Demonstration (M-Demo)

SD-2, DoD Acquisitions – Buying Commercial Items and Nondevelopmental Items
DoDI 5000.74, Acquisition of Services
DoDI 4000.10, Support Agreements
MIL-STD-961, Defense and Program-Unique Specifications Format and Content
U.S. House of Representatives Office of the Law Revision Counsel United States Code
White House Services Executive Services Directorate
DoDM 4120.24, Enclosure 4, Defense Standardization Program (DSP) Procedures
MIL-HDBK-338, Electronic Reliability Design Handbook
Failure Modes & Effects Analysis (FMEA) and Failure Modes, Effects & Criticality Analysis (FMECA)
Net-Ready Key Performance Parameter
Reliability and Maintainability (R&M) Engineering
Materiel Fielding Plan (MFP)
Total Package Fielding
System Fielding and Site Activation
MIL-STD-1472, Human Engineering
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