PRODUCT SUPPORT MANAGER GUIDEBOOK

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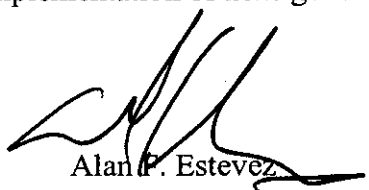
FOREWORD

The Department of Defense (DoD) must continue to improve product support, with a specific focus on increasing readiness and enabling better cost control. In 2008, the Office of the Assistant Secretary of Defense for Logistics and Materiel Readiness (ASD(L&MR)) established a group of senior government, industry, and academia representatives called the Product Support Assessment Team (PSAT) to drive this effort. In November 2009, Dr. Ashton Carter, Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)), approved and signed the Weapon Systems Acquisition Reform Product Support Assessment (WSAR-PSA) report and its eight integrated recommendations to improve life cycle product support. One of those recommendations was to further develop a Product Support Business Model (PSBM) and assist the Product Support Manager in the execution of his or her duties. This Product Support Manager's (PSM's) Guidebook develops the PSBM recommended in the WSAR-PSA report and provides guidance to the Program Manager / Product Support Manager (PSM) on how to develop and execute a product support strategy. It supports Dr. Carter's November 2010 memorandum on "Better Buying Power" by addressing the themes of increased competition, long-term affordability and controlling cost growth, and innovation in industry.

This guidebook is written for the PSM and provides an easy reference addressing key requirements for managing product support across the entire life cycle of the weapon system. It was written by a senior team of system engineers, logisticians, acquisition experts, and financial experts from the Services, Agencies, Industry, and Academia. Their broad knowledge and experience are embedded in this guidebook to help PSMs serve their primary customers, the Warfighter and the Taxpayer, and to better align the acquisition and life cycle product support processes. This PSM guidebook will serve as an operating guide to assist the PSM and the Acquisition Community with the implementation of next-generation product support strategies.



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1 Supersession Instructions

This document supersedes *Performance Based Logistics: A Program Manager's Product Support Guide*, published in March 2005, which has been commonly referred to as "The PBL Guide."

1. Introduction, Background, Purpose, Major Tasks of the PSM, and Relationship to Policy and Other Guidance

1.1. Introduction

Experienced leaders recognize that logistics is the key to success in any military strategy or campaign. Historically, logistics has focused on how to efficiently and effectively deliver our war fighting capability at acceptable readiness levels. Total life cycle weapon system product support became the focus of program managers and logisticians. Numerous initiatives were introduced in the late 1990s to streamline the way Department of Defense (DoD) acquires and supports weapon systems. One of these, Performance Based Logistics (PBL), fundamentally changed the way we structured logistics support. It directly tied the delivery and support of products and services to Warfighter product support outcomes to enable Warfighter effectiveness. Performance based strategies have continued to evolve since that time. In an era of shrinking budgets and increasing costs, support solutions must balance Warfighter outcomes with the cost of delivery. This guidebook will assist the Product Support Manager (PSM) in determining the mix of capabilities and providers that best fulfills the Warfighter's performance and cost requirements.

This guide is a tool for Program Managers (PMs), Product Support Managers (PSMs), and their support staff as they develop and implement product support strategies for new programs, major modifications to legacy programs, or as they re-validate and re-engineer product support strategies for existing fielded systems. This guide is focused on identifying, developing, implementing, incentivizing, and measuring quantifiable best value outcome based product support strategies that optimize life cycle costs and readiness. It delineates processes for outcome goals of systems, ensures that responsibilities are assigned, provides incentives for attaining these goals, and facilitates the overall life cycle management of system reliability, availability, supportability, and life cycle costs. It seeks to provide an integrated acquisition and sustainment framework for achieving Warfighter performance requirements throughout a program life cycle. It also recognizes and seeks to implement the DoD Instruction 5000.02 guidance that:

> *the PM shall work with the user to document performance and sustainment requirements in performance agreements specifying objective outcomes, measures, resource commitments, and stakeholder responsibilities. The PM shall employ effective Performance based Life Cycle Product Support (synonymous with PBL) planning, development, implementation, and management. Performance based Life Cycle Product Support offers the best strategic approach for delivering required life cycle readiness, reliability, and ownership costs. Sources of support may be organic, commercial, or a combination, with the primary focus optimizing customer support, weapon system*

availability, and reduced ownership costs. The DoD Components (and by extension, the PSM) shall document sustainment procedures that ensure integrated combat support.[1]

The assistance provided in this guidebook is not the work of a single individual or office; it implements the Product Support Guiding Principles shown in Figure 1 and comprises the efforts and expertise of representatives from the DoD Services and Agencies, the Joint Staff, the Office of the Secretary of Defense (OSD), industry, and academia.

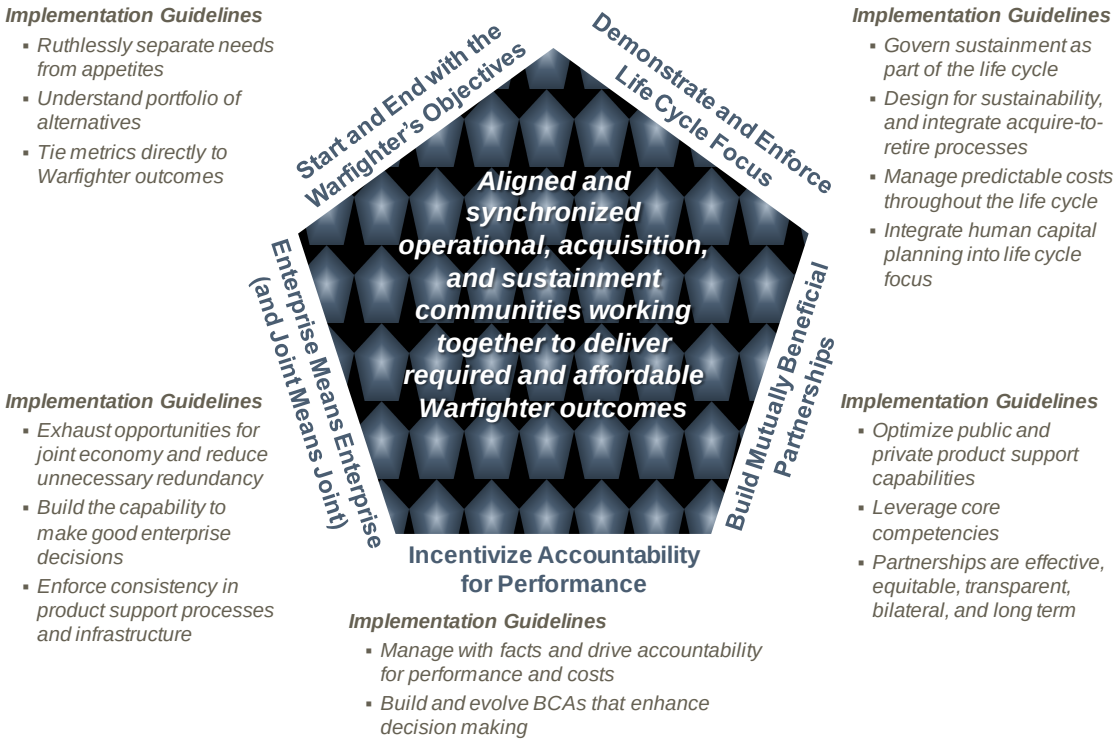


Figure 1. The Product Support Guiding Principles provide direction to a sustainment vision that aligns and synchronizes operational, acquisition, and sustainment communities to deliver required and affordable Warfighter product support outcomes.

1.2. Background

"The PM [Program Manager] shall be the single point of accountability for accomplishing program objectives for total life cycle systems management, including sustainment…PMs shall consider supportability, life cycle costs, performance, and schedule comparable in making program decisions. Planning for Operation and Support and the estimation of total ownership costs shall begin as early as possible. Supportability, a key component of performance, shall be considered throughout the system life cycle."[2]

[1] DoD Instruction 5000.02, *Operation of the Defense Acquisition System*

[2] DoD Directive 5000.01, *The Defense Acquisition System*

"The tenets of life cycle management emphasize an early focus on sustainment within the system life cycle. Life cycle management is the implementation, management, and oversight, by the designated Program Manager (PM), of all activities associated with the acquisition, development, production, fielding, sustainment, and disposal of a DoD system across its life cycle. It empowers the PM as the life cycle manager with full accountability and responsibility for system acquisition and follow-on sustainment. Life cycle management concepts are now policy and have been initiated to provide more effective, affordable, operationally ready systems through increased reliability, supportability, and maintainability. The PM is also responsible for ensuring, throughout the system life cycle, that the sustainment strategy is both regularly assessed and in full compliance with applicable statutory requirements in Title 10, United States Code." [3]

Life Cycle Management (LCM) is defined as the designated PM's implementation, management, and oversight of all activities associated with the acquisition, development, production, fielding, sustainment, and disposal of a DoD system across its life cycle. Under LCM, the PM, with support from the PSM for sustainment 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, during post-production support, and through retirement or disposal.

PMs pursue two primary support objectives. First, the weapon system must be designed to be supportable and reduce the demand for product support. Second, product support must be effective and efficient. The resources required to provide product support must be minimized 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. LCM is therefore the implementation, management, and oversight, by the designated PM, of all activities associated with the acquisition (such as development, production, fielding, sustainment, and disposal) of a DoD weapon system across its life cycle. LCM bases major system development decisions on their effect on life cycle operational effectiveness and affordability. LCM therefore encompasses, but is not limited to, the following:

- Single point accountability (the PM, with direct support from the PSM) for developing and delivering program product support objectives including sustainment
- Development and implementation of product support strategies
- Documentation of product support strategies in the Life Cycle Sustainment Plan (LCSP)
- Continuing and regular reviews, revalidation, and update of product support and sustainment strategies, including the LCSP and the Business Case Analysis (BCA)

Implementation of the LCM approach means that all major materiel alternative considerations and all major acquisition functional decisions demonstrate an understanding of the effects on consequential operations and sustainment phase system effectiveness and affordability. In addition, LCM assigns the PM responsibility for effective and timely acquisition, product support, availability, and sustainment of a weapon system throughout its life cycle.

[3] Manual for the Operation of the Joint Capabilities Integration and Development System

Product Support, a key life cycle management enabler, is the package of support functions required to deploy and maintain the readiness and operational capability of major weapon systems, subsystems, and components, including all functions related to weapon systems readiness. The package of product support functions related to weapon system readiness and which can be performed by both public and private entities includes the tasks that are associated with the Integrated Product Support (IPS) Elements.[4] These elements are an expansion of the Integrated Logistics Support (ILS) elements and should be considered during the development, implementation, and subsequent revalidation of the product support strategy. Product support and system engineering activities must be integrated to deliver an effective and affordable product support package.[5] PSM involvement early in design is a critical part of ensuring a supportable and affordable system.

Product support is scoped by the IPS elements, which provide a structured and integrated framework for managing product support. The IPS elements include product support management; design interface; sustaining engineering; supply support; maintenance planning and management; Packaging, Handling, Storage, and Transportation (PHS&T); technical data; support equipment; training and training support; manpower/personnel; facilities and infrastructure; and computer resources. Further discussion on the IPS elements is contained in Section 3.4.2 and Appendix A – Integrated Product Support Elements.

Product support considerations should begin prior to Milestone A with early requirements determination, and continue through system design, development, operational use, retirement, and disposal. Recognizing that 60–70% of system life cycle costs are frequently in Operations and Sustainment (O&S), efforts to improve product support management have been an ongoing concern for DoD. These efforts have demonstrated clear successes while highlighting the need for a more uniform and rigorous application of product support governance and best practices.

Despite DoD's efforts to correct its deficiencies, issues persist:

- Product support decisions and support continue to be accomplished within ILS element stovepipes, resulting in optimization of discrete ILS elements while sub-optimizing the overall integrated product support strategy.
- Product support business model requirements such as enterprise objectives, funding stability, supply chain operational strategy, and cost and performance measurement and incentives are inconsistently met.
- Despite substantive readiness and availability gains achieved by Performance Based Logistics sustainment strategies over the last decade, critics still point to limited cost visibility, undeterminable cost benefits, and concerns that inherently governmental functions are too often being outsourced to the private sector, resulting in perceptions of potential

[4] See Appendix A , Integrated Product Support Elements

[5] A product support package is the logistics elements and any sustainment process contracts or agreements used to attain and sustain the maintenance and support concepts needed for materiel readiness.

losses of key competencies within the organic DoD workforce. Note that critics also point to limited cost visibility, undeterminable cost benefits, and inconsistent delivery of Warfighter sustainment outcomes as shortfalls of traditional transactional based strategies.

- DoD business case analyses for product support have in some cases been problematic:
    - DoD guidance on business case analysis is not common or comprehensive, does not specify comparison criteria, and has no enforced standards.
    - Business case analyses used to support product support decisions often have missing or incomplete data.
    - In some cases, PBL business case analyses were not done, were not fully documented, did not demonstrate a full understanding of the program cost drivers or interdependencies, or were not as comprehensive as they could have been.

In addition to providing the PSM with the tools and a product support business model framework needed to develop and implement a comprehensive product support strategy, the issues cited above are addressed in this guidebook.

1.3. Purpose

DoD recognizes that the Program Manager (PM) has life cycle management responsibility. In 2009, Congress officially established the PSM as a key leadership position, distinct from the PM, who reports directly to the PM for ACATACAT 1 and 2 programs. The PM is charged with delivering Warfighter required capabilities while the PSM, working for the PM, is responsible for developing and implementing a comprehensive product support strategy and for adjusting performance requirements and resource allocations across Product Support Integrators (PSIs) and Product Support Providers (PSPs) as needed to implement this strategy. Furthermore, the PSM's responsibility carries across the life cycle of the weapon system by requiring the revalidation of the business case prior to any change in support strategy or every five years, whichever occurs first. The PSM must be a properly qualified member of the Armed Forces or full-time employee of the Department of Defense.[6]

This guidebook provides the PSM an overview of the theory, roles and responsibilities, relationships, and tasks associated with performing his or her job. It follows the Product Support Business Model. As such, it provides the PSM a common and consistent product support language and guidance on how to develop and execute product support.

More importantly, this guidebook expands the set of solutions the PSM can use in fulfilling Warfighter requirements by expanding the range of product support strategies from the binary labels of "PBL" or "traditional transactional" to a more accurate description of the range of alternatives. This is accomplished by using the Product Support Business Model (PSBM, explained later in this guide), which recognizes two fundamental axioms of product support:

[6]Public Law 111-84, Section 805 of the 2010 National Defense Authorization Act and Section 820a of the 2007 John Warner NDAA

1. With rare exception, every product support strategy is dependent on both organic and commercial industry support. The intent of the PSM is to determine through a considered analysis the best blend of public and private resources, and the partnering relationship between those entities, to achieve an effective product support strategy that delivers Warfighter operational readiness.
2. The objective of the product support strategy is to achieve Warfighter operational readiness outcomes. Achieving these outcomes is dependent on optimizing the IPS elements that comprise the support strategy. The PSM should determine the appropriate performance metrics for the IPS elements that will, in aggregate, achieve the top-level Warfighter operational outcomes. These performance metrics ensure achievement of the outcomes required for the objective weapon system, subsystem, and components.

Finally, this guidebook helps PSMs objectively decide on the appropriate blend of public and private resources in the support strategy based on the available data, consideration of total costs, identification of implementation metrics and incentives, and achievement of measurable outcomes consistent with statute, policy, and Warfighter requirements. The ultimate strategy will strike the proper balance between operational suitability and affordability. The result of the PSM's efforts will be a support solution that resides within the product support framework shown in Figure 2.

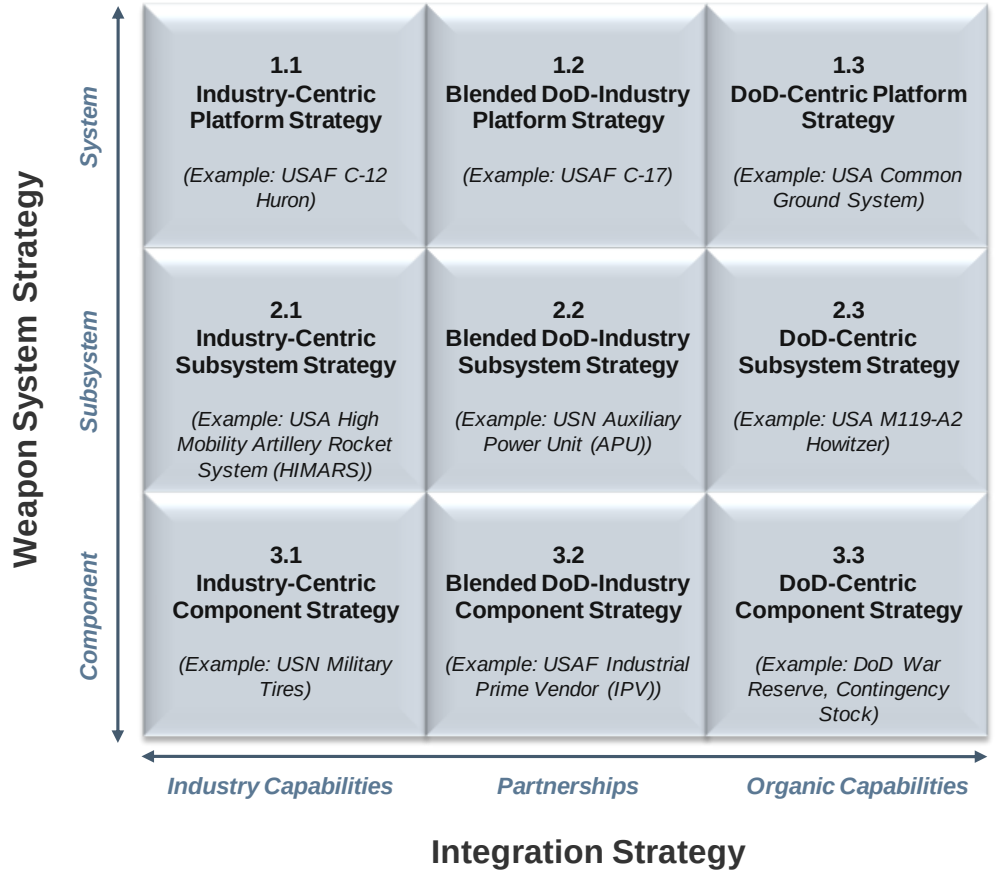


Figure 2. The Product Support Decision Matrix shows the continuum between component and system centric strategies and partnerships using predominately commercial or industry capabilities to government or organic capabilities. See the Defense Acquisition Guidebook (DAG) Chapter 5, Sections 5.1.1 and 5.1.2 for further discussion of Product Support strategy development.

Product support strategies can take many forms at many levels, leveraging the capabilities of a variety of product support providers. They can be established and implemented at the system, subsystem, or component level; they can more heavily leverage industry capabilities of the commercial sector, organic government capabilities or an integrated best value mix of commercial and organic sector competencies, capabilities, and expertise. There are therefore a variety of options represented on the matrix shown in Figure 2. Within each of the nine blocks there are further distinctions in terms of specific product support strategy solutions. The optimum support strategy will be identified along a continuum of support alternatives bounded within the matrix. Very often it will leverage the capabilities of both sectors through the use of public-private partnerships (PPP). [7] Ultimately, the product support strategy will depend on the unique requirements, constraints, and boundary conditions associated with a specific program. This includes statutes (e.g., Core and 50/50), policy (e.g., Contractors Accompanying the Force), Service preferences (e.g., organic operation of forward theater functions), funding availability, and the organizations where core competencies reside.

[7] 10 US Code Sections 2474, 2770, 2563, 2208j, and 2667

The product support strategy will undoubtedly need flexibility to adjust to changing requirements and constraints throughout the program's life. Decisions made early in the program life can affect the ability to evolve the support strategy later in the life of the program. Regardless of which long-term sustainment approach proves to deliver optimized readiness and life cycle cost, outcome based product support strategies integrate responsibility for system support in one or more Product Support Integrators (PSIs) who manage both public and private sources of support in meeting the negotiated and agreed-to performance outcomes. The PM, along with the PSM and while maintaining LCM responsibility, may delegate some levels of responsibility for system support implementation oversight to PSIs at the system, subsystem, or component level, to manage public and private sources of support in meeting agreed-to performance outcomes. Source of support decisions should not favor either organic (Government) or commercial providers (unless mandated by statute). The decision is based upon a best value determination, evidenced through the BCA process, assessing the best mix of public and private capabilities, infrastructure, skills base, past performance, and proven capabilities to meet set performance objectives. Although this can include transaction based purchases of specified levels of spares, repairs, tools, and data, very often the more effective approach is to obtain specified levels of performance of such things as system availability and reliability within life cycle cost constraints. Thus, implementation responsibility and some level of corresponding risk for making support decisions is delegated to the PSI, identifying *what* outcomes are desired, not necessarily specifying exactly *how* to do it.

It is important to note that the product support strategy for any specific program or commodity must be tailored to the operational and support requirements of the end item, and in some cases, to the Service or DoD enterprise level goals and objectives. However, readiness and availability must be balanced with affordability, taking budget realities into account. There is no "one-size-fits-all" approach to product support strategy development and implementation. Similarly, there is no single agreed-to template regarding sources of support when implementing these strategies. Almost all of DoD's system support comprises a combination of public (organic) and private (commercial) support sources. Finding the right mix of support sources is based on best value determinations of inherent capabilities and compliance with statutes, policy, available funding, and the BCA. This process will determine the optimum product support strategy within the product support spectrum, which can range from primarily organic support to a total system support package provided by a commercial Original Equipment Manufacturer (OEM) or other industry partner.

1.4. Major Tasks of the PSM

The PSM for a major weapon system shall accomplish six major tasks:

1. Develop and implement a comprehensive product support strategy for the weapon system;
2. Conduct appropriate cost analyses to validate the product support strategy, including cost benefit analyses as outlined in Office of Management and Budget Circular A-94;
3. Assure achievement of desired product support outcomes through development and implementation of appropriate product support arrangements;

4. Adjust performance requirements and resource allocations across product support integrators and product support providers as necessary to optimize implementation of the product support strategy;
5. Periodically review product support arrangements between the product support integrators and product support providers to ensure the arrangements are consistent with the overall product support strategy; and
6. Prior to each change in the product support strategy or every five years, whichever occurs first, revalidate any business case analysis performed in support of the product support strategy.[8]

These tasks are systematically addressed throughout this guidebook.

1.5. Relationship to Policy and Other Guidance

The PSM Guidebook aligns with DODD 5000.01 and DODI 5000.02. This guidebook is intended to be a desk reference that complements the Defense Acquisition Guidebook (DAG) by explaining (to an experienced PSM) the Product Support Business Model (PSBM) and showing how the PSM should execute the tasks discussed by the DAG. It is not intended to provide all the necessary documentation to fully qualify a PSM. It recognizes the need for companion documents that must be developed or incorporated separately to provide further details on PSBM tasks.

[8]Public Law 111-84, Section 805 of the 2010 National Defense Authorization Act

This guidebook flows from the introduction of product support to the integrated roles and responsibilities of product support stakeholders, management tools, processes, and the major program phase activities associated with the IPS elements. Each major program phase has a unique set of activities that should be performed to achieve increasing levels of program maturity and readiness. These activities are associated with the Sustainment Maturity Levels (SMLs)[9], a concept introduced in this guidebook as a best practice that identifies activities that should be performed and when they should be completed to ensure the program is maturing the support strategy and is prepared to deliver sustainment capability when required. Once a system is fielded, the SMLs identify what should be done to ensure the support strategy continues to meet the Warfighter needs as circumstance change over time. As seen in Figure 3, the life cycle phase identifies *when* something should be done, the SMLs identify *what* should be done, and the PSM Guidebook helps answer the question "*how* do I do it?" The result is an ever-maturing support strategy documented in the Life Cycle Sustainment Plan. How successful the PSM has been in preparing for sustainment is assessed by Logistics Assessments (LA), Logistics Health Assessments (LHA), Independent Logistics Assessments, and other Service-specific reviews. The guidebook's structure is shown in Figure 3.

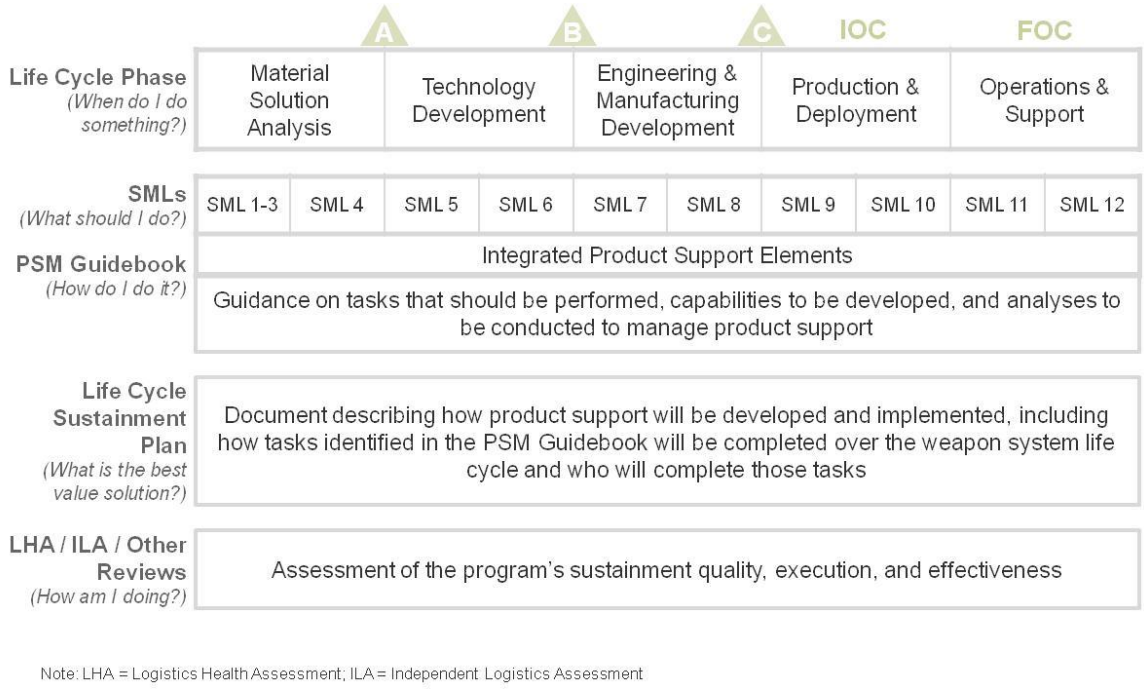


Figure 3. The PSM Guidebook helps the PSM integrate life cycle product support management activities and guidance to achieve Warfighter requirements.

[9] Additional information on SMLs is found in Appendix H of this guidebook.

2. Product Support Business Model (PSBM), Roles and Responsibilities, Product Support Arrangements, and Product Support Strategy and Implementation

2.1. PSBM

The PSBM 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 effectively 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.

The model provides a clearly delineated description of the roles, relationships, accountability, responsibility and business agreements among the managers, integrators, and providers of product support. Those roles and responsibilities are portrayed, consistent with their level of accountability and responsibility, in Figure 4.

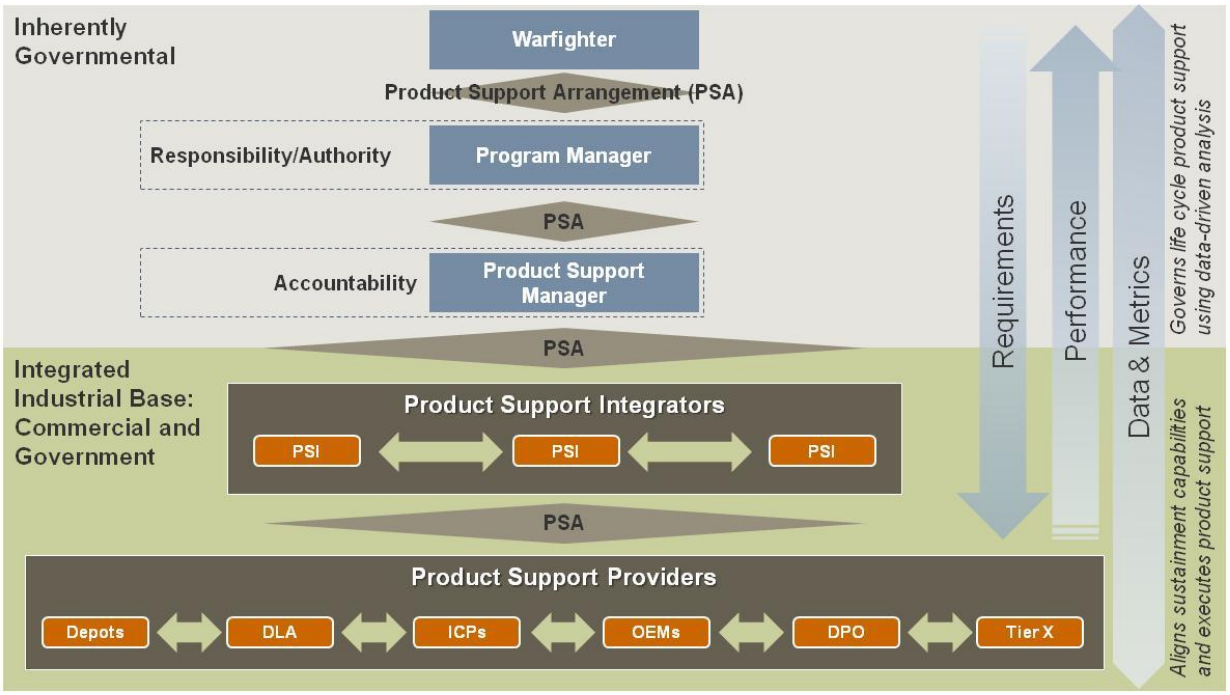


Figure 4. The PSBM highlights that the PSM is the Warfighter's principle product support agent responsible for integrating PSIs to achieve Warfighter requirements.

2.2. Roles and Responsibilities

The top tier of the framework designates the inherently governmental functions of developing and managing the overall product support strategy across the life cycle, beginning with the Warfighter's performance requirements. The PM is assigned Life Cycle Management responsibility and is accountable for the implementation, management, and oversight of all activities associated with development, production, sustainment, and disposal of a system across its life cycle. As part of this, the PM has the responsibility to develop an appropriate sustainment

strategy to achieve effective and affordable operational readiness consistent with the Warfighter resources allocated to that objective. The PM's responsibilities for oversight and management of the product support function are typically delegated to a PSM who leads the development, implementation, and top-level integration and management of all sources of support to meet Warfighter sustainment and readiness requirements. This top-level government role is crucial to the delivery of not only system level, but also portfolio and enterprise level capabilities across the spectrum of defense resources.

The framework's bottom tier portrays the product support implementing agents. Consistent with the model's emphasis on a performance/outcome based product support approach, there may be a requirement for one or more PSIs who are chartered with integrating sources of support, public and private, defined within the scope of their implementing arrangements, to achieve the documented outcomes. There is a clear need for entities (public or private) assigned the responsibility for delivering performance outcomes to be endowed with authority to integrate, manage, and provide oversight over the lower-level support functions that, in combination, achieve the specified outcomes.

2.2.1. Role of the PSM

The principal duties of the PSM are to:

1. Provide weapon system product support subject matter expertise to the program manager (PM) for the execution of the PM's duties as the Total Life Cycle Systems Manager.
2. Develop and implement a comprehensive, outcome based product support strategy. The product support strategy should be designed to assure achievement of Warfighter capability outcomes documented in the LSCP, generally expressed in terms of weapon system materiel availability, materiel reliability, and operations and support cost affordability.
3. Promote opportunities to maximize competition while meeting the objective of best value long-term outcomes to the Warfighter. Competition, where there is more than one available source, is a means to an end—that is, obtaining supplies and services at the best value to the government. Tradeoffs between the benefits of long-term relationships and the opportunity for cost reductions through the competitive processes should be considered together with associated risk.
4. Seek to leverage enterprise opportunities across programs and DoD Components. Enterprise strategies are a priority where the component, subsystem, or system being supported is used by more than one Component. Product support strategies should address a program's product support interrelationship with other programs in their respective portfolio and joint infrastructure, similar to what is performed for operational interdependencies.
5. Use appropriate analytical tools to determine the preferred product support strategy. Analytical tools can take many forms, such as Analysis of Alternatives (AOA), Supportability Analysis, Reliability Growth Analysis, Core Logistics Analysis/Core

Depot Assessment, and Business Case Analysis. The decision on what tool to use is dependent upon what is being evaluated and the stage of the program's life cycle. These tools are used to help identify the best possible use of available DoD and industry resources at the system, subsystem, and component levels by analyzing all alternatives available to achieve the desired performance outcomes. Additionally, resources required to implement the preferred alternative should be assessed with associated risks. Sensitivity analyses should also be conducted against each of the IPS elements and tracked to determine those IPS elements where marginal changes could alter the preferred strategy.

6. Develop appropriate product support arrangements for implementation. These arrangements should take the form of performance based agreements, memorandums of agreements, memorandums of understanding, and partnering agreements or contractual agreements with product support integrators (PSIs) and product support providers (PSPs), as appropriate. Development and implementation of product support arrangements should be a major consideration during strategy development to assure achievement of the desired performance outcomes.
7. PSMs, working in concert with the PM, users, resource sponsors, and force providers, should adjust performance levels and resources across PSIs and PSPs as necessary to optimize implementation of the strategy and manage risk based on current Warfighter requirements and resource availability.
8. Document the product support strategy in the LCSP. The LCSP describes the plan for the integration of sustainment activities into the acquisition strategy and operational execution of the product support strategy. The PSM prepares the LCSP to document the plan for formulating and executing the product support strategy so the design and every facet of the product support package (including any support contracts) are integrated and contribute to the Warfighter's mission requirements. The LCSP is updated to reflect the evolving maturity of the product support strategy at each milestone, at full rate production (FRP), and prior to each change in the product support strategy or every five years, whichever occurs first.
9. Conduct periodic product support strategy reviews. The product support strategy evolves with the maturation of the weapon system through its various life cycle phases. At FRP, the LCSP should describe how the system is performing relative to the performance metrics and any required corrective actions to ensure the metrics are achieved. Reviews and revalidations of the strategy should be performed at a minimum of every five years or prior to each change in the strategy to ensure alignment across system, subsystem, and component levels in support of the defined best value outcomes. In those situations where a support strategy is at the weapon systems level, the PSM's reassessment should explore potential opportunities for evolving toward a portfolio approach (i.e., across platforms). In those situations where an LCSP is based on a collection of outcome based product support strategies at the subsystem or component level, the periodic review should

explicitly address integrated performance at the weapon systems level. In all situations, the reassessment should consider opportunities to make better use of industry and DoD resources.[10]

2.2.2. Role of the PSI

The Product Support Integrator (PSI) role is assigned within the scope, direction, and oversight of the PSM. (Note that the PSI is assigned at the discretion of the PSM; not all programs will require a PSI). PSIs accomplish their product support role through use of one or more Product Support Providers (PSP). Product support integrators are responsible for the activities and output of one or more product support providers within a specific product support element or across product support elements. There may be a system-level PSI that manages subsystem level PSIs. A PSI may also perform the function of a product support provider. A PSI may be either a government or commercial entity.

2.2.3. Role of the PSP

The PSPs are assigned responsibilities to perform and accomplish the functions represented by the IPS elements which, per the 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 program, portfolio, or enterprise level.

2.3. Product Support Strategy and Implementation

A product support strategy encompasses the means by which defense system sustainment is to be accomplished. It is not a one-time decision made early in the system life and executed in the same form throughout the life cycle. It is evolutionary, since the requirements, capabilities, competencies, operational mission, and material condition of defense systems change over time. The PSM must be cognizant of the baseline conditions when assessing and selecting the appropriate strategy, monitoring its performance, and when revising the strategy as circumstances change.

Product Support Strategy Alternatives

A support strategy alternative is simply one of any number of options for providing support as represented by Figure 2 and further explained by the example represented by Figure 10. DoD weapon systems are increasingly an integration of discretely developed and very sophisticated subsystems and components. While a system comprises a war fighting capability to a combatant commander, from a sustainment perspective, it is comprised of separately designed and integrated subsystems such as propulsion, electronics, or fire control. Each of these has an inherent sustainment "tail" that ensures its readiness and availability which, in turn, achieves the

[10] Memorandum 10-105: *Requirements for Life Cycle Management and Product Support*

operational readiness of the system. Accordingly, a product support strategy must consider the optimum approach for the level of support as well as the scope of support.

Product support may be categorized into three levels: system, subsystem, and component, level.

- A "system" is defined as a weapons platform, such as a tactical aircraft, an M1 Abrams tank, or an AEGIS ship. (There are circumstances where a system may house or support another system managed by a different PM.)
- A "subsystem" is an integrated critical subsystem that is part of a war fighting platform, such as an aircraft engine, a ground tactical vehicle fire control system, or on-board radar.
- A "component" is generally defined as an item that can be readily removed and replaced. Components can be repairable assemblies or a commodity item requiring little or no repair, such as aircraft tires.

While every item on a weapon system will be supported, the degree of integration in the outcome based solution is dependent on many factors. In selecting the level of support to be provided, the PSM must weigh the financial and non-financial benefits of a highly integrated approach (e.g., at the system level) to the more fragmented but tightly focused approach available at the subsystem or component levels. Outcome based strategies focused on optimizing system level availability require more complex development.

The range of product support is generally defined by the scope of the IPS elements comprising the support strategy. For example, many of the component level support strategies are narrow in scope, encompassing primarily supply support activities. Conversely, most system level strategies are much broader in scope, and include the majority of the IPS elements. The range of product support is primarily determined by the desired level of service for the component, major subsystem, or system and the desired outcomes. For example, if the desired outcome for an Auxiliary Power Unit (APU) is "availability at retail inventory," then the functions necessary to ensure that availability includes supply chain management, distribution, maintenance and repair, and some level of sustaining engineering. PSMs should give careful consideration to the appropriate range of support to ensure there is consistency with the level of support and the desired performance outcomes.

2.4. Product Support Arrangements

The foundational documents that enact and implement the relationships across this framework are PSAs. It begins with the Warfighter (user) defined performance requirements that are initiated through the Joint Capability Integration and Development System (JCIDS). The PSM (acting on behalf of the PM) incorporates the appropriate needs and constraints in arrangements with PSIs. They, in turn, ensure that the necessary performance requirements to meet their arrangements are properly passed to the PSPs, who accomplish the product support activities. PSAs are used to ensure performance expectations of all product support entities are clearly articulated.

PSAs require defined outcomes and differ from a "best effort" approach typical of some DoD organic support processes. PSAs provide a clear delineation of performance outcomes, corresponding support requirements, and the resources required to achieve both; they create a clear understanding of the outcomes and the commitments required to achieve those outcomes among all stakeholder parties.

Well designed PSAs should include:

- Clear and understood cost, schedule, and performance objectives and metrics to achieve documented Warfighter requirements
- Roles and responsibilities
- Conflict adjudication procedures
- Reliability, availability, maintainability, supportability, and cost improvement targets
- Data sources and collection frequency
- Arrangement terms and conditions
- Planned flexibility
- Unforeseen circumstances identification and management
- Meeting cadence
- Performance reviews
- Incentives and penalties

A Product Support Arrangement (PSA) is a contract, task order, or any type of agreement or non-contractual arrangement within the Federal Government, for the performance of sustainment or logistics support required for major weapon systems, subsystems, or components. The term includes arrangements for any of the following:

- Performance based logistics
- Sustainment support
- Contractor logistics support
- Life cycle product support
- Weapon systems product support

3. Life Cycle Sustainment Management Tools

3.1. Sustainment Maturity Levels

Developing and fielding the product support package evolves over time. Support packages are dependent on variables such as operating doctrine, changes in technology, as well as commercial and government repair capabilities. As a result, a consistent metric to measure the maturity of the implementation process is useful in conveying the progress across the various communities. The SML concept is used to document the program's status in implementing the product support strategy, including the design and the resultant Product Support Package to achieve the sustainment metrics. 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 SMLs can be applied across major sub-systems to provide a common, consistent, repeatable means of articulating and understanding the product support package maturity.

Achieving the levels along the indicated timeline helps the PSM evolve the program's product support approach to achieve the best value support solution. Achieving the "up front" levels will help in designing support actions to reduce total ownership costs and ensure the product support package is being developed using supportability analysis concepts such as Failure Mode, Effects and Criticality Analysis (FMECA), Fault Tree Analysis (FTA), Reliability Centered Maintenance Analysis (RCMA), Level of Repair Analysis (LORA), and Maintenance Task Analysis. Achieving the SMLs will help ensure that the product support strategies can be continuously improved based on actual data collected during the testing and operations phases.

SMLs can be used to help assess and reduce the risks in implementing the product support package. This is because they are directly tied to the DAG guidance on *what* should be done and the LA criteria relative to the *quality* of the product support package. In the event an SML is not reached, understanding and mitigating the associated risks of not reaching an SML greatly increases the probability of fielding a solution that provides the Warfighter suitable product support. Risk Management should be focused on mitigating risk, including identification and elimination of the root cause; controlling the root cause or consequence; transferring the risk; or assuming/mitigating the risk. Finally, since the SMLs are directly related to the design evolution of the system being supported, the PSM gets an early warning to adjust the product support package if the support package gets out of sync with the design.

3.2. Logistics Assessments (LAs)

The PSM is encouraged to use the criteria in the Logistics Assessment (LA) Guidebook[11] as a step-by-step guide to maximize the likelihood that the product support organization will achieve the Warfighter-required outcomes. Each row of the criteria is phrased as a leading statement to inspire further thought and investigation and is not intended to simply be a compliance statement.

[11] The LA Guidebook is in development by the ODASD-MR and is scheduled to be released summer 2011

The LA closely aligns with the IPS elements, with each element assessed and given an individual score. Note, however, that two IPS activities, Program Support Budgeting and Funding and Environmental Safety and Occupational Health (ESOH), are assessed independently of their IPS element since they are heavily dependent on subject matter experts (SMEs) from outside of the product support organization and have assessment criteria distinctly different from the other activities comprising their IPS elements.

3.3. Metrics

A key component of any PBA is the establishment of well understood and achievable metrics.[12] What constitutes performance must be defined in a manner in which the achievement of required outcomes can be tracked, measured, assessed, and revalidated as required. The identification of top-level metrics achieves this objective. The PM works with the user or Warfighter to establish system performance needs and then works with the PSI or PSPs to fulfill those needs through documentation of the requirements, including appropriate metrics, in PSAs. An effective product support strategy implementation depends on metrics that accurately reflect the user's needs and can be an effective measure of the PSI and PSP performance.

Linking key reliability, availability, maintainability, supportability, and cost metrics to existing Warfighter measures of performance and reporting systems is essential. Many existing logistics and financial metrics can be related to top-level Warfighter performance outcomes. Although actual product support strategies may delineate metrics at levels lower than the Warfighter top-level measures (e.g., system availability), it is important that the initial identification of performance outcomes be consistent with the four key Life Cycle Sustainment Outcome measures (Materiel Availability, Materiel Reliability, O&S Cost, and Mean Down Time) identified in the CJCSM 3170 Joint Capabilities Integration and Development System (JCIDS).[13] Three Life Cycle Sustainment Outcome measures—Materiel Availability, Materiel Reliability, and O&S Cost—are mandatory for Joint Requirements Oversight Council (JROC) interest programs with materiel solutions. (The fourth, Mean Down Time, is optional.) These measures are applicable to all product support strategies and are discussed in detail later in this document.

The sustainment metrics are a powerful tool for the PSM to create an aligned product support strategy. While the JCIDS metrics are mandatory; programs should have additional, subordinate metrics aligned to the JCIDS metrics to ensure Warfighter system requirements are met. Metrics that the PSM might use are provided in Appendix B – Typical Supporting Performance Metrics. In all cases, the program metrics must be integrated to communicate a shared understanding of expectations across stakeholders and to measure success in achieving the Materiel Availability (A_M) outcome. Each stakeholder must understand how their performance contributes to the overall system A_M. While the metrics management process described below starts prior to program initiation, it is a repetitive process that is applied in all life cycle phases. The main difference is that later in the life cycle, metrics are analyzed at a greater level of detail based on actual performance rather than estimates created early in system life.

[12] DoD Instruction 5000.02, *Operation of the Defense Acquisition System* (Enclosure 2, Para 8c)

[13] CJCSM 3170 Joint Capabilities Integration and Development(JCIDS)(Enclosure 7)

The mandatory sustainment Key Performance Parameter (KPP) is Materiel Availability. Materiel Reliability and Ownership Cost are the two supporting mandatory sustainment Key System Attributes (KSAs).[14] These requirements, along with Mean Down Time, align with recent Joint Staff actions and establish a single set of sustainment metrics throughout a program's life cycle. Goals for these four materiel readiness outcomes should be established early in the material solution analysis and then carried through as program baseline goals until system retirement. These metrics are reported in the top right quadrant of the Sustainment Chart shown in Figure 5. Status towards these goals should be reported at Program Reviews. In addition, data on these four metrics for Major Defense Acquisition Programs (MDAPs) must be reported quarterly to OSD using the Defense Acquisition Management Information Retrieval (DAMIR) system. Instructions for using the Sustainment Chart shown in Figure 6 are found in Appendix C – Sustainment Chart Usage Instructions.

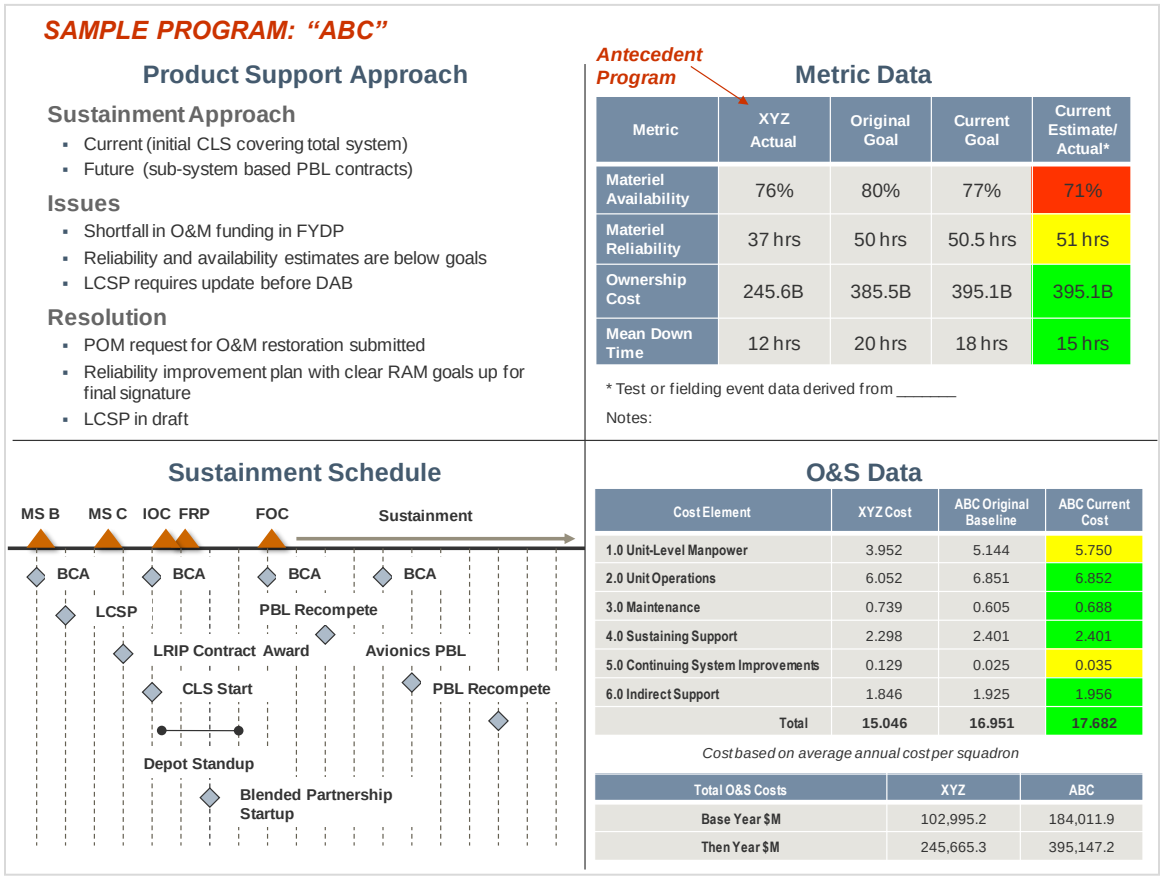


Figure 5. The "Sustainment Chart" provides a ready reference for executive decision makers to use when reviewing a program's product support organization, and is mandatory at all programmatic reviews.

[14] CJCSM 3170 Joint Capabilities Integration and Development(JCIDS)

One of the most critical elements of an effective product support strategy is the tailoring of metrics to the operational role of the system and ensuring synchronization of the metrics with the scope of responsibility of the support providers. Support providers, along with the PSI, are fully responsible for meeting the metrics first mandated in the CDD & CPD, which are then defined in the PBAs (and other formal documents such as contracts) that result. To assure accountability, there must be consistency between the defined metrics and the scope of support responsibilities. If a PSI does not perform or manage all functions contributing to materiel/operational availability, consideration must be given to identifying and tailoring other appropriate supporting metrics for which the PSI may properly be held accountable. While objective metrics should form the bulk of the evaluation of a PSI/PSP performance, some elements of product support requirements might be more appropriately evaluated subjectively by the Warfighter and the PM/PSM team. This approach allows some flexibility for adjusting to potential support contingencies. Ultimately measures of readiness and supportability performance must be balanced against cost and schedule requirements, as well as other program, Service or DoD priorities.

3.3.1. Using Metrics in Acquisition

Sustainment metric requirements must be sub-allocated into lower levels of indenture to specific subsystems and equipments. These requirements are then used to develop the specific support strategies and maintenance plans for both the system and its logistic support system. The requirements that drive supportability must be inserted into acquisition documents and the PSM must ensure the appropriate program documentation, plans, budgets, and actions are put into place to develop, field, and sustain the product support package. Technical performance measures (TPMs) must be put in place to monitor the progress of the design in relationship to supportability. TPMs should be jointly developed by the systems engineering and product support manager teams at the start of the program.

Special coordination and emphasis is required with the engineering community to ensure the proper design features are included in the system specifications and reinforce product support goals. The PSM must also ensure the Systems Engineering Plan (SEP) includes the processes to achieve the required sustainment performance along with the contractor reporting requirements. The Test and Evaluation Master Plan (TEMP) and other testing documentation must include the means to verify that the performance estimates including vital logistic support elements (i.e., training, support equipment, maintenance and operator publications, spares, etc.) are adequate to achieve the sustainment thresholds defined in the JCIDS document in an operational environment.

Specific PSM efforts during acquisition and fielding include:

- Prioritizing the most critical driver metrics for management attention (including developing risk mitigation strategies for each, fallback options, as well as identifying when the fallback options have to be implemented, if the estimates indicate the thresholds are not likely to be met)
- Ensuring sustainment requirements are included in acquisition documents

- Establishing detailed measurement and evaluation criteria for each sustainment metric (including any key dependent enabling technologies) to validate/verify performance as well as provide information about risk and risk mitigation , as related to sustainment, as the development and testing continue
- Participating in design reviews and monitoring sustainment metrics and the BCA estimates based on the evolving design process and prototyping to help provide confidence the system will achieve the sustainment objectives
- Participating in test reviews and monitoring the maturation of sustainment metrics including logistic support elements (i.e., training, support equipment, maintenance and operator publications, spares, etc.) throughout test and deployment
- Tracking the supplier's performance during acquisition to ensure there are no base risk performance anomalies when the system is fielded

Finally, the results of the PSM's efforts during acquisition are listed in the sustainment chart shown in Figure 5. It is used to strengthen sustainment governance by providing senior management visibility of key sustainment factors to help ensure the PM's sustainment strategy is meeting the Warfighter materiel readiness objectives with long-term affordability considerations.

3.3.2. Using Metrics to Adjust Product Support

Once the system is fielded, actual performance tracking enables corrective actions and adjustments to the product support package as required to achieve Warfighter requirements and to control O&S costs. This is accomplished by continually comparing performance against requirements, defined as thresholds; and expectations, defined as objectives. Actual equipment and support performance data will be used, improving product support strategies to meet the users' requirements. This includes updating the variance analysis that examines actual versus predicted cost and performance, supply chain processes based on actual values to help balance logistics support through a thorough review of readiness degraders, maintenance data, maintenance capability, and support process implementation. For example, reliability data captured through the maintenance process can be compared, through the use of reliability modeling, to specified system reliability. Those components that are critical reliability drivers can then be submitted for analysis to determine the most cost-effective mitigation strategies.

3.4. Enterprise Synergies and IPS elements

3.4.1. Enterprise Synergies

"Enterprise synergies" refers to the ability to leverage the efforts of other programs or portfolio of programs. The PSM's challenge varies throughout the life cycle and grows more complex over time as fleet configurations change due to varying ages, blocks, and modifications of the systems being managed. Other systems and functional organizations are also evolving in parallel with the PSM's, providing opportunities for the PSM to identify and take advantage of synergistic relationships across the enterprise. For example, the PSM of a legacy bomber might take advantage of another heavy aircraft's avionics modernization program to upgrade a cockpit without investing separately in a stand-alone, bomber-unique cockpit upgrade. This would create

economies of scale in procurement of the system upgrade, consolidate and add efficiency to spending for supply chain management, and accelerate the learning curve for installation and maintenance. Each of these benefits would result in improvements to the Warfighter and minimized life cycle costs.

Enterprise synergies are achievable through various methods, including:

- Design joint systems with joint supply chains to improve performance and achieve cost benefits of common processes.
- Use shared IPS element expertise whenever possible, rather than standing up separate organizations, to develop deep and broad expertise in tasks such as sustaining engineering, supply support analysis, and maintenance management.
- Use common IPS element hardware, software, and processes where possible (e.g., common support equipment) across multiple platforms to achieve economies of scale.

Ultimately, enterprise solutions will have to be coordinated at the DoD Component or portfolio level and leveraged by the PSMs of individual programs as applicable.

3.4.2. Integrated Product Support (IPS) Elements

Specific synergies and requisite tradeoffs are identified through analysis and management of the IPS elements. Integration of all Product Support Elements is critical. PSMs may be tempted to think of the IPS elements as a set of discrete functions that must each be individually accomplished to manage sustainment, as has often been the case in the past under traditional integrated logistics support management. The PSM must understand how each element is affected by and linked with the others and as such, should manipulate all of them in an integrated fashion to reach the goal of balancing Warfighter requirements for suitability and affordability. For example, if the PSM recognizes that a system is down more often than predicted and, upon further analysis, determines that a key part is wearing out faster than its designed life would indicate, that maintenance personnel are properly trained, and that there is no other subsystem that is causing early part failure, the PSM should examine at least three solution alternatives and combinations of these alternatives, ranging from:

- Redesigning the part to be more durable
- Changing maintenance procedures to inspect this part more frequently and replace it earlier in its life or overhaul the unit rather than conducting spot repairs if the investment in overhaul results in a positive return on investment
- Buying additional parts

Additionally, there are other approaches besides the three cited above that may apply. Examples include:

- If commercially repaired units are more reliable, investigate whether commercial practices or a teaming arrangement can be applied to the organic depot.

- If a lack of training is resulting in more frequent removals, field the appropriate training teams.
- If new or better test and repair equipment is available, and there is a positive return on investment, field the improved equipment.

Each of these alternatives will have a different impact on the program and should be evaluated for system availability, reliability, and cost across each of the other IPS elements.

3.5. Business and Variance Analysis

PSMs should base decisions on empirical facts and proven analytical techniques to ensure they are made as objectively as possible and should use that analyzed data to support informed opinions. All major decisions regarding product support strategy development, including assignment of workloads and responsibility for integration of those workloads (PSI delegation) should be informed by unbiased BCAs that account for all applicable cost assessed equitably across all alternatives to meet Warfighter requirements. Likewise, the PSM should understand the cause of variances between predicted and actual product support cost and performance. The level of analysis depends on the life cycle phase, purpose of the BCA, and scope of the BCA.

3.5.1. Data Quality for All Analyses

Data used for sustainment governance should be obtained from authoritative data sources such as Visibility and Management of Operation and Support Cost (VAMOSC) or Component Enterprise Resource Planning (ERP) tools that, as much as possible, rely on automated data collection. Ideally, these same data sources will be used to populate the consolidated cost figures used in Service and DoD reporting and planning. If this dual use of data is not possible, then any data sources used must be validated to ensure they provide timely, accurate, and usable data that reflects actual program performance.

3.5.2. Business Case Analysis

Specific instructions on business case analysis completion process, product template, and authoritative data sources are contained in the OSD BCA Guidebook. If the PSM's program is legacy and does not currently have a business case analysis, the PSM should initiate a cost and performance baseline that addresses each portion of the standard OSD Product Support BCA to economically and effectively understand the program's current status and to enable future business case analyses. This use of a standard BCA process also facilitates the PSM meeting the statutory requirements that stipulate a validation of a weapon support strategy business case every five years or prior to a major change in the program product support strategy.[15] It also ensures that the PSM addresses and acts to prevent systemic product support issues.

[15]Public Law 111-84, Section 805 of the 2010 National Defense Authorization Act

The PSM should use a BCA to determine how the system will be supported across the integrated product support elements. The PSM should document these decisions within the LCSP and should also document any requirements to deviate from the decisions recommended by the BCAs. The PSM should also maintain a complete history of BCAs over the course of the system life cycle to be able to track decisions and understand how real-world operations are causing deviations from predicted cost and performance through a variance analysis.

The PSM should recommend the use of the OSD BCA Guidebook to identify appropriate analytical tools and authoritative information sources to drive standardization and repeatability of analysis and ensure future analyses can make use of, or correctly compare against, current analyses. This also helps the PSM ensure analysts are not picking tools or data that will help them develop a pre-decided recommendation.

BCA objectives and approach are dictated to a significant degree by the point at which they are accomplished within the weapon system life cycle. Acquisition and early operational fielding BCAs are primarily used to select a product support strategy. Later life cycle BCAs (e.g., out of production legacy systems) are generally used to assess changes from the current product support strategy. In that sense, the process is simplified by the following characteristics:

- Early Life-cycle BCAs are used to determine the best value portfolio of strategic sourcing and support alternatives to address each IPS element in a program from a set of candidate alternatives. They are iterative, in that they evolve and mature as the data, support infrastructures, and availability of support providers and alternatives evolve.
- Later life cycle BCAs are used to identify the best value alternative product support solution as compared against the current product support solution and to determine whether a change in product support strategy is beneficial. They are characterized by mature cost, performance, and supportability data and readily available, in-place product support infrastructure(s).

IPS element BCAs are accomplished throughout the life cycle. The data, factors, alternatives, and purpose of the BCA evolve consistent with the point at which the analysis is performed within the life cycle. For example, a Milestone B BCA, accomplished concurrent with the approval of a defense system program office, is necessarily constrained by the lack of real world performance, supportability (reliability, availability, and maintainability), and cost data, making it highly reliant on analogous data, if available. Also, at Milestone B, there is no in-place organic support infrastructure. The development system is almost entirely reliant on the commercial development OEM (Original Equipment Manufacturer) for sustainment throughout the design, development, and most of the production phase for the program. As a result, there are few "alternatives" available for consideration in a Milestone B BCA, and it is inappropriate to characterize this BCA as a life cycle product support strategy decision analysis. However, the value in completing a Milestone B BCA is to initiate and institutionalize the resources, skills, and process infrastructure to collect, compile, update, and analyze the requisite data as it grows and matures after Milestone B such that each iterative updated BCA will improve the ability of the PSM to identify and compare viable product support strategy alternatives leading up to the point at which sufficient data accuracy and availability will enable a life cycle decision support strategy analysis. In that context, a Milestone B BCA will utilize the same format and section

content as subsequent BCAs, but will contain much less detail and will reflect "placeholders" for content as it becomes available.

A Milestone B BCA will establish the BCA framework and process for a program. A Milestone C BCA, with available test and evaluation data, will begin to identify the viable sourcing and support alternatives, and accomplish initial analysis of those alternatives sufficient to develop the scope of the product support framework and the identification of the key performance and supportability outcomes appropriate to the objective system. As organic infrastructures are established the BCA is the primary means by which the public-private partnerships and best competency, best value workload sourcing decisions can be implemented.

Given that the product support alternatives vary as the life cycle evolves, there is no standard set of alternatives for a Product Support BCA, such as "organic," "contractor," or "partnership." For acquisition programs the alternatives, to a great degree, will materialize through the BCA process as it is used to assess the product support elements required for sustainment of the objective system. The merits of various sourcing and partnering options will be identified as capabilities; infrastructures; and cost, supportability, and performance data are accrued and analyzed.

3.5.3. Product Support and Variance Analysis

PSMs must also ensure that other appropriate analyses are performed and tools used over the course of the weapon system life cycle. While specific requirements will vary by program, in general statistical process control tools such as control charts should be used to monitor program trends and keep program processes in control. Likewise, variance between predicted and actual performance and cost must be evaluated periodically to ensure processes are actually achieving required outcomes and to provide opportunities for continuous process improvement within the program. Finally, tools such as the Joint Supply Chain Architecture (JSCA) Weapon System Diagnostic process, found in Appendix D – Weapon System Diagnostic (WSD) Process, should be used upon fielding the system and throughout the life cycle thereafter to ensure the end-to-end supply chain for planning, sourcing, maintaining, delivering, and returning material is functioning at required cost and performance levels, that improvement opportunities are identified, and potential future issues are proactively identified before they impact the Warfighter.

3.6. Supply Chain Management

Supply Chain Management includes but is not synonymous with the Supply Support IPS element. It also includes sustaining engineering, maintenance and maintenance planning, PHS&T, support equipment, and tech data. PSMs should be cognizant of their system's supply chain from a logically bounded end-to-end perspective. Typically this means that they should view it as an integrated network that extends from their suppliers' suppliers to their customers' customer and back. This does not mean that the PSM should act as an agent of the prime manufacturer performing sub-vendor management functions. However, he or she should, at all times, hold the prime accountable for the performance of their vendor base. For example, if the PSM manages a system with nuclear propulsion, they might need to maintain oversight and

situational awareness of the supply chain from the raw material source to the Warfighter to the disposal of potentially contaminated material. Conversely, if the PSM manages a system with less stringent requirements, they might need to only understand the ultimate source of supply and maintain situational awareness from the Inventory Control Point (ICP) to the Warfighter.

Supply chain management responsibility includes the distribution, asset visibility, and obsolescence mitigation for weapon system sustainment material. From a Warfighter's perspective, transportation and asset visibility have a substantial impact on high-level sustainment metrics and should be emphasized in the product support strategy. All the skilled labor, advanced technology, and performance of a modern weapon system mean little without the "right part, in the right place, at the right time."

Of special concern to the PSM is the need to constantly look for and implement mechanisms to reduce and streamline the logistics footprint. This may involve continued collaboration with systems engineers but might just as easily involve using existing supply chains that are supporting other systems rather than developing a new supply chain, thereby minimizing redundancy and associated footprint.

The JSCA, which is based on and directly maps to the Supply Chain Operations Reference-model (SCOR®), is a framework used by DoD to improve supply chain management performance. (*SCOR® is a registered trademark of the Supply-Chain Council, Inc.*) The PSM may use the JSCA reference model in the initial definition and mapping of supply chains as well as in continuous process improvement efforts for managing existing supply chains. More information on JSCA is found in Appendix E – Proposed Joint Supply Chain Architecture (JSCA) Supply Chain Management Metrics.

3.7. Life Cycle Sustainment Plan (LCSP) and Product Support Package Update

System sustainment is enabled by effective planning, development, implementation, and management. To accomplish this, the program manager needs to adequately plan for the long term supportability and sustainment through the aggressive application of performance based life cycle product support strategies. The plan for implementing these strategies seamlessly spans the entire life cycle and is spelled out in the LCSP. The LCSP is an evolutionary document begun during the Materiel Solution Analysis Phase as a strategic framework for obtaining optimal sustainment at minimal Life Cycle Cost (LCC). It evolves into an execution plan for how sustainment is applied, measured, managed, assessed, and reported after system fielding. By Milestone C, it should contain details on how the program is fielding integrated logistics elements to meet readiness targets, sustain system performance capability threshold criteria, mitigating operating and support (O&S) costs, reducing the logistics footprint, and complying with environmental and other logistics related statutes and regulations.

Specific details of the LCSP contents are found in the Defense Acquisition Guidebook. These contents comprise the PMs and PSMs plan for formulating, implementing and executing the sustainment strategy from system design through to disposal. The LCSP is the PSM's product support execution plan for ensuring the system's product support meets the Warfighter's mission

requirements by achieving and maintaining the Sustainment KPP/KSAs while controlling overall program ownership costs.

The LCSP serves as a ready reference for all product support information. Continuously updated by the PSM organization, the LCSP is a single source of integrated data for both day-to-day and strategic decisions. The LCSP helps to ensure the actions across a wide organizational range are coordinated.

While the PSM should update the LCSP as needed when the sustainment strategy or operating environments change, the PSM should work toward officially updating the LCSP for any Post-IOC Sustainment Reviews and at a minimum every five years or when:

- Subsequent increments are approved and funded to reflect how the support strategy will evolve to support multiple configurations
- Significant changes are required to the product support package to achieve the objective sustainment metrics, including major support provider changes.

The LCSP is implemented by the Product Support Package which in turn contains key implementing documents such as PSAs. The Product Support Package must evolve to reflect changes in the outcomes required by the sustainment strategy. The PSM should take corrective action if the Product Support Package is not fully aligned with the LCSP. Corrective actions can range from: modifying supply chain functions, renegotiating PSAs, restructuring teams that are accomplishing IPS element actions, adjusting the Product Support Package to acquire new/better capabilities to redesigning the system. Regardless of the path, the LCSP needs to be adjusted to convey changes in program direction.

3.8. Funding Alignment

For a product support strategy to succeed, a PSM must ensure it is funded appropriately. It is important to align funding appropriations with support requirements. Typically, acquisition phase sustainment is funded out of Research, Development, Test, and Evaluation (RDT&E) and Procurement appropriations. As the system transitions to operational use, support is typically funded from the Operations and Maintenance (O&M) appropriation. PSMs should work to identify O&M funding requirements early prior to operational use so as to ensure adequate planning and budgeting of sustainment funds once the system has been fielded. As the system evolves into the Operations and Support (O&S) phase of its life cycle, it may be necessary to include Procurement and RDT&E funding for necessary modifications and upgrades to the system to prevent degradations in performance and/or to mitigate rising cost for sustainment as the system ages. Each Program typically has a group of Business Financial Managers (BFMs) who track funding and funding alignment. The PSM should endeavor to meet with program BFMs on a periodic basis to maintain situational awareness and oversight on all appropriations affecting platform support. In addition, the PSM should work with the BFM community to ensure the program of record reflects financial resources required for support and sustainment of the weapon system.

4. Developing a Product Support Strategy

4.1. Introduction

Figure 6. The DoD Product Support Strategy Process Model provides a ready reference to the iterative 12 steps for defining and implementing product support strategies.

Programs will often change their weapon system product support strategy over their life cycle for the various reasons discussed throughout this guidebook. The development of, or revision to, a product support strategy adheres to a logical methodology captured in the 12-step model depicted in Figure 6.

The Life Cycle Product Support Strategy Process Model represents the major activities required to implement, manage, evaluate, and refine product support over the life cycle. It is not a one-time process, but rather a continuing, iterative process in which the sustainment of a system (or systems) is adapted and evolved to optimally support the needs and requirements of the Warfighter in an effective and affordable manner. The Product Support Strategy Process Model follows.

4.2. 12-Step Product Support Strategy Process Model

4.2.1. Integrated Warfighter Requirements and Support

Translate system operational requirements into the sustainment strategy that will deliver those requirements. The objective of Product Support is to develop, enable, and execute a sustainment strategy that will deliver optimum operational readiness to the Warfighter, consistent with Warfighter requirements, at an affordable, best value cost. Warfighter requirements are expressed in operational terms. Those requirements must be interpreted and translated as needed into sustainment objectives that will drive the achievement of those outcomes.

An effective outcome based strategy implementation begins in the JCIDS process by focusing capabilities needs on overall performance and linking supportability to performance.

Understanding Warfighter requirements in terms of performance is an essential initial step in developing a meaningful support strategy. The PSM team consults with the operational commands and organizations that support the war fighting combatant commanders. The operational commands are generally PM's primary customers. Their Warfighter capability needs are translated into requirements. The metrics are derived from the requirements to drive outcomes that will: (a) be documented in PSAs; and (b) serve as the primary measures of support provider performance. Supportability requirements should also be a Key Performance Parameter (KPP) consideration or a testable performance metric.

Understanding Warfighter requirements is not a one-time event. As scenarios change and the operational environment or funding profiles evolve, performance requirements may also evolve, leading to changes in the suitability requirements which in turn drive supportability strategy and outcome based sustainment methodology. Thus, meeting Warfighter needs and remaining in close alignment with Warfighter requirements and logistics personnel are essential and continuous processes for the PSM.

To achieve this needed flexibility, product support strategies should be implemented via Product Support Arrangements that specify the roles, responsibilities, duration of support, resource commitments, and any specified support or performance outcomes and the corresponding metrics sufficient to achieve the operational requirements. Ideally, the product support strategy will be aligned across various tiers of support and operations tempos.

4.2.2. Form the Product Support Management Integrated Product/Process Team (IPT)

Form the PSM team that will develop, implement, and manage product support. The PSM is charged with the responsibility to plan, develop, implement and execute the product support strategy. Product support encompasses a range of disciplines including, but not limited to, logistics, requirements, operational mission planning, financial, contracts, legal, and integrated product support elements functional subject matter experts.

Although the PM is the total life cycle systems manager, the PSM is the orchestrator of that 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, as shown in the notional IPT depicted in Figure 7. However, it is vital that members are able to 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.

The structure of the team may vary depending on the maturity and the mission of the program. For instance, during the Engineering and Manufacturing Development (EMD) phase, systems design for operational effectiveness has the biggest impact on life cycle sustainment. The PSM must now consider where the system is at in the life cycle, understand what major decision points or events are approaching, and provide useful information to the decision makers for the program to move forward through the life cycle successfully.

IPT membership will typically include a Program Office "core" team who has a daily responsibility to plan, develop, implement, and oversee the product support strategy; the core team will be supplemented, often on an ad hoc basis, by other stakeholders and subject matter experts as needs arise. After the IPT is organized, the members establish their goals, develop plans of action and milestones (documented in an approved IPT Charter), and obtain adequate resources.

Figure 7. Product Support IPTs should be cross-functional and include the Warfighter.

The Product Support Management IPT could include representatives from a component command headquarters and logistics representatives from supply, maintenance, and transportation staffs. It could also include representatives from operational commands or defense agencies, as well as engineering, technical, procurement, comptroller, information technology organizations, and contract support. Depending on the stage of the life cycle, the team could also include the Product Support Integrator(s) and key Product Support Provider(s). After the team is organized, the members establish their goals, develop plans of action and milestones, and obtain adequate resources. 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 life cycle cost.

4.2.3. Baseline the System

Collect the data, or begin data collection for new systems, that will be needed to assess and analyze support decisions, including inputs from engineering and supportability analyses. This data includes such things as reliability, maintainability and diagnostics predictions, Failure Modes Effects & Criticality Analysis (FMECA), Failure Reporting and Corrective Action System (FRACAS), Level of Repair Analysis (LORA), Maintenance Task Analysis (MTA), Reliability Centered Maintenance (RCM) analysis, and other key maintenance planning tasks, as well as Reliability, Availability, and Maintainability (RAM) and Life Cycle Cost (LCC) analyses.

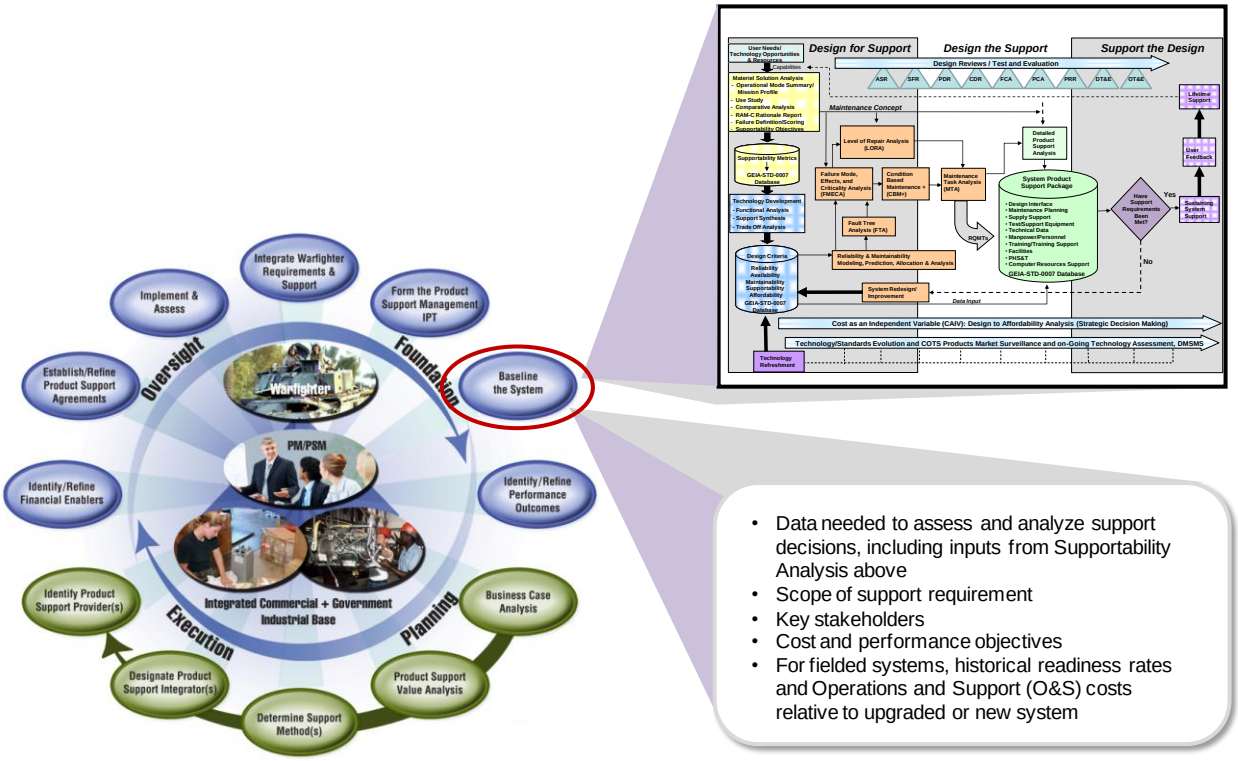


Figure 8. Baselining the system is discussed in further detail in the Defense Acquisition Guidebook.

Defining and documenting the system baseline answers four key questions:

1. What is the scope of your support requirement?
2. Who are the key stakeholders?
3. What are your cost and performance objectives?
4. For fielded systems, what are the historic readiness rates and Operations and Support (O&S) costs relative to the upgraded or new system?

The PM/PSM needs to identify the difference between existing and desired performance requirements to develop an effective support strategy, as shown in Figure 8. Accordingly, the PM/PSM identifies and documents the current performance and cost baseline. The life cycle stage of a program determines the scope of a base lining effort. For new programs with no existing product support infrastructure, the baseline should include an examination of the cost to support the replaced systems. If there is no replaced system, Life Cycle Cost (LCC) estimates should be used. For new systems, the business model for supporting the product demonstrates its risks and benefits as part of the systems engineering process. This proof of concept for the support solution is part of the EMD phase. For existing systems, the baseline assessments form the basis for BCA of product support approaches being considered. Determination of the sustainment and readiness performance history and associated operations and support cost is essential. Therefore actual data should be used for fielded systems.

The process of developing the system baseline is to identify all of the information known about the system to include performance, support, reliability, maintainability, and cost data. A robust Integrated Data Environment (IDE) should be initiated (or accessed) as a fundamental component in the support strategy development or revision process. This stage of the process also provides an essential linkage to a variety of systems engineering and life cycle logistics efforts to ensure a system is designed with supportability in mind, including key inputs from Supportability Analysis activities outlined in the Affordable System Operational Effectiveness model outlined.[16] These include IPS activities such as Failure Modes Effects & Criticality Analysis (FMECA), Failure Reporting and Corrective Action System (FRACAS), Fault Tree Analysis (FTA), Level of Repair Analysis (LORA), Maintenance Task Analysis (MTA), Reliability Centered Maintenance (RCM) analysis, and other related maintenance planning tasks, as well as Reliability, Availability and Maintainability (RAM) and Life Cycle Cost (LCC) analyses. Throughout the maintenance planning process, however, it is important to remember that, "the PM shall design the maintenance program to minimize total life cycle cost while achieving readiness and sustainability objectives. Maintenance program management shall begin at program initiation."[17]

Implementation of a disciplined design for support approach, including these systems engineering analysis tools are directly linked to a system's Reliability, Availability, and Maintainability (RAM) attributes and life cycle costs, and will play a key role in not only

[16]Defense Acquisition Guidebook(DAG) in Paragraph 5.2 of Ref (9)

[17]DoD Instruction 5000.02, *Operation of the Defense Acquisition System* (Enclosure 2)

establishing top-level product support metrics, but in ultimately meeting Warfighter performance requirements. Close collaboration between systems engineers and life cycle logisticians is critically important during system design and development and throughout the life cycle. These tasks are further refined during the subsequent Business Case Analysis to determine a cost effective, sustainable product support solution to meet user needs in an operational environment.

4.2.4. Identify/Refine Performance Outcomes

Using your product support requirements, develop a process for identifying critical product support outcomes and how you will measure success. Identify the critical behaviors that your metrics will influence to achieve your product support strategy outcomes. The starting points for metrics identification are Warfighter outcomes and OSD's specified top-level weapon system metrics. Each product support strategy, as it evolves, must be tailored consistent with the maturity of data and existence of in-place support infrastructure and capabilities. The metrics defined as accountable outcomes must be tailored accordingly, with an objective to maintain a close correlation with, and enable the achievement of, the Warfighter and OSD top-level outcomes.

Having collected the Warfighter, Service, and OSD requirements for each IPS element, the PSM must decide on the actual and as-measured performance outcomes required for the product support strategy.

The formal Product Support Arrangement between the PSM and the Warfighter states the objectives that form the basis of the product support effort. The PSM should focus on a few key outcomes, such as weapons system availability, mission reliability, logistics footprint, or overall system readiness levels, using the metrics as discussed in this guidebook's Section 3.3, "Metrics." Linking key reliability, availability, maintainability, and supportability metrics to existing Warfighter measures of performance and reporting systems is essential. Many existing logistics and financial metrics can be directly related to top-level Warfighter performance outcomes.

4.2.5. Business Case Analysis

Assess the capabilities, effectiveness, cost, competencies, and process efficiencies to identify the optimum best value product support solution.

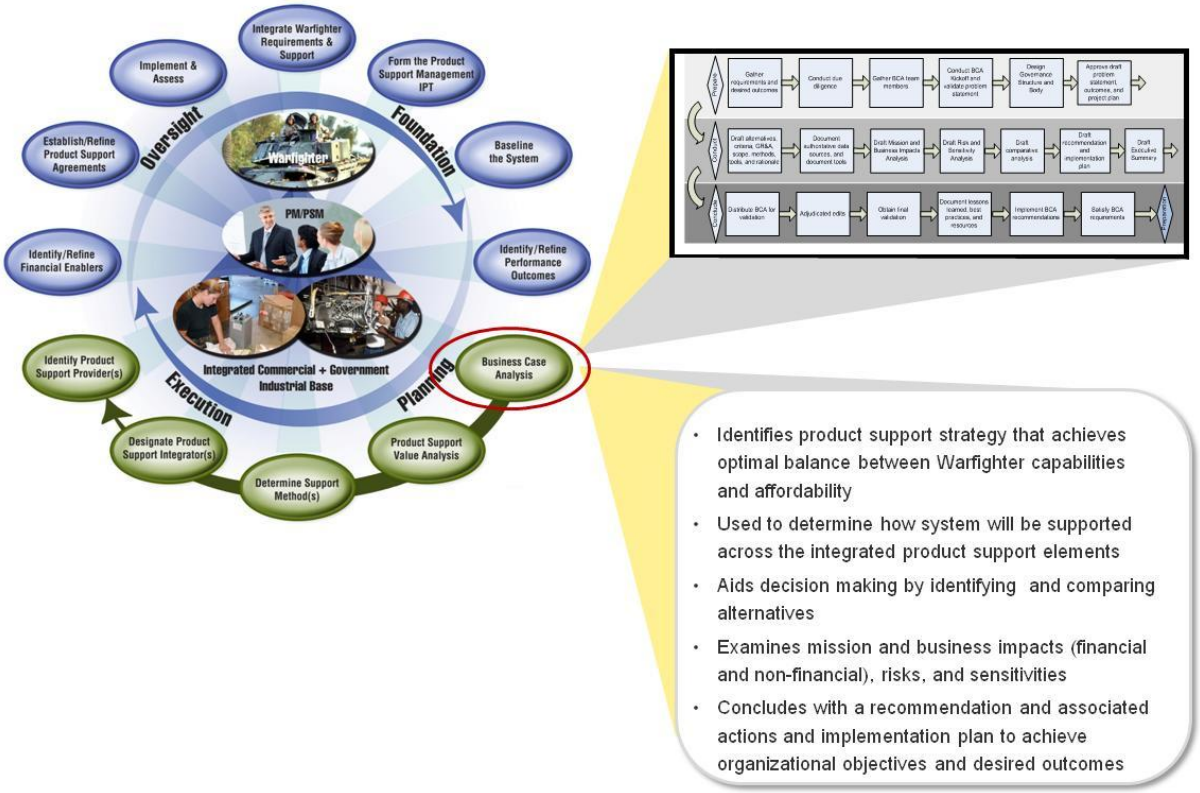


Figure 9. The BCA process overview provided in the PSM Guidebook is detailed in the BCA Guidebook.

BCA Purpose

A 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. The BCA concludes with a recommendation and associated specific actions and implementation plan to achieve stated organizational objectives and desired outcomes. The goal of the Product Support or Sustainment BCA is to identify the product support strategy that achieves the optimal balance between Warfighter capabilities and affordability. A BCA does not replace the judgment of a decision maker, but rather provides an analytic, standardized, and objective foundation upon which credible decisions can be made. The BCA should be a full, fair, and accurate comparison when evaluating multiple alternatives. A BCA is used for major life cycle, sustainment, and other product support decisions, especially those that result in new or changed resource requirements. The BCA helps leadership with significant investment and strategic decisions. For example, use a Product Support BCA to evaluate a decision on whether or not to transform business operations such as the degree of commercial involvement and choosing a PSI or PSP, develop a web-based training curriculum, or retire an asset.

Details of this execution are documented in the DoD Product Support Business Case Analysis (BCA) Guidebook.

BCA Structure

Although BCA contents and implementation processes will be promulgated in a separate DoD Product Support BCA Guidebook, as a minimum, a product support BCA should include:

1. Executive Summary
2. Introduction
    a. Problem Statement
    b. Background
    c. Scope
3. Desired Outcomes and Requirements
    a. Desired Outcomes
    b. Requirements
4. Methods and Assumptions
    a. Ground Rules and Assumptions
    b. Analysis Methods, Tools, and Rationale
    c. Evaluation Criteria
5. Alternatives
    a. Current Baseline/Anticipated Initial Support/Status Quo
    b. Alternatives
6. Mission and Business Impacts
    a. Benefits and Non-Financial Analysis
    b. Cost and Financial Analysis
7. Risk Analysis and Mitigation Plans
    a. Risk Analysis
    b. Mitigation Plans
8. Sensitivity Analysis
9. Conclusion
    a. Comparison of Alternatives
    b. Summary of Results
10. Recommendations
        i. Specific Actions Based on Business Objectives
        ii. Implementation Plan

The BCA becomes an iterative process, conducted and updated as needed throughout the life cycle as program plans evolve and react to changes in the business and mission environment.

4.2.5.1. Product Support Strategy Value Analysis

Best Value analysis to optimize long-term life cycle costs and benefits would include:

- *Optimum level of support (System, Sub-system, or component level), evaluation of product support strategy considerations related to the 12 IPS elements*
- *Supply Chain Management strategy*

- *Workload allocation strategy (including depot maintenance Core, 50/50, $3M Rule, and Public-Private Partnering (PPP) considerations)*
- *Refinement of program data management strategy (DMS)*
- *Strategies for continuous modernization and improvement of system reliability, availability and maintainability (RAM), and proactively addressing obsolescence, Diminishing Manufacturing Sources & Material Shortages (DMSMS), and corrosion issues.*
- *Life cycle cost control and risk mitigation.*
- *Affordable alignment with Department strategic objectives.*

A product support BCA provides a best value analysis, considering not only cost, but other quantifiable and non-quantifiable factors supporting the product support strategy implementation and related investment decisions. This can include, but is not limited to, performance, producibility, reliability, maintainability, and supportability enhancements. In outcome based product support strategies, it is important and frequently necessary to make up-front investments in Reliability and Maintainability (R&M) improvements and proactive obsolescence/DMSMS mitigation that result in short-term increases in system costs to generate the requisite LCC savings later. To effectively provide this justification, it is critical that the process, scope, and objectives of the BCA be clearly understood and communicated. A BCA should be developed in an unbiased manner, without prejudice, and not constructed to justify a preordained decision. The analysis must stand on its own and be able to withstand rigorous analysis and review by independent audit agencies. The Product Support Strategy BCA is an iterative process, periodically revisited, or updated throughout the life cycle. Portions of strategy decisions informed by BCAs also include:

- Are used in the initial decision to invest in a project;
- Guides the decision to select among alternative approaches;
- Are used to validate any proposed scope, schedule, or budget changes during the course of the project;
- Should also be used to identify the various budget accounts and amounts affected by the various product support strategies;
- Should be a living document—as project or organization changes occur, they should be reflected in updates to the business case;
- Should be used to verify that planned benefits are realized at the completion of the project.

This information should be used in further decisions to sustain or enhance the solution and to refine estimation of benefits and costs for future projects in the organization. The independently and objectively derived BCA will identify which alternative provides optimum mission performance given cost and other constraints, including qualitative or subjective factors.

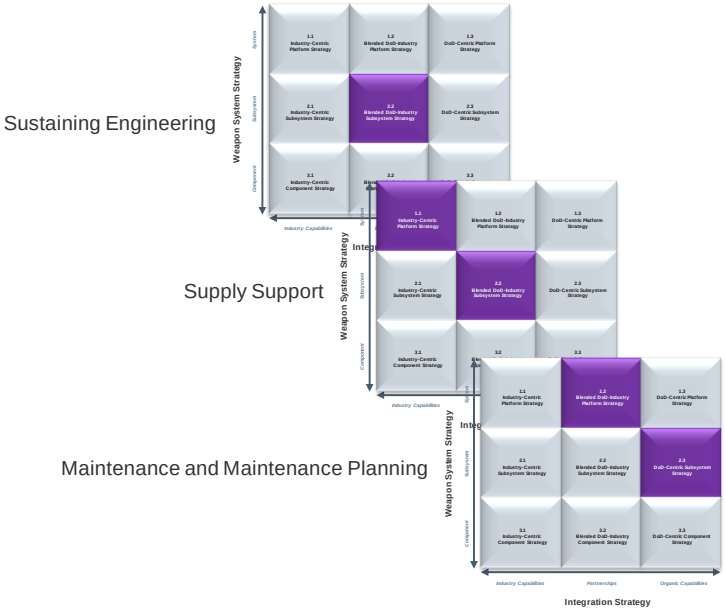


Figure 10. Each IPS element will have a recommendation to achieve Warfighter requirements at a best value, with this recommended alternative falling somewhere on the PSDM.

The outcome of the BCA will be an integrated support strategy which will fall somewhere on the Product Support Decision Matrix (PSDM) shown in Figure 2. Note that this matrix shows the continuum between component and system-centric strategies and government and commercial capability-based strategies. As mentioned earlier, virtually every product support strategy is comprised of both government and commercial product support. Finding the right blend of both public and private support while simultaneously determining the level (component, subsystem, system) of support, and tailoring that support to the objective system dependent on its life cycle phase, mission, operational environment, and funding requirements is a complex process. While the PSDM shows nine discrete support strategy "blocks," in reality there are variations within each of those blocks, resulting in a continuum of product support alternatives. This means the PSM should look at selected strategies from the perspective of what is required for *their* system with regard to determining the appropriate mix of support sources required to achieve Warfighter requirements at a best value.

Figure 10 shows how an airplane Sustainment BCA might recommend the best value alternative for the Sustaining Engineering, Supply Support, and Maintenance and Maintenance Planning IPS elements. Similar PSDMs would show the best value strategy for each of the remaining IPS elements. In this example, Sustaining Engineering would be performed on a subsystem basis with a dedicated team of government and commercial engineers. Supply Support would similarly have a partnership to support engines with government and commercial personnel. Conversely, the Supply Support strategy for the plane that is independent of the engine is to use capabilities that are predominately held by a commercial entity with only minimal government involvement to manage the airframe PSI. Finally, Maintenance and Maintenance Planning would have a partnership with roughly equal government and commercial capabilities providing Depot level maintenance services at the system level with Organizational level maintenance performed by organic personnel.

4.2.5.2. Determine Support Method

Determine whether support will be acquired from the Product Support Integrators or Product Support Providers using an outcome- or transactional based acquisition method. Decision(s) are validated or made using a best value analysis consistent with the BCA.

A PSM does not perform product support; he or she is rather the architect of that support, conducting a considered analysis leading to a decision as to where, how, and by whom that support will be accomplished. Once they have selected the providers of product support, they must decide how that support is to be acquired. There are ultimately only two options available to them (with some variations between these two options). They can either acquire the discrete goods and services necessary to enable the required Warfighter outcomes, or they can acquire the outcomes themselves. The former is the "transactional" support model, and the latter is the "performance based" (or outcome based) model. DoD policy and guidance specifies a preference for the performance based model wherever possible. In using the transactional model, the PSM and the organic support corpus must determine the quantities, timing, and locations where the unit-purchased goods and services must be delivered or accomplished–a demanding and complex task. If the support purchased proves to be inadequate (or too much) the risk for performance, cost, and obsolescence, along with storage, maintenance, and distribution lies entirely with the organic acquirer of support. In the performance- or outcome based model, there is a shared risk equation. The PSM, in assigning responsibility for outcomes to a PSI (who accomplishes them through management of subordinate PSPs), is responsible for specifying and incentivizing the appropriate outcomes. If those have been specified correctly, the responsibility for delivering them is shared between the PSM and the PSI. The method of support, transactional or performance based, does not alter the basic functions or tasks that comprise the support, only in how that support is acquired. The PSM retains the overall role of and accountability for managing product support on behalf of the Warfighter.

4.2.5.3. Designate Product Support Integrator(s) (PSI)

For outcome based support, identify the Product Support Integrator(s) who will be delegated the responsibility to integrate support providers to deliver the specified outcomes assigned consistent with the scope of their delegated responsibility. Decision(s) are validated or made using a best value analysis consistent with the BCA.

A fundamental tenet of the product support business model is identifying single-point accountability for support. That responsibility belongs to the PSM, who delegates, as supported by the BCA, responsibility for one or more components of support to one or more PSIs who are responsible for integrating their sources of support, public and private, to meet the identified performance outcomes. The PM or PSM selects a PSI from the Government or private sector to coordinate the work and business relationships necessary to satisfy the product support arrangement.

The PM's responsibilities for oversight and management of the product support function are typically delegated to the PSM, who leads the development and implementation of the product support strategies and ensures achievement of desired support outcomes during sustainment. The

PM/PSM and the Product Support Management IPT employ a PSI, or a number of PSIs as appropriate, to achieve those outcomes. The PSI is an entity performing as a formally bound agent (e.g., Performance Based Agreement (PBA), contract, Memorandum of Agreement (MOA), Memorandum of Understanding (MOU), Service Level Agreement (SLA), etc.). charged with integrating all sources of support, public and private, defined within the scope of the product support arrangements to achieve the documented outcomes. The product support manager, while remaining accountable for system performance, effectively delegates the responsibility for delivering Warfighter outcomes to the PSI. In this relationship, and consistent with outcome based product support, the PSI has considerable flexibility and latitude in **how** the necessary support is provided, so long as the outcomes are accomplished.

Given the stated preference (by policy and statute) for outcome or performance based acquisition of product support services, an effective product support strategy will generally require designation of one or more Product Support Integrators who will be responsible, within the scope of their assigned product support outcomes, for managing and integrating the functions and Product Support Providers necessary to achieve the specified performance and/or support outcomes designated by the PSM. Note that there are circumstances when transactional support is a correct support solution and may be evaluated as an alternative. In all cases, the PSM is accountable to the PM for the support outcome.

The role of the PSI can be narrow or broad, as directed and designed by the PSM. At one end of the spectrum, a single PSI could be assigned with the responsibility for entire system level outcomes (e.g., Operational Availability, Materiel Availability). This approach has the advantages of clearly assigning responsibility (and visibility) of Warfighter outcomes to a single-point of responsibility and provides for a comprehensive and horizontally integrated support solution that accounts for all the product support elements. Alternately, the PSM can assign top-level PSI roles for the major system subsystems; the most prevalent example would be dual PSIs for an aircraft system, with a PSI designed for the airframe and a PSI designated for the propulsion system. Devolving further, PSIs could be assigned for multiple major subsystems that comprise a larger platform system capability, such as a naval vessel. The determination of the number, designation, and responsibilities of the PSIs comprising a product support strategy framework will result from both the BCA process as well as the PSM's consideration of the operational mission role, environment, and support requirements of the objective system.

The PM or PSM selects a PSI from DoD or the private sector. Activities coordinated by support integrators can include, as appropriate, functions provided by organic organizations, private sector providers, or partnership(s) between organic and private sector providers. The PSM ensures that the product support concept is integrated across the IPSEs to provide an agile, robust, and cost-effective combat capability. The PM/PSM invites the Service and DLA logistics activities to participate in product support strategy development and IPTs. These participants help to ensure effective integration of system oriented approaches with commodity oriented approaches (common support approaches), optimize support to users, and maximize total logistics system value.

As with the product support strategy and the arrangement with the Warfighter, the PSI function is a key component of the product support strategy documented in the acquisition strategy and

the Life Cycle Sustainment Plan (LCSP). While product support execution is accomplished by numerous organizational entities (also called Product Support Providers or PSPs), the PSI is the single point of accountability for integrating all sources of support necessary to meet the agreed to support/performance metrics. The most likely candidates for the integrator role are:

- The system's original equipment manufacturer or prime contractor;
- An organic agency, product, or logistics command (e.g., DLA, Naval Inventory Control Point (NAVICP), depots);
- A third-party logistics integrator from the private sector; and
- The PM's own logistics organization.

Once the PM has answered some key questions, he or she is better able to evaluate the PSI options and select the alternative that provides the greatest benefits. Typical questions the PM may want to answer are:

- What sustainment functions are planned to be included in this product strategy?
- What specific capabilities are required to perform these functions?
- Are these functions inherently Governmental?
- Are there statutory or regulatory limitations associated with performance of these functions?
- Are the desired functions more commonly performed in the commercial sector?
- Which provider offers the optimal mix of required performance at the lowest LCC (also frequently referred to as best value)?

Anyone who provides products or services in the sustainment of an acquisition system is a PSP. The primary role of the PSI is to integrate the activities of the various PSPs. The PSI function can be aligned along vertical (weapons system platform) or horizontal (at the sub-system, commodity, or component level) axes. The primary difference in the two approaches is whether or not the PSI is assigned the responsibility of implementing and managing the support functions from the top down (a weapons system platform approach), or implements support incrementally across a range of subsystems, etc., that may support multiple platforms.

4.2.5.4. Identify Product Support Provider(s) (PSP)

Utilizing BCA value analysis as well as PSI discretionary decisions for lower tied supplier support, select the best mix and blend of sources to perform the ***product support functions.*** *Decision(s) are validated or made using a best value analysis consistent with the BCA.*

A primary objective of the BCA process is to determine, for the individual IPS elements and, in aggregate, the objective system, the optimum sources of support depending on capabilities, competencies, best value, and the qualitative efficiency and effectiveness of support. For each of the IPS elements there will be logical candidates, both public and private, to accomplish the required product support. And within each of those IPS element support functions the work will further delineate into technical, hands-on, management, and quality tasks. DoD guidance expresses a clear preference for performance based support, unless there is compelling financial,

statutory, or other factors compelling pursuit of a transactional approach. The PSM may elect to assign support integration responsibilities to one or more Product Support Integrators who will be assigned specified performance or support outcomes and, consistent with that assignment, given authority to manage the Product Support Providers and functions necessary to achieve those outcomes. The "mix" of PSIs, and PSPs may be government or commercial, as determined by the BCA process. The use of a performance based support strategy can simplify the complex process of configuring the broad range of sustainment functions and support providers so as to optimize achievement of required Warfighter capabilities.

The most likely candidates for the PSP roles include:

- The system's original equipment manufacturer or prime contractor;
- Commercial sector suppliers, vendors, subcontractors, support contractors, etc. ;
- An organic agency, product, logistics command or materiel (e.g., DLA, Naval Inventory Control Point (NAVICP), depots, USTRANSCOM);
- Commercial sector logistics, maintenance, repair, overhaul (MRO), and transportation organizations; and
- The PM's own logistics organization.

4.2.6. Identify/Refine Financial Enablers

Identify the range, types, and amount of funding needed to perform the required support consistent with the terms, conditions, and objectives of the Product Support Arrangements.

Once the product support strategy "framework" has been finalized to show the range and responsibilities of the PSIs and PSPs and the enabling Product Support Arrangements have been drafted, the PSM should work the financial aspect of assuring that appropriate levels and types of funding are resourced to successfully execute the strategy. The amounts and types of funding required will be driven by the unique needs and characteristics of the system and its operational priorities. As discussed in Section 3.8 of this guide, product support can be accomplished by various funding appropriations throughout the life cycle, including Procurement, RDT&E, and Operations and Maintenance.

The PSM should plan and advocate for sufficient funding from the organizations to which those funds have been appropriated. This can involve actions ranging from ensuring that an adequate budget projection, commonly referred to as a "wedge," is inserted into the Planning, Programming, Budget, and Execution (PPBE) process sufficient to effect transition of a development system to operational use with sufficient funds for support, including Procurement and RDT&E funds for known required modifications and upgrades necessary for effective sustainment of the system. Once the funds have been appropriated, the PSM should ensure the funds are made available as needed to fund the support as defined in the Product Support Arrangements. While the Warfighter advocates for the required funding, the PSM has a clear management and oversight role of the funds used for product support. The PSM should request the full amount of funding needed and provide impact statements to the Warfighter, PM, and

program sponsor explaining the impact of the reduced support that resulting from incomplete funding.

4.2.7. Establish/Refine Product Support Arrangements

Document the implementing Product Support Arrangements (contract, MOA, MOU, PBA, CSA, SOO/SOW for the Performance Work Statement, etc.) that assign and delineate the roles, responsibilities, resourcing, and reciprocal aspects of product support business relationships.

Product Support Arrangements, discussed in detail in Section 2.2 and *Appendix F – Product Support Arrangement (PSA) Types* of this guide serve to formalize the roles, responsibilities, relationships, and commitments of the active participants in the product support strategy, including, at minimum, the PM, PSM, Warfighter customer, resourcing Commands, PSIs, PSPs, and associated stakeholders or participants in product support. Product Support Arrangements may take a variety of forms, including Memoranda of Understanding (MOUs), Memoranda of Agreement (MOAs), Product Support Agreements (PSAs), and contracts, or a combination of any or all of these. The PSM should ensure that PSAs are in place to document and define each relationship that is part of the execution of the product support strategy. These PSAs should exactly reflect the price and performance agreements used in source selection and include agreed on mechanisms to demonstrate achievement of outcomes. The PSAs should ensure the PSM's plan will be executed in a manner agreeable to both the PSI and the PSM.

4.2.8. Implement and Assess

Implement and manage the product support, including documenting updates to the Life Cycle Sustainment Plan (LCSP), conducting and implementing recommendations from Logistics Assessments (LA), and maturing the Sustainment Maturity Level (SML). Include the continuous, ongoing assessment of Product Support effectiveness through using the established governance mechanisms driving decisions and actions to review, modify, revise, or evolve product support strategies and business arrangements.

The PSM's oversight role includes developing the performance assessment plan, monitoring performance, and revising the LCSP and Product Support Package as needed. The PM also acts as the agent for the Warfighter, certifying PSI performance and approving incentive allocations. The PSM should take a hands-on approach and not assume that the PSAs will be self-regulating.

Programs are required to conduct periodic post-IOC assessments of system support strategies to determine actual versus expected levels of performance and support.[18] These reviews occur nominally every five years after IOC or when precipitated by changes in requirements/design or by performance problems. These reviews should at a minimum assess:

[18]Public Law 111-84, Section 805 of the 2010 National Defense Authorization Act; Requirements for Lifecycle Management and Product Support

- PSI performance
- Product improvements incorporated
- Configuration control
- Modification of PSAs as needed based on changing Warfighter requirements or system design changes
- Plans for conducting product support BCA(s)
- Revalidation or re-accomplishment of support strategy BCA(s)
- Affordability and cost control of current product support strategy

The PSM should review each PSI's performance against its PSA on at least a quarterly basis and use that data to prepare for the post-IOC assessments.

5. Sustainment in the Life Cycle Phases

5.1. Introduction

This section is oriented around the major phases of a program's life cycle and the activities and deliverables associated with each phase and start with the Warfighter and sustainment stakeholders developing sustainment requirements. The PSM then develops a strategy and plans to fulfill these requirements. These strategies and plans address each of the IPS elements and will change over time. This change over time is represented by the SMLs, which describe the expected level of maturity and summarize key documents and capabilities of the sustainment program at a given point in the weapon system life cycle. Execution of these plans and strategies result in associated costs that also vary across the life cycle. Finally, execution of these plans and strategies also result in Warfighter-desired support outcomes. This process is shown in Figure 11.

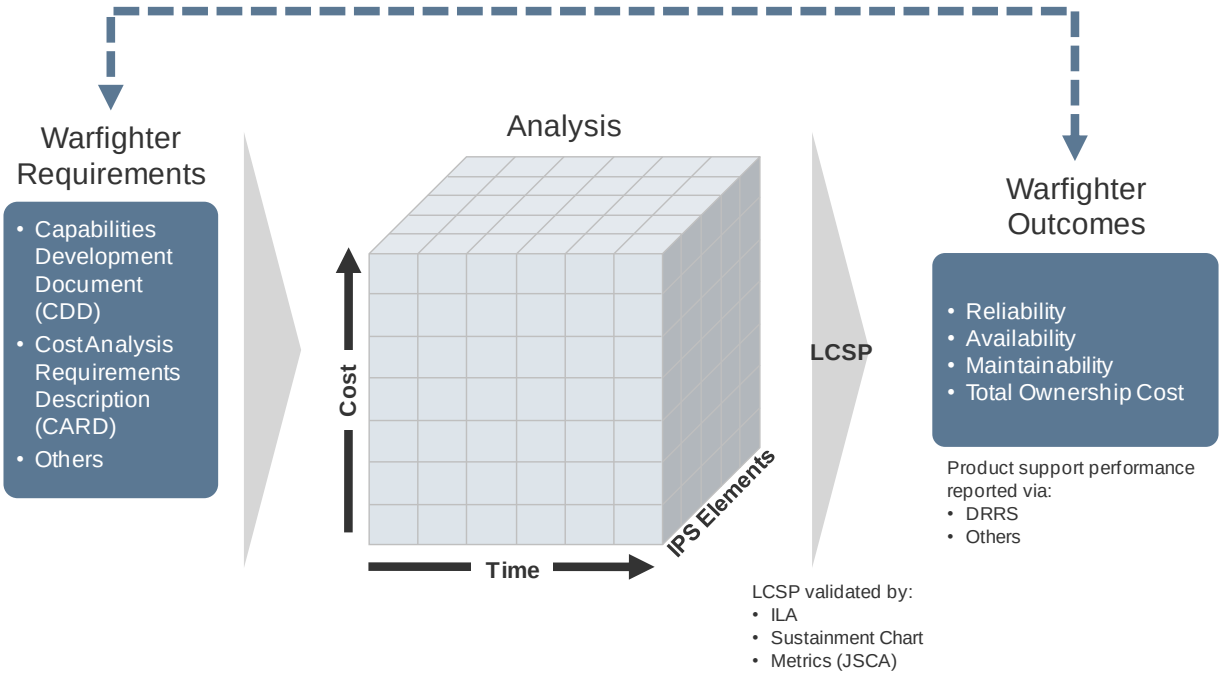


Figure 11. A successful outcome based product support strategy uses structured analysis to convert Warfighter requirements into product support outcomes.

An integrated view linking these various program events with a PSM focus is detailed in

Table 1.

Phases and Milestones	Program Inception	Materiel Solution Analysis	MS A	Technology Development	MS B	Engineering & Manufacturing Development	MS C	Production and Deployment	IOC
		SMLs 1-4		SMLs 5-6		SMLs 7-8		SMLs 9-10	
Key Events, Entry/Exit Products/Documents	ICD	AoA	ICD, LCSP, BCA, SEP, DMS	PDR, ILA	APB, CDD, CLA, AS, BCA, LCSP, TEMP, DMS, SEP	CDR, T&E, Log Demo, ILA	APB, CDA, CPD, AS, DSOR, LCSP, TEMP, IUID Plan, CPCP, DMS, TC, MR, Depot Maint Support Plan, Disposal Plan, PBAs, BCA, SEP, Non-Organic Support Transition Plan	LRIP, TPF, PPP, FRP, OT&E, ILA, IOC	Mission Support Plan, PPSP, BCA, MR Approval, Materiel Fielding Plan Disposal Plan
Integrated Product Support Elements									
Product Support Management	See Section 5.2 for Specific Activities and Exit Documents & Products			See Section 5.3 for Specific Activities and Exit Documents & Products		See Section 5.4 for Specific Activities and Exit Documents & Products		See Section 5.5 for Specific Activities and Exit Documents & Products	
Design Interface									
Sustaining Engineering									
Supply Support									
Maintenance Planning and Manage									
PHS&T									
Technical Data									
Support Equipment									
Training & Training Support									
Manpower & Personnel									
Facilities and Infrastructure									
Computer Resources									

Table 1. The remainder of this guidebook is broken up by life cycle phase and relevant milestones to provide time-phased "how-to" guidance.

The above integrated view will be sub-divided in each of the future life cycle sections, namely the Materiel Solution Analysis, Technology Development, Engineering and Manufacturing,

Production and Deployment, and Operations and Support phases. These life cycle sections will have the following elements:

- The program life cycle phase overview with key events, SML considerations, and recurring major objectives;
- Entrance and exit documents for the life cycle phase; and
- PSM Guidance on specific activities within the life cycle phase.

Specific Product Support activities to be accomplished linking to the ILA are included in Appendix G – Using the Independent Logistics Assessment (ILA) Assessment Criteria as a Product Support Management Tool.

5.2. Materiel Solution Analysis (MSA) Phase

5.2.1. Overview

Unless this phase of the Acquisition process is being applied to a legacy system that is receiving a major modification, there will be little actual data and most estimations will be derived from analogous systems or engineering projections. Accordingly, the primary objective of this phase is ensuring user requirements and operational environmental constraints impacting sustainment are identified and documented in the LCSP.

The PSM team will execute the activities required in the Materiel Solution Analysis (MSA) phase to support the maturing support solution characterized by the sustainment maturity levels which are aligned with program key events in Table 2.

	Program Inception	Materiel Solution Analysis	MS A
		SMLs 1-4	
Key Events, Entry/Exit Products/Documents	ICD	AoA	ICD, LCSP, BCA, SEP, DMS
Integrated Product Support Elements			
Product Support Management		x	
Design Interface		x	
Sustaining Engineering			
Supply Support		x	
Maintenance Planning and Management		x	
PHS&T		x	
Technical Data		x	
Support Equipment		x	
Training & Training Support		x	
Manpower & Personnel		x	
Facilities and Infrastructure		x	
Computer Resources		x	

Table 2. Milestone A Activities and Documents

5.2.2. Sustainment Maturity Levels (SML) in the MSA Phase

SMLs 1-4 require that the Warfighter requirements and operational concepts be identified to ensure that they are understood and agreed on by all stakeholders. Note that this would normally be the responsibility of the PSM but that there may be a different entity performing this since the PSM might not yet be designated. The logistics and sustainment capabilities and potential maintenance concepts should be evaluated as part of the Analysis of Alternatives (AoA).

Boundary conditions for this phase should include the following:

- **Operational CONOPs**. Conduct a "Day in the life" use-case scenario to understand how the system might be supported in an operational environment
- **Integrated Product Support Elements**. Assess each IPS element and establish the initial baseline for each IPS element's implementation

SML 1-3 activities will use these boundary conditions while SML 4 activity focuses on how the program developmental efforts acknowledges and defines logistics and sustainment KPP/KSAs as considerations in the program integrated system requirements definition.

5.2.3. Key Documents

Entry Documents
Initial Capabilities Document
Analysis of Alternatives Plan
Alternative Maintenance & Sustainment Concept of Operations
Exit Documents
Analysis of Alternatives (including Market Research results)
Draft Capability Development Document
Technology Development Strategy
Test and Evaluation Strategy
Acquisition Strategy
SEP
Initial Life Cycle Sustainment Plan (LCSP)
Data Management Strategy
IUID Plan (Part of SEP)
Business Case Analysis (BCA)

Table 3. Materiel Solution Analysis Phase Key Documents[19]

[19] Terminology defined in Defense Acquisition Guidebook (DAG)

5.2.4. Major Activities

Enterprise Synergies, IPS Element Trades, and Key Relationships

The greatest flexibility in defining a product support strategy exists during this phase. The fundamental goal is aligning broad product support strategy requirements with the Warfighter's requirements. Also, no new system specific investments have been made in supporting the weapon system. Accordingly, PSMs have the least constraints during this phase and should actively search within and outside of their Service for existing solutions for each IPS element and understand the extent to which potentially shared solutions achieve performance and cost outcomes that are highly similar to their Warfighter customer's requirements. The beginning of a program's life cycle is the best time to promote standardized systems, components, spare parts and support equipment. PSMs should specifically look to their logistics directorates, their Secretariats, Office of the Assistant Secretary of Defense Logistics & Materiel Readiness, DLA, and industry associations to efficiently gain the broadest possible perspective on potential enterprise synergies.

Once potential high-performing outcome based strategies are identified, the PSM should analyze feasibility of migrating those synergies to their program and determine whether clarification and negotiation of changing requirements with the Warfighter are warranted.

IPS elements are still relatively unconstrained during this phase since their primary function is in helping define potential product support alternatives. Two broad areas are directly influenced by IPS element trades and relationships in this phase:

1. **Logistics Footprint**: Logistics footprint minimization in projecting and sustaining the force is an overarching DoD goal because minimizing the logistical burden a system will place on deployed forces benefits the user, improves deployment time, and can help reduce the LCC. During this phase, footprint metrics appropriate to the system and its operational environment should be analyzed and considered as subsequent KPP, KSA, or design requirements. At a minimum, logistics footprint metrics to meet the concept of operations should be established to be used in baseline trade analyses throughout the life cycle to help impact the design and establish a minimal logistics footprint for the system concept.
2. **System Design**: Address the system's design and planned logistics resources support its readiness requirements and wartime utilization. This includes consideration of activities and resources (such as fuel) necessary for system operation as well as real world constraints and environment. It also includes all resources that contribute to the overall support cost (e.g., personnel; equipment; technical support data; and maintenance procedures to facilitate the detection, isolation, and timely repair/replacement of system anomalies).

Business and Variance Analysis

Data in this phase may be minimal and uncertainty will be high. Regardless, the PSM must bound this uncertainty as much as possible by creating at least a high-level BCA that will be

updated as better data is obtained. The primary objective of analysis during this phase is to ensure complete Life Cycle Cost (LCC) will be captured and used to create fair comparisons between alternatives as potential sustainment strategies are developed. This means that key sustainment related cost performance criteria, such as site activation non-recurring costs and O&S cost per operating hour should be considered in implementing the Cost as an Independent Variable (CAIV) principle. Additionally, the PSM must ensure modeling and simulation is combined with LCC analysis in accordance with the BCA process to set the foundation of robust analysis of alternatives during the Technology Development Phase selection process and to define the desired ranges for the sustainment metrics thresholds and objectives.

Supply Chain Management

Supply chains in this phase are notional at best since supply support and maintenance concepts are not yet known. However, part of understanding potential enterprise synergies involves understanding potential supply chain synergies. For example, if the system will be an advanced attack helicopter, the cost and performance of a benchmark population of aviation systems should be examined to understand the demonstrated results of potential supply chain models. To that end, using JSCA or SCOR® to understand the plan, source, make and maintain, deliver, and return aspects of each supply chain examined while looking for enterprise synergies and provide a ready way to quantitatively and qualitatively compare potential alternatives is a good way to ensure all aspects of the supply chain are considered. A thorough review of currently fielded systems, components, spare parts, and support equipment should be conducted to encourage the highest degree of standardization and prevent unneeded development new supply chains.

LCSP and Product Support Package Initiation

The LCSP starts in this phase as the sustainment concept. Create the LCSP in accordance with the DAG. At this stage, the LCSP will capture initial support and maintenance concepts based on AOA results and requirements identified in initial CDD. Also, create a plan to collect additional information to refine the LCSP and fill in all placeholders. There are no Product Support Package updates at this point of the life cycle.

Funding Alignment

Funding during this phase is focused on ensuring any new sustainment technologies needed to achieve the requirements identified in the AOA are funded appropriately.

5.3. Technology Development Phase

5.3.1. Overview

The PSM's major objective in the Technology Development (TD) phase are ensuring the supportability design features achieve supportability KPP/KSAs' and are incorporated in the overall design specifications. Essential IPS element activities are developing the supply chain performance requirements, logistics risks and risk mitigation strategies, the maintenance concept and sustainment operational plan from the MSA documents, training strategies, support

equipment plans, technical data management and infrastructure, and manpower and personnel strategies.

The PSM team will execute the activities required to support the Technology Development Phase of the support solution characterized by the sustainment maturity levels which are aligned with program key events as seen in Table 4.

	Technology Development	MS B
	SMLs 5-6	
Key Events, Entry/Exit Products/Documents	PDR, ILA	APB, CDD, AS, LCSP, TEMP, DMS, SEP, BCA
Integrated Product Support Elements		
Product Support Management	x	
Design Interface	x	MAC
Sustaining Engineering	x	
Supply Support	x	
Maintenance Planning and Management	x	CLA
PHS&T	x	Transportability Report
Technical Data	x	
Support Equipment	x	
Training & Training Support	x	STRAP
Manpower & Personnel	x	
Facilities and Infrastructure	x	
Computer Resources	x	

Table 4. Milestone B Activities and Documents

5.3.2. Sustainment Maturity Levels in the TD Phase

SMLs 5-6 require that the initial system capabilities have been analyzed, initial supportability objectives and requirements have been defined, and initial Reliability, Availability, and Maintainability (RAM) management strategies have been formulated and integrated with the Systems Engineering process. Design features needed to achieve the product support strategy, including diagnostics and prognostics, should be incorporated into system performance specifications. The TEMP addresses when and how sustainment design features and sustainment metrics will be verified. The LCSP should be written and approved, to include supply chain performance requirements, manpower, information technology infrastructure, support equipment plans, logistics risks and mitigation plans, preliminary support strategies, and preliminary product support arrangement strategies.

PSMs measure success in this phase by the quality, as measured by the ILA process, with which the following boundary conditions develop and influence the design of both the system and its Product Support Package:

- **Operational CONOPs**. Expand the "Day in the Life" use-case scenarios developed previously to include sparing levels, fleet sizes, operator and maintainer training, operating locations, manpower, information technology infrastructure, support equipment plans, and operating tempos.
- **Approach to Design Influence to Achieve Support Strategy**. The maintenance and logistics support planning must be closely coordinated with the design iteration process to accurately reflect the needs of the design and its current configuration and conversely, to influence design formulation consistent with the product support strategies determined to be optimum from an operational effectiveness and life cycle cost viewpoint.
- **Life Cycle Phase Boundary Conditions for Product Support Elements. Asse**ss **each IPS element and establish the initial baseline for each IPS element's** implementation and use this to develop and establish the initial BCA framework and schedule.
- **PSM Organizational Construct and Integration into the Program Management Team**. Collaborate with PM and ensure the PMO contains a cross-IPS element and cross-organizational team to help manage product support with a focus on the requirements that were decided on in MS A and then integrating those requirements in systems engineering process.

5.3.3. Key Documents

Entry Documents:
Draft Capability Development Document (including sustainment technology issues)
Technology Development Strategy
Test and Evaluation Strategy
Initial Support & Maintenance Concepts
Support strategy
Data Management Strategy
Item Unique Identification (IUID) Plan
Exit Documents:
Analysis of Alternatives (including Market Research results)
System Performance Specification
Capability Development Document
Preliminary Design Review Results
Test and Evaluation Master Plan (TEMP)
Programmatic Environmental, Safety and Occupational Health Evaluation (PESHE)
Information Support Plan
Acquisition Strategy
Human Systems Integration (HSI)
Core Logistics Analysis/Source of Repair Analysis
MDA Approved Source of Repair Decision
Industrial Capabilities
Life Cycle Sustainment Plan
Life Cycle Cost Estimate and Manpower Estimate

Preliminary Maintenance Plans
Acquisition Program Baseline (APB)
Affordability Assessment (including DoD Component Cost Analysis & ICE)
Corrosion Prevention and Control Plan
Business Case Analysis (BCA)
Replaced System Sustainment Plan (RSSP)

Table 5. Technology Development Phase Key Documents[20]

5.3.4. Major Activities

Enterprise Synergies, IPS Element Trades, and Key Relationships

Data in this phase is more mature since laboratory generated data is more available and support concepts are more refined which allows for using better analogous data. This more mature data should be used to help crystallize those enterprise synergy opportunities that will be captured during the build-out of the product support organization.

The PSM should use the more mature data available in this phase to begin a robust logistics TEMP. This plan should rely on a Model Based Enterprise for sustainment planning to design the complete life cycle sustainment concept and all interrelating IPS elements. This will allow rapid systematic analysis of tradeoffs and understanding of relationships between those IPS elements via modeling and simulation.

The PSM should ensure that data collected and information generated use a standards-based Product Life Cycle Support data exchange to ensure that life cycle data can be used throughout the program by all system development and sustainment partners. The PSM should also ensure that all data and information is captured in a government accessible Integrated Data Environment (IDE). Additionally, the Data Management Strategy should include the technical data requirements for initial provisioning and cataloging. Further, depending on the product support strategy, and in order to enable competition and mitigate DMSMS and obsolescence, the requirement for detailed technical data necessary for re-manufacturing, re-procurement, and/or sustainment engineering should be addressed.

During this phase, the PSM should also create an initial baseline "map" of the desired product support organization that provides the concept of operations of how sustainment will be executed. This map should be based on initial analyses and will create a convenient way for the PSM to understand the interrelationships of all entities that form the product support organization.

Business and Variance Analysis

The PSM should use analysis to refine conceptual support strategies developed previously into an integrated preliminary product support strategy. The BCA process should be used to

[20] Terminology defined in Defense Acquisition Guidebook (DAG)

accomplish this with a focus on understanding the likelihood of alternatives achieving the Warfighter required outcomes resulting from the requirements development process. Part of the outcome of the BCA process should be a list of potential risks and mitigation plans associated with the preliminary support strategy for inclusion in the LCSP.

Supply Chain Management

Supply chain performance requirements to meet the required system performance and cost metrics should be determined through analysis done in support of the TEMP. Supply chain management enabling technologies such as usage of Service and Agency managed Enterprise Resource Planning (ERP) software or the requirements for stand-alone software should be determined. Additionally, decisions on basing requirements and site activation should be made. All decisions should be documented in the LCSP.

LCSP and Product Support Package Update

The LCSP is a living document and will be updated as sustainment strategies evolve. The initial LCSP, however, should be finalized and approved during this phase. The Product Support Package development strategy should be structured at this time to construct the PSAs needed to execute the LCSP.

Funding Alignment

Funding during this phase is, as with MSA, focused on ensuring investment account funding is provided to develop the system and that innovations that will reduce the LCC during sustainment are planned for and funded appropriately.

5.4. Engineering and Manufacturing Development (EMD) Phase

5.4.1. Overview

The PSM's objective in the Engineering and Manufacturing Development (EMD) phase is ensuring the program develops an integrated logistics system that meets readiness targets, sustains system performance capability threshold criteria, manages operating and support (O&S) costs, optimizes the logistics footprint, and complies with environmental and other logistics-related regulation.

The PSM team will execute the activities required to produce the solution characterized by the sustainment maturity levels which are aligned with program key events as defined in Table 6.

	Engineering & Manufacturing Development	MS C
	SMLs 7-8	
Key Events, Entry/Exit Products/Documents	CDR, T&E, Log Demo, ILA	APB, CDA, CPD, AS, DSOR, LCSP, TEMP, IUID Plan, CPCP, DMS, TC, MR, Depot Maint Support Plan, Disposal Plan, PBAs, BCA, SEP, Non-Organic Support Transition Plan
Integrated Product Support Elements		
Product Support Management	x	
Design Interface	x	
Sustaining Engineering	x	
Supply Support	x	Provisioning Data
Maintenance Planning and Management	x	CDA MAC
PHS&T	x	Transportability Report
Technical Data	x	Equipment Pubs
Support Equipment	x	
Training & Training Support	x	STRAP
Manpower & Personnel	x	BOIP
Facilities and Infrastructure	x	
Computer Resources	x	CR Management Plan

Table 6. Milestone C Activities and Documents

5.4.2. Sustainment Maturity Levels in the EMD Phase

SMLs 7-8 require that the Product Support Package element requirements are integrated, finalized, and reflect the approved system design and Product Support Strategy. Testing validates that the design conforms to support requirements and that the boundary conditions are operationally suitable. In addition, sustainment metrics are estimated based on the latest configuration and test results. The approved Product Support Package's capabilities, including associated supply chain and other logistics processes and products, are demonstrated and validated to ensure the support solution is operationally suitable and affordable.

5.4.3. Key Documents

Entry Documents:
Analysis of Alternatives (including Market Research results)
System Performance Specification
Capability Development Document
Preliminary Design Review Results
Test and Evaluation Master Plan (TEMP)
Programmatic Environmental, Safety and Occupational Health Evaluation (PESHE)
Information Support Plan
Acquisition Strategy
Human Systems Integration (HSI)
Cooperative Opportunities
Core Logistics Analysis/Source of Repair Analysis
Industrial Capabilities
Life Cycle Sustainment Plan
Life Cycle Cost Estimate and Manpower Estimate
Preliminary Maintenance Plans
Acquisition Program Baseline (APB)
Affordability Assessment (including DoD Component Cost Analysis & ICE)
Corrosion Prevention and Control Plan
Exit Documents:
Initial Product Baseline
Test Reports
PESHE
Acquisition Strategy
Human Systems Integration (HSI)
TEMP
Information Support Plan (ISP)
Life Cycle Sustainment Plan
Updated Maintenance Plan
Updated Affordability Assessment
Corrosion Prevention and Control Plan
CPD input
Cost/Manpower Estimate update
Business Case Analysis (BCA)
Replaced System Sustainment Plan (RSSP)
Logistics Funding Requirements in POM
Depot Activation Plan

Table 7. Engineering and Manufacturing Development Phase Key Documents[21]

[21] Terminology defined in Defense Acquisition Guidebook (DAG)

5.4.4. Major Activities

Enterprise Synergies, IPS Element Trades, and Key Relationships

The product support organization is solidifying during this phase. Initially there is some flexibility, but through much analysis and negotiating of PSAs, that flexibility is replaced by a tangible product support organization. Synergies that should be captured during this phase will be identified through the BCA process. These synergies are located primarily within designing the supply chain and include opportunities such as using preexisting contracts with commercial industry partners to gain economies of scale in the procurement of goods and services, expanding capabilities within those Centers of Industrial and Technical Excellence (CITEs), and maximizing the use of common DoD distribution processes via the Distribution Process Owner (DPO).

During this phase, supportability design features are mature enough to be incorporated into the design within the budget and schedule as are other design constraints such as weight, size, and bandwidth. Also, the product support organization should be matured to support IOC. Accordingly, IPS element trades are made as part of ongoing negotiations between Warfighters and sustainers to finalize PSA requirements for PSIs and PSPs. The PSM should update the baseline product support organization "map" that addresses each IPS element with the entities, required service levels, PSAs, information channels, and any other pertinent information.

Business and Variance Analysis

Data is more mature during this phase than in previous phases since the system prototypes will be in operation. This means that there will be much less reliance on analogous data and rules of thumb and more engineering analysis. Since there is less uncertainty, the BCA produced is used to actually develop the PSAs and make the investment decisions that will be major components of the Product Support Package.

Product support models that are used for inventory planning, manpower planning, training planning, and all other IPS elements should be updated with actual data as it becomes available. Variance between actual data and estimations created during previous analyses should be examined to validate or influence the selection of new product support decision tools.

Supply Chain Management

The supply chain design is finalized based on the product support strategies selected. Every aspect of the supply chain should drive to achieve the Warfighter required performance and cost metrics and should have in place mechanisms to automatically and electronically share data and information between all Services, Agencies, and commercial entities that help manage and comprise the supply chain. Strong consideration should be made toward establishing long-term relationships that effectively use competitive pressures to deliver reliable performance at affordable costs rather than competing simply to drive cost down without regard to increasing the variability in performance experienced by the Warfighter.

Based on the outputs of the business case analysis and in alignment with the approved product support strategies, initial provisioning decisions should consider innovative strategies such as Direct Vendor Delivery (DVD), prime vendor, consignment, or leased reparables strategies in addition to Government owned inventory. When PBL arrangements utilize commercial sources, the PSM should work with the ICP/DLA on smartly drawing down existing government inventory and adjusting inventory levels and forecasting to meet changes in demand. Data collection channels to capture Failure Mode and Effects Analysis data for improving material reliability should be validated. This will help the PSM reduce the learning curve so that reliability improvements can be made earlier in the life of the system.

LCSP Product Support Package Update

The LCSP continues to mature in this phase, and the boundary conditions are implemented into the operational test environment. Resource requirements are driven by the boundary conditions and the specific Service approach to deploying and operating the system. Resource requirements for the production and deployment phase are determined and agreed on via collaboration between the program management team and external stakeholders.

The LCSP should be updated with the final "map" of the product support organization. The product support strategies determined through the BCA process and approved by the ultimate decision makers should be recorded in the LCSP. Also, the Product Support Package that implements the LCSP should be adjusted to contain the formal PSAs that document the PSIs and PSPs.

Funding Alignment

Resource requirements are driven by the projected fielded design, likely Product Support Package performance based on test results, and the specific Service approach to deploying and operating the system. Resource requirements for the production and deployment phase are determined and agreed on via collaboration between the program management team and external stakeholders.

The Product Support Package fielding resources requirements must be in place entering into the Milestone C decision taking into account the total requirements including the:

Service System Basing Decisions/Site Activation Capital Investment Decisions: PSMs should analyze where and when operating locations will be stood up to enable IPS element finalization to support IOC.

Spares Capital Investment Decision: Finalize initial provisioning requirements such that those requirements directly support the best value outcome based product support strategy that will be supporting the system.

Training System and Devices Capital Investment Decision: Determine operator and maintainer student throughput requirements and training device reliability requirements needed to support Service IOC requirements.

Information Infrastructure Capital Investment Decision: Determine computer hardware and software requirements for implementing the program into the Service and DoD IT infrastructures.

Industrial Base Capital Investment Decision: Conduct BCAs to determine facilities, equipment, depot locations to support program operations in the time frame up to Service IOC declaration is determined.

Industry Partnership Strategy: Finalize PSAs to support the LCSP.

5.5. Production and Deployment (P&D) Phase

5.5.1. Overview

The PSM's primary objectives in the Production and Deployment (P&D) phase are to execute the LCSP well and to constantly monitor that execution to rapidly adjust the LCSP as operational realities are discovered. The PSM team will execute the activities required to support of the support solution characterized by the sustainment maturity levels which are aligned with program key events as detailed in Table 8.

	Production and Deployment	IOC
	SMLs 9-10	
Key Events, Entry/Exit Products/Documents	LRIP, TPF, PPP, FRP, OT&E, ILA	Mission Support Plan, PPSP, BCA, MR Approval, Materiel Fielding Plan Disposal Plan
Integrated Product Support Elements		
Product Support Management	x	BCA, Post-IOC Rev
Design Interface	x	
Sustaining Engineering	x	
Supply Support	x	DMSMS Plan
Maintenance Planning and Management	x	
PHS&T	x	
Technical Data	x	Equipment Pubs
Support Equipment	x	
Training & Training Support	x	Training Program of Instruction
Manpower & Personnel	x	Trained Personnel
Facilities and Infrastructure	x	Depot Maintenance Capability
Computer Resources	x	PD SW Support

Table 8. Initial Operating Capability Activities and Documents

5.5.2. Sustainment Maturity Levels in the P&D Phase

SMLs 9-10 require that the Product Support Package is fielded to support initial operating capability. The Product Support Package is fielded at operational sites and sustainment and product support capabilities proven in an operational environment. Performance is measured against availability, reliability and cost metrics. Any identified issues or "weak spots" identified through testing have remediation plans that are being executed. Finally, the product support organization is measured against its ability to meet planned Materiel Availability, Materiel Reliability, Ownership Cost and other sustainment metrics required to support the Warfighter.

In this phase, resource requirements for the boundary conditions are funded and implemented by the Services. Critical activities the PSM must execute that will drive results are:

Service Capital Investment Follow-up.

Complete essential activities such as Site Activation Gap Closure, sparing strategy execution, Diminishing Manufacturing Sources and Material Shortages (DMSMS) management strategy execution, Training Concurrency Options, Information Architecture Maturation Plan, and Maintenance, Repair, and Overhaul (MRO) solution development.

Supplier Reliability Performance.

Monitor and manage effectiveness of the product support organization at accomplishing required outcomes.

5.5.3. Key Documents

Entry Documents
Initial Product Baseline
Test Reports
PESHE
Acquisition Strategy
Human Systems Integration (HSI)
TEMP
Information Support Plan (ISP)
Life Cycle Sustainment Plan
Updated Maintenance Plan
Updated Affordability Assessment
Corrosion Prevention and Control Plan
CPD input
Cost/Manpower Estimate update
Exit Documents
LCSP/Supportability Assessment Strategy/Post Production Support Plan
Business Case Analysis (BCA)
Product Support Arrangements (ICS, CLS, Organic, Performance based)
Post Production Software Support Plan/Contract

Acquisition Strategy & Data Management Strategy
Materiel Release Approval & Materiel Fielding Plan
Diminishing Manufacturing Sources and Materiel Shortage Plan
Depot Maintenance Support Plan
Configuration Management Plan
Replaced System Sustainment Plan (RSSP)

Table 9. Initial Operating Capability Key Documents[22]

5.5.4. Major Activities

Enterprise Synergies, IPS Element Trades, and Key Relationships

PSMs should focus on monitoring product support developments within their own and others' parent organizations to capture emerging best practices or high performing shared services for their own use. This is important because the LCSP is relatively mature in this phase and support strategies are only going to be modified when there is a compelling reason to do so.

IPS element trades and key relationships are relatively unchanged from the previous phase, but the PSM's understanding of those relationships may evolve as actual data is collected. Any observed changes should be reflected in the product support organization "map."

Business and Variance Analysis

Analysis in this phase focuses on monitoring and identifying the root cause of variance between planned and actual cost and performance. Ongoing analysis of each IPS element's achievement of required performance objectives, including variance between predicted and actual results, may indicate that IPS element implementation strategies should be modified to some extent. Any modifications must be analyzed prior to implementation to maximize their likelihood of success.

The PSM should use a program management dashboard or other similar toolset that employs such tools as statistical process control charts or instantaneous performance meters to provide ongoing indication of program health. Moreover, the PSM should look specifically for leading indicators that will help the PSM identify and mitigate potential product support issues before they happen.

Supply Chain Management

Supply chain performance should be closely monitored during this phase since this is the first real "stress test" the supply chain has faced. Any improvement opportunities identified will be easier to address before the behaviors and practices that created those improvement opportunities are part of the product support organization's culture.

[22] Terminology defined in Defense Acquisition Guidebook (DAG)

This phase will also see a strong reliance on using the production supply chain to support sustainment. The PSM should ensure that measures are in place that ensure the easy access to parts that are earmarked for production do not encourage complacency with supply chain managers who see that access as a ready source of spares; otherwise, the supply chain will have a tendency to default to a spares-centric strategy regardless of the LCSP. Furthermore, relying on a production supply chain risks putting undue stress on the production organization and may have cost implications.

Finally, if the product support strategy requires contractors in a battlefield environment, ensure the execution of this strategy is in accordance with Joint Publication 4-0 Chapter 5 and DoD Component implementing guidance. The PSM should coordinate supply chain services to ensure affected Combatant Commanders are aware of functions performed by contractors, together with functions performed by military personnel, and government civilians, are integrated in operations plans (OPLANs) and orders (OPORDs).

LCSP and Product Support Package Update

During this Phase, the Product Support Package implementing the approved LCSP is in place. The PSM will use continuous data collection to validate that performance and cost accrual is according to plan. If the business analysis indicates a change in the LCSP is required, the PSM must update the LCSP and modify the Product Support Package as needed.

Funding Alignment

During this phase, some sustainment may be paid for with procurement dollars, but the PSM must remain vigilant to ensure O&M dollars are being programmed to ensure product support plans are executable. The PSM should work with the PM and Program Executive Office (PEO) to align Service or Joint funding to support the system.

5.6. Operations and Support (O&S) Phase

5.6.1. Overview

The O&S phase of the defense system framework represents the longest duration period of the weapon system life cycle and constitutes the largest portion of weapon system life cycle cost (approximately 60–70%). As the single largest component of the DoD budget, the impact of the O&S phase on life cycle cost is enormous.

O&S begins when an operational capability has been fielded. This generally occurs at the IOC milestone, but depending on fielding strategies, may occur earlier. Sustainment of the weapon system begins prior to IOC as early production assets are delivered for Test and Evaluation, Low Rate Initial Production, and/or other pre-operational uses. This “pre-operational” support is usually performed primarily by the Original Equipment Manufacturer (OEM) under an Interim Contractor Support (ICS) arrangement due to lack of an organic infrastructure (depot support capability must be in place no later than four years following IOC for systems determined to be “core” IAW 10 USC § 2464, para (a) (3)). Active analysis, planning, and continuous refinement of the long term product support strategy that is guided by the PSM should be underway.

At IOC, 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. Each change requires an evaluation of the product support strategy via the BCA process.

PSMs must revalidate their program's support strategy and ensure that it still strikes an optimal balance between suitability and affordability. Legislation requires revalidated business case analysis whenever a new support strategy is proposed, or every five years, whichever comes first.[23] PSMs must continually monitor and assess their programs to understand their sustainment strategies' suitability and determine when strategy updates are required, particularly in light of how operating conditions and baseline assumptions change over the system life cycle. Although the PSM will not be the decision authority making the final disposition decision, he or she must also recognize when the system has reached the end of its planned useful life to determine life extension or disposal plans. The PSM will, however, play a key role in providing input to the status of the system during O&S.

PSM tasks in the O&S phase differ from those during design or development. During design and development, the PSM is planning for sustainment. During O&S, the PSM is executing sustainment while continuously monitoring the performance of the system and assessing the effectiveness and affordability of the product support strategy. With the system in operational use, actual data is available as a basis for analysis and product support decision making. Operational issues, system reliability, demand rates, response-times, funding requirements, and product support provider performance are visible and must be addressed as needed. Incremental development of systems may precipitate the requirement to support multiple configurations or blocks of a weapon system.

As the system ages and evolves, the PSM role also evolves. Out-of-production systems have an entrenched sustainment infrastructure in place and are typically suffering from declining performance and rising sustainment costs due to diminishing reliability as parts and components wear out or are impacted by obsolescence and DMSMS. It is difficult for the PSM to do a considered assessment and revision of the product support strategy in the face of significant day-to-day challenges to maintain operational readiness. The path of least resistance is often stop gap measures addressing evolving critical items, finding needed spares, and juggling shifting priorities, with little time available to analyze and revise the product support strategy. Yet unless the PSM takes a proactive action to accomplish this critical action, the "death spiral" of declining performance and rising O&S cost will only worsen. These many challenges must be successfully navigated by the PSM during the O&S phase to properly support the Warfighter.

[23] Public Law 111-84, Section 805 of the 2010 National Defense Authorization Act

	Operations & Support	FOC
	SMLs 11-12	
Key Events, Entry/Exit Products/Documents	Post-IOC Review, ILA, CDA	Mission Support Plan, PPSP, BCA, MR Approval, Materiel Fielding Plan Disposal Plan
Integrated Product Support Elements		
Product Support Management	X	BCA, Post-IOC Rev
Design Interface	X	
Sustaining Engineering	X	
Supply Support	X	DMSMS Plan
Maintenance Planning and Management	X	
PHS&T	X	
Technical Data	X	Equipment Pubs
Support Equipment	X	
Training & Training Support	X	Training Program of Instruction
Manpower & Personnel	X	Trained Personnel
Facilities and Infrastructure	X	Depot Maintenance Capability
Computer Resources	X	PD SW Support

Table 10. Operations and Support Activities and Documents

5.6.2. Sustainment Maturity Levels in the O&S Phase

SMLs 11-12 require that sustainment and product support performance be regularly measured against sustainment metrics and that corrective actions have been taken. The Product Support Package has been refined and adjusted based on performance and evolving operational needs and initiatives to implement affordable system operational effectiveness have been implemented. All support systems and services have been delivered and depot maintenance is being performed in accordance with the LCSP.

Moreover, analysis has revealed opportunities for product improvement, modifications, and upgrades and these changes have been planned. The product support strategy has been refined to achieve Warfighter-required outcomes by leveraging the best value mix of organic and commercial support for each of the IPS elements. Finally, system retirement and disposal planning has been implemented as required.

If the program uses the tenets of this guidebook throughout the acquisition process, challenges in the O&S phase should be minimized due to the advanced planning inherent in the LCSP management process. Although still applicable, PSMs may be limited in their ability to apply all

the tenets of this guidebook to a program that has already been fielded. The PSM can still work with the existing support solution to ensure product support success and evolve it over time to optimize performance.

5.6.3. Key Documents

Entry Documents:
LCSP/Supportability Assessment Strategy/Post Production Support Plan
Business Case Analysis (BCA)
Product Support Arrangements (ICS, CLS, Organic, Performance based)
Post Production Software Support Plan/Contract
Acquisition Strategy & Data Management Strategy
Materiel Release Approval & Materiel Fielding Plan
Diminishing Manufacturing Sources and Materiel Shortage Plan
Depot Maintenance Support Plan
Configuration Management Plan
Exit Documents/Activities:
Disposal Implementation Plan
Replaced System Sustainment Plan (RSSP)

Table 11. Operations and Support Key Documents[24]

If an entrance document does not exist, the information contained within it must be accounted for by formally identifying the documents that contain the entrance document identification.

5.6.4. Major Activities

Enterprise Synergies, IPS Element Trades, and Key Relationships

PSMs should focus on monitoring product support developments within their own and others' parent organizations to capture emerging best practices or high-performing shared services for their own use. The LCSP is mature in this phase and support strategies are only going to be modified when there is a compelling reason such as large cost-savings opportunities that are obtainable through change or difficulty in hitting required performance targets that would necessitate change.

One synergy that is predominately achieved during O&S is Technology Insertion (TI), which is a process for strategically improving system capability or reliability or mitigating Diminishing

[24] Terminology defined in Defense Acquisition Guidebook (DAG)

Manufacturing Sources/Material Shortage issues via modernization. The PSM must understand the opportunity and risk relative to TI. Affordability gains are tied to scalability of TI over time and ease of inserting new technology. TI initiatives are planned to reflect a strategy for long-term affordability, supportability, performance and availability. Success is more likely when TI is addressed at the architecture level. The use of standards, modular design and open systems approach enables TI in the future. Although TI planning is successful at the system level for sustaining a given capability, large gains are more likely when TI is addressed at the domain or program office level and then coordinated within the specific programs. The role of Product Support Manager should coordinate and align with higher-level TI strategic planning and with other members of the IPT including systems engineering and finance in relation to the development and fielding of the support system.

Business and Variance Analysis

The Life Cycle Business Case Analysis initiated and completed prior to Milestone C is the tool the PM and PSM used to determine best support and best value sustainment solution for the weapon system. The Life Cycle BCA began with the development and establishment of the Program's Technical Baseline—the Life Cycle BCAs level of fidelity at this time will depend on the design maturity of the system as well as the level of the development of the maintenance plan.

Specific instructions on business case analysis completion process, product template, and authoritative data sources are contained in the BCA Guidebook. If the PSM's program is legacy and does not currently have a business case analysis, the PSM should complete a cost and performance baseline that addresses each portion of the standard DoD BCA to economically and effectively understand the program's current status and to enable future business case analyses. This use of a the standard BCA process also ensures that the PSM will meet the requirements that stipulates a review of a weapon support strategy every five years or prior to a major change in the program.[25]

Supply Chain Management

The supply chain is always evolving in parallel with the system it supports. PSMs should work closely with their PSIs/supply support activities to monitor the health and efficiency of the supply chain. Any improvement opportunities identified will be easier to implement now than at any other time in the program's future since the behaviors and practices that create those improvement opportunities have not yet become part of the product support organization's culture.

Eventually, the system will no longer be in production and any product support strategy that relied on the production supply chain will need to be shifted to a pure sustainment supply chain. Also, the risk of Diminishing Manufacturing Sources and Material Shortages (DMSMS) increases over this time and the PSM must constantly monitor this through annual assessments of the supplier base health.

[25] Requirements for Lifecycle Management and Product Support

Weapon Systems Diagnostic Process

The PSM must ensure that the supply chain continues to support the JCIDS KPP and KSAs throughout the weapon system life cycle. The JSCA Weapon System Diagnostic (WSD) process, found in Appendix D – Weapon System Diagnostic (WSD) Process, should be leveraged to analyze the end-to-end supply chain actual performance to ensure that Customer Wait Time (CWT), Perfect Order Fulfillment (POF), and Total Supply Chain Management Cost (TSCMC) metrics continue to track according to the level required to achieve those JCIDS metrics. The PSM should use the WSD process to assess where potential issues within the supply chain lay by comparing those collected data against a representative benchmark population of data that is also collected and maintain through the JSCA initiative.

Configuration Management

The PSM must address Configuration Management (CM).[26] This CM should manage change by documenting and disseminating changes prior to or as they occur. This will ensure that supply chain managers understand the material they are responsible for and which material will no longer apply to their system.

The PSM should ensure a CM process that includes surveillance of the combined and systematic application of the following sub-processes

- Configuration Identification
- Configuration Control
- Configuration Control Board (CCB)
- Configuration Audits
- Functional Configuration Audit (FCA)
- Physical Configuration Audit (PCA)
- Configuration Status Accounting

LCSP and Product Support Package Update

Prior to the O&S phase, the LCSP is predominately estimations and assumptions. Update the LCSP with new analysis as it is generated and empirical data as it is collected during the O&S phase as needed based on product support performance and evolving needs to ensure the plan maintains or increases relevancy. Ensure these analyses and data are of sufficient detail and focus to ensure the acquisition, design, sustainment, and user communities integrated by the PSM maintain a common understanding of evolving sustainment requirements, approaches, and risks and to ensure the PSM has the data needed to make fact-based decisions.

[26] EIA-649B, National Consensus Standard of CM; MIL-HDBK-61A

Maintenance Plan Update

A key part of the LCSP are the maintenance plans, which includes such items as preventative maintenance plans and programmed depot maintenance plans. These plans should be updated throughout the O&S phase as new data is collected and analyzed. Also, conduct quality reviews, approve and issue maintenance plan updates and maintenance planning data for the users for acquiring the IPS element products needed to sustain the weapon system and associated equipment. Finally, review the Maintenance Plan and Maintenance Concept for in-service equipment when one or more of the following events occur:

- Significant changes occur in the operational scenario
- Hardware maintenance significant drivers change as monitored through proactive sustained maintenance planning
- Product support falls short of the design requirement adversely impacting readiness or costs
- Class 1 ECP changes in legacy systems or equipment
- Real-world experience gained from fielded system utilization

The Maintenance plan in the DoD is a "living document." The PSM should monitor the execution of the maintenance plan and ensure that maintenance is performed at the correct level and within the identified specification and scope of repair.

Maintenance Management

Monitor fleet maintenance to ensure maintenance is being performed in accordance with the established maintenance concept and maintenance plan. PSMs should use existing maintenance and supply chain reporting systems to monitor fleet maintenance, emerging safety issues, implementation design changes, and weapons systems usage trends that may impact service life and maintenance practices.

In the O&S phase the PSM will rely on his Cognizant Engineering Activity (CEA) to provide support in monitoring trends in supply chain management, failure modes, reliability, material degradation and management of critical safety items. In some cases, SMEs may be deployed directly to the maintenance activities to provide updated training and instruction that will supplement the established maintenance publications and instructions.

Funding Alignment

As a program transitions into the O&S Phase, emphasis shifts to supporting the fielded system. This includes:

- Establishing and monitoring operational units
- Maintaining the readiness and operational capability of the deployed systems
- Continuing test and evaluation
- Identifying operational/support problems

- Determining if product improvement/service life extension programs are warranted
- Addressing equipment obsolescence/aging technology, structural fatigue, component/parts wear out, premature failures, changes in fuel/lubricants, and aging aircraft
- Sustainment efforts start immediately upon fielding and deployment of a system.

General IPS element services obtained from in-house field activities or by contract that are integral to out-of-production and in-service systems and equipment should be properly funded. The PSM's role regarding sustainment funding is to serve as an advocate for funding required to implement and execute an effective and affordable product support strategy. This execution may be complex, as shown in Figure 12.

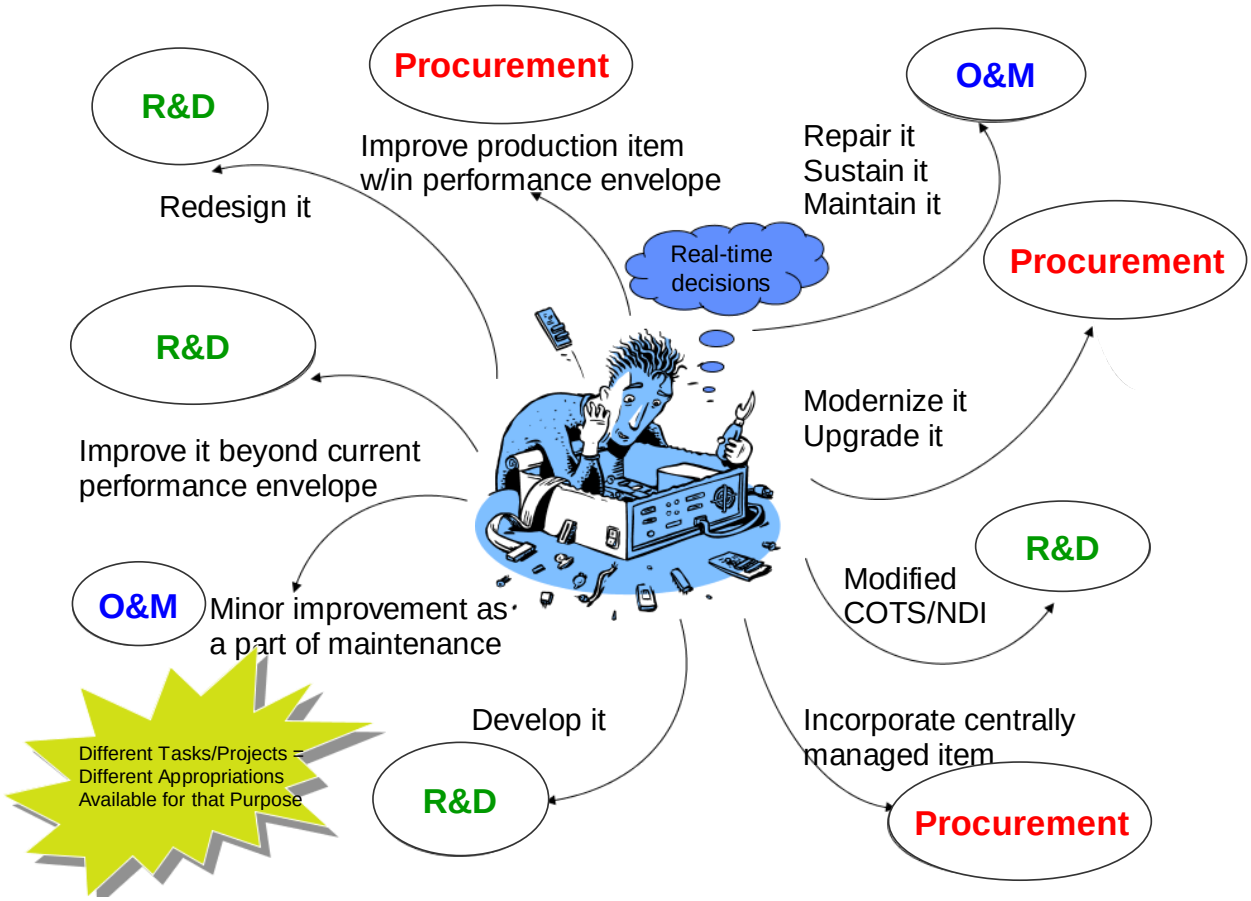


Figure 12. Funding is complex and is governed by, at a minimum: 31 USC 1301: purpose statute; 31 USC 1502: time money is available to spend; 31 USC 1517: amount available to spend; and 31 USC 1341: color of money.

Sustainment funding consists primarily of Operation and Maintenance (O&M) appropriations that are budgeted for and appropriated to the Military Departments. The PSM relies on the Major Operational Commands within the Military Departments to provide funding for the sustainment of the objective system or subsystem, using:

- O&M to pay the Defense Working Capital Funds (DWCF) for depot level maintenance and repair, including the purchase of necessary supply parts to accomplish those repairs; and
- Procurement funds to pay for the upgrade of weapons systems and subsystems.

The DWCF provides a dedicated, integrated, DoD -owned and operated worldwide supply, transportation, and maintenance system. The DWCF operations are unique in that:

- Unlike other DoD organizations, it sells its products and services to its customers much like a private business and, with a few exceptions, it does not receive a direct appropriation; and
- Unlike private-sector companies that provide similar services, the DWCF activities are chartered to support the DoD Warfighter using DoD civilians and military personnel. The workforce is therefore stable, which is not always the case in a contract environment where contractors can change with each new competition.

What does the DWCF offer the PSM?

- Placing work with a DWCF activity is fairly straightforward, and, since the transaction is internal to DoD, Federal procurement rules do not apply.
- Since the DWCF is not operated for profit, it can retain capabilities that private sector companies may chose to divest. For example, it retains inventories of spare parts with low demand, an important consideration with aging weapon systems. It retains excess maintenance capacity during peacetime for use during extended contingencies.
- For new weapon systems, the PSM purchases and provides the DWCF with initial spares which the DWCF sells. The DWCF then uses the cash collected from the sale of parts and supplies to purchase replacement stocks.
- Because the DWCF has budgetary contract authority, it can order replacements prior to the receipt of funded orders, an important consideration for long-lead-time items.
- The prices the DWCF charges for parts or maintenance once set in the budget are not normally changed during the year of execution. So, the PSM is protected from inflation: The price the PSM budgets for an item or labor hour is the price the PSM pays.
- The DWCF has extensive procurement expertise to seek the best price for spare parts from the industrial base and find new sources of supply when manufacturers decide to discontinue support.
- When necessary, the maintenance activities can fabricate the needed items.
- Several DWCF maintenance activities have special authorities that permit them to enter into partnership with private sector companies that permit the PSM to take advantage of the best of the public and private sectors. The private companies may operate in a DoD maintenance depot dividing the work between the public and private workforces.

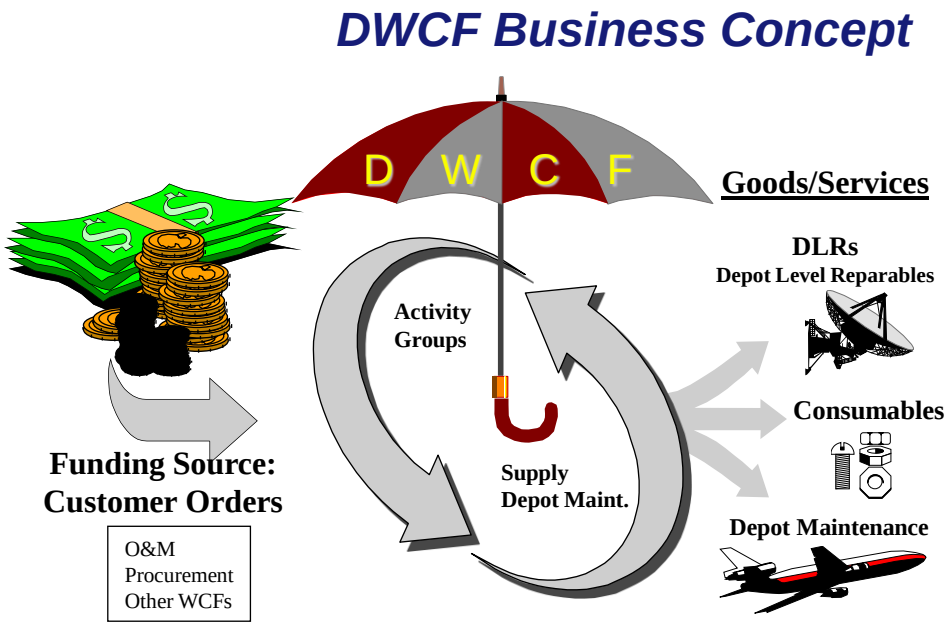


Figure 13. Defense Working Capital Fund Operating Model

Additional information on the financial aspects of the DWCF is available in the DoD Financial Management Regulation (FMR) 7000.14, Volumes 2B and 11B. In addition, the subject matter experts of the Revolving Funds Directorate in the Office of the Under Secretary of Defense (Comptroller) can provide policy and technical assistance.

5.6.5. O&S Phase Specific Major Activities

5.6.5.1. Integrated Product Support Element Trades and Key Relationships

PSMs should continually review and assess the program's product support strategy. Changes to existing product support are usually driven by reliability, obsolescence, and maintenance support issues. Substantive changes to the operating environment or changes to the operational and mission requirements can also drive a review of the sustainment strategy. PSMs should work closely with their supply chain managers and DLA to identify those areas of support that require reassessment.

The PSM should document these decisions within the LCSP and should also document any requirements to deviate from the decisions recommended by the BCAs. The PSM should also maintain a complete history of BCAs over the course of the system life cycle to be able to track decisions and understand how real-world operations are causing deviations from predicted cost and performance.

Robust sustainment governance is vital to fulfilling Warfighter A_M requirements and achieving the Department's program life cycle management improvement objectives. The proper application of standardized, comprehensive and visible governance enables leadership focus on

risk identification and continuous improvement, and enforces a culture of collaboration and accountability in meeting sustainment objectives. Implementing and managing sustainment governance must be a major focus area for all PSMs.

Formal requirements for sustainment governance, which are described below, have been established by the Department for acquisition programs. These requirements are considered minimum standards, and should be augmented by PSMs as necessary to ensure a forward looking, action oriented approach to sustainment governance is applied. The governance approach must also ensure that responsibility for corrective action is assigned and corrective progress monitored.

5.6.5.2. Reset

"Reset" is a set of actions to restore equipment to desired level of combat capability commensurate with the unit's future mission. Equipment reset includes the repair, rebuild/upgrade, and replacement of equipment damaged, worn out/stressed or destroyed in combat.

The overall objectives of reset programs are to restore units to a desired level of combat capability commensurate with the unit's future mission. It encompasses maintenance and supply activities that restore and enhance combat capability to unit and pre-positioned equipment that was destroyed, damaged, stressed, or worn out beyond economic repair due to combat operations by repairing, rebuilding, or procuring replacement equipment. These maintenance and supply activities involve Depot and Field Level (e.g., Organizational and Intermediate) repairs/overhauls centrally managed to specified standards and extensive supply support provided by commercial and organic supply organizations such as DLA. Included are Procurement, RDT&E, and Operation and Maintenance funded major repairs/overhauls and recapitalization (Rebuild or Upgrade) that enhances existing equipment through the insertion of new technology or restores selected equipment to a zero miles/zero hours condition.[27]

Roles and Responsibilities include:

- Working with the Sustainment Engineering Team will develop Maintenance Requirements, based on the specific operational/environmental conditions and sustainment requirements. Maintenance Tasks are derived from RCM analysis and organizational scheduled maintenance.
- The PSM must be aware of other considerations that may include ensuring publications are updated and reviewed, and that engineering investigation backlog and Reliability Centered Maintenance (RCM) analysis are completed.
- Reset teams should be organized to take the burden off the operational maintainer by using a contractor field team that is embedded within the maintenance processes and meets the service specific requirements for maintenance safety and operations.

[27] Joint Publication 4-0, Chapter 5

Best practices suggest reconstitution be performed on all Weapons System returning from the operational theater that have at least 60 days of consecutive operations in theater. During the reconstitution phase, the PSM should assist organizational maintenance activities by supporting maintenance and supply requirements applicable to the weapon systems returning from the operational theater that are actively involved in a reset program.

5.6.5.3. In-Theater Sustainment

Best practices suggest In-theater sustainment be performed on all weapon systems that are deployed on extended rotation (more than 1 year) to ensure equipment is ready for tasking before return to their home base.

During the In-Theater Sustainment Phase, the PSM should assist organizational maintenance activities in supporting maintenance and supply requirements related to all weapons systems in the operational theater in an active reset program. Organizational maintenance activities and programs must collaborate with in-service engineering and logistics teams to maximize in theater sustainment capabilities.

Finally, the PSM should proactively identify and implement methods for reducing the logistics footprint required to sustain the system in-theater. Footprint reduction can be done via several mechanisms, of which three common mechanisms follow:

1. Identify logistics demand drivers, and then execute engineering change proposals to increase reliability to reduce that demand.
2. Leverage in-theater logistics networks to use existing infrastructure and personnel to support equipment rather than bringing additional material and personnel into theater.
3. Footprint reduction must account for fully burdened costs of fuel and personnel sustenance and support associated with the system's sustainment.

5.6.5.4. Technology Refresh and Insertion

During the O&S phase, the PSM must be actively engaged in any plans the program might have to implement technology insertion, system upgrades, or implement windfalls or projects, engineering change proposals, value and logistics engineering change proposals. An evolutionary approach delivers capability in increments, recognizing up front the need for future capability improvements while recognizing the opportunities to improve reliability, maintainability, and availability.

System and Block Upgrades

With the onset of Service Life Extension Program (SLEP) system, block upgrades are becoming commonplace. Upgrades are sometimes pursued without due diligence. Some of the areas that continue to be overlooked that have a direct impact on supportability include:

- Technology Maturity

- Commercial Off the Shelf (COTS)
- Design Integration
- Configuration Management and Status Accounting
- Supportability

It is important the PSM actively engage with the PM, Systems Engineer and the IPT to determine opportunities to leverage improvements within the scope of the modification. The modifications and upgrade process comes with a great responsibility for maintaining focus on improving the maintainability and suitability of the fielded system, while reducing life cycle costs. While involved in a modification to the weapons system the PSM must:

- Ensure reliability growth opportunities are being considered and aggressively pursued
- Identify opportunities to improve support
- Identify and plan for associated risk
- Ensure all support requirements have traceability preventing requirements creep.
- Continuously influence the deployed system design for support
- Identify and address supportability cost drivers such as obsolescence during the modification process using the business case analysis
- Consider other support strategies such as Performance Based Logistics to support the modification
- Ensure funding and resources are allocated for logistics, support planning and implementation
- Perform comprehensive analysis to evaluate proposed changes to each of the logistics elements in support of the Upgrade

Technology Insertion

Tools and Methods

State-of-the-art methods and tools that may be useful in implementing and improving the effectiveness of planning for technology insertion include:

Modeling & Simulation Tools

Such tools may be used to create executable architectures to verify that the proposed TI will in fact address the subject capabilities, and also to develop testing scenarios for the effort. Ensure these tools provide a focused, quantifiable result that adds value to the verification and validation processes.

Change Road Maps

Developing a roadmap would establish the strategic context for the insertion initiatives and identify the tactical efforts that are necessary to achieve the stated goals. Roadmaps provide a

higher level of planning than a work-breakdown structure. The level of abstraction keeps the focus on the goals of TI and puts it in the appropriate time frame.

Value Networks

A value network is a graphic representation of all of the organizations, groups, and individuals that are or could be involved in the development, marketing, and use of a technology. Valuable information is derived in the course of building such a network that provides insight into innovative technology solutions and partnerships which might provide funding or in-kind resources along with improved speed and efficiency of implementation, and the influence of key players and opinion leaders.

Commercial Off the Shelf (COTS)

The PSM should be actively involved in the Analysis of Alternatives when Commercial Off the Shelf systems are considered for technology refresh or insertion. Although COTS may offer reduced schedule, greater technology maturity/stability and reduced cost initially, if it is deemed difficult to support it may not be a feasible selection. COTS can come with significant technical, schedule, and cost risks due to an underestimation of the following:

- Configuration management
- Maintenances Planning
- Design integration complexity
- Rigidity applicable to intended operational environment
- Intellectual property access
- Design interface challenges (System of System compatibility)
- Obsolescence

5.7. Disposal (Reserved for future updates)

2 Appendix A – Integrated Product Support Elements

Integrated Product Support Element	Activities
1. Product Support Management	1.1. Warfighter and maintainer requirements capture 1.2. Alliance Management 1.2.1. Public Private Partnership (PPP)/Third Party Logistics (3PL) management 1.2.2. International Partners 1.2.3. Foreign Military Sales (FMS) 1.3. Contract Development and Management 1.3.1. Develop and maintain a Product Support Agreement (PSA) with the Warfighter 1.3.2. Develop and maintain PSAs with the Product Support Integrators (PSIs) 1.4. Supportability Test and Evaluation 1.5. Development and maintenance of Sustainment Business Case Analyses (BCAs) 1.6. Logistics Trade Studies 1.7. Product Support Performance Management 1.7.1. Manage balanced performance metrics 1.7.2. Sustainment metrics reporting 1.8. Product Support Budgeting and Funding 1.8.1. Budget execution 1.8.2. Budget management 1.8.3. Mid-year review justification 1.9. Total Ownership Cost (TOC) Management 1.10. Planning Management 1.10.1. IPT Management 1.10.2. Independent Logistics Assessment (ILA) Management 1.10.3. Life Cycle Sustainment Plan (LSCP) development and management 1.10.4. Milestone Gate Review Management 1.11. Portfolio Transfer Planning and Transfer Execution 1.12. Logistics Policy Implementation 1.13. Configuration Management 1.13.1. Configuration identification and baseline maintenance 1.13.2. Configuration control 1.13.3. Configuration Status Accounting 1.13.4. Configuration auditing 1.14. Performance based Life Cycle Product Support (PBL)

	1.15. Continuous Process Improvement (Lean Six Sigma, Theory of Constraints, etc.)
2. Design Interface	2.1. Standardization and interoperability 2.2. Engineering data analysis 2.3. Net-centric capability management 2.4. Reliability, availability, maintainability (RAM) design 2.5. Producibility 2.6. Supportability/Sustainability 2.7. Deployability management 2.8. Human Systems Integration (HSI) 2.8.1. Human Factors Engineering 2.8.2. Personnel 2.8.3. Habitability 2.8.4. Training 2.8.5. Safety and Occupational Health plan development and management 2.9. Environmental management 2.10. Warfighter/machine/software/interface/usability management 2.11. Survivability and vulnerability management 2.12. Affordability 2.13. Modularity and Open Systems Architecture (MOSA) 2.14. Corrosion control and prevention 2.15. Nondestructive inspection 2.16. Hazardous material management 2.17. Energy management
3. Sustaining Engineering	3.1. Post deployment ongoing operational data analyses 3.2. Engineering considerations 3.2.1. Relation to Systems Engineering 3.2.2. Engineering and Technical Support 3.3. Analyses 3.3.1. Safety hazards 3.3.2. Failure causes and effects 3.3.3. Reliability and maintainability trends 3.3.4. Operational usage profiles changes 3.4. Root cause analysis of in-service problems such as: 3.4.1. Operational hazards 3.4.2. Corrosion effects

	3.4.3. Reliability degradation 3.4.4. Special Considerations for Software Sustainment Engineering 3.5. Development of required design changes to resolve operational issues 3.6. Materiel Improvement Plan (MIP) review boards 3.7. DMSMS mitigation 3.7.1. Parts obsolescence 3.7.2. Technology Refresh 3.7.3. Technology insertion 3.8. Engineering dispositions 3.9. Technical manual and technical order updates 3.10. Repair or upgrade vs. disposal or retirement 3.11. Maintenance evaluation automation 3.12. Failure Reporting, Analysis and Corrective Action System (FRACAS)
4. Supply Support	4.1. Initial provisioning 4.2. Routine replenishment management, including buffer and safety stock management 4.3. Demand forecasting and Readiness Based Sparing (RBS) 4.4. Bills of Material management and maintenance 4.5. Support equipment initial provisioning 4.6. Support equipment routine replenishment provisioning 4.7. Reparable, repair part, and consumable procurement 4.8. Cataloging 4.9. Receiving 4.10. Storage 4.11. Inventory management 4.12. Transfer 4.13. Issuance 4.14. Redistribution 4.15. Disposal 4.16. Material pricing 4.17. Total Asset Visibility/AIT 4.17.1. Serialized Item Management (SIM) 4.17.2. Item Unique Identification (IUID) 4.17.3. Radio Frequency Identification (RFID) 4.18. Shelf Life Management 4.19. Buffer Management

	4.20. Warranty Management 4.21. Supply Chain Assurance 4.21.1. Counterfeit material prevention 4.21.2. Malicious hardware and software prevention 4.21.3. Unauthorized technology transfer prevention
5. Maintenance Planning and Management	5.1. Maintenance Concept Design 5.2. Core capability management 5.3. Title X 50/50 management 5.4. Public-Private Partnerships 5.5. Maintenance execution 5.6. Level of repair analysis – hardware 5.7. Level of repair analysis – software 5.8. Failure Modes Effects and Criticality Analysis (FMECA) Required repair times determination 5.9. OPTEMPO variance management 5.10. Routine versus battle-damage repair management 5.11. Built-in and manual testability management 5.12. Inter-service, organic, and contractor mix of repair responsibilities 5.13. Condition Based Maintenance Plus (CBM+); Diagnostics, Prognostics & Health Management 5.14. Reliability Centered Maintenance (RCM) 5.15. Depot Workload Allocation, Planning, Activation, and Execution
6. Packaging, Handling, Storage, and Transportation (PHS&T)	6.1. Short and long term preservation 6.2. Packaging requirements determination 6.3. Containerization requirements determination 6.4. Shelf life requirements determination 6.5. Handling requirements determination 6.6. Transportation requirements determination 6.7. Environmental control requirements determination 6.8. Physical shock control requirements determination 6.9. Static shock control requirements determination 6.10. Security classification requirements determination 6.11. Container Reutilization 6.12. Marking
7. Technical Data	7.1. Engineering data maintenance 7.2. Specifications determination

	7.3. Standards management 7.4. Data Item Descriptions (DID) management 7.5. Technical standards development and management 7.6. Embedded Technical Data Systems 7.7. Technical manuals (TMs) including Interactive Electronic Technical Manuals (IETMs) management 7.7.1. S1000D Implementation 7.8. Engineering drawings management 7.9. Data rights management 7.10. Data delivery 7.11. Proprietary data management 7.12. Data validation 7.13. Data storage and backup
8. Support Equipment	8.1. Manual and automatic test equipment management 8.2. Equipment design 8.3. Equipment commonality management 8.4. Maintenance concept integration 8.5. Ground handling and maintenance equipment management 8.6. Equipment capacity determination 8.7. Air conditioners requirement determination and management 8.8. Generators requirement determination and management 8.9. Tools requirement determination and management 8.10. Metrology and calibration equipment requirement determination and management 8.11. Deployability requirement determination management 8.12. Automatic Test Systems 8.13. Support Equipment Integrated Product Support
9. Training & Training Support	9.1. Initial, formal, informal, and On the Job Training (OJT) individual, crew, and unit New Equipment Training (NET) 9.2. Initial, formal, informal, and OJT individual, crew, and unit Institutional training 9.3. Initial, formal, informal, and OJT individual, crew, and unit Sustainment training 9.4. Initial, formal, informal, and OJT individual, crew, and unit Displaced Equipment Training (DET) 9.5. Embedded training insertion and management 9.6. Computer Based Training 9.7. Distance Learning

	9.8. Training Equipment 9.9. Train the Trainer 9.10. Simulator Sustainment
10. Manpower and Personnel	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 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 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 10.4. Wartime versus peacetime personnel requirements determination and management 10.5. Additional personnel identification and justification process management
11. Facilities & Infrastructure	11.1. Facilities Plan Management 11.1.1. Facilities and facility improvement studies design and execution for every IPS Element (i.e., Maintenance Planning and Management, Computer Resources, Training & Training Support, etc.) 11.1.2. Location selection 11.1.3. Space requirements determination 11.1.4. Environmental requirements determination 11.1.5. Security requirements determination 11.1.6. Utilities requirements determination 11.1.7. Storage requirements determination 11.1.8. Equipment requirements determination 11.1.9. Existing versus new facilities determination 11.2. Site activation
12. Computer Resources	12.1. Manage and update the Program's Computer Resources Support Management Plan (CRSMP) when major system changes occur. The following items should be considered: 12.1.1. Mission critical computer hardware/software operation and support

	12.1.2. Management reports development and maintenance 12.1.3. Disaster recovery planning and execution 12.1.4. Computer resource working group standup and management 12.1.5. Computer programs and software baselines management 12.1.6. Computer programs and software modifications management 12.1.7. Software licenses management 12.1.8. Software and hardware obsolescence management 12.1.9. Defense Information Switch Network (DISN) or other network connectivity requirements determination and management 12.1.10. Specifications determination 12.1.11. Flow/logic diagrams determination 12.1.12. Computer Software Configuration Item (CSCI) definitions determination 12.1.12.1. CSCI test descriptions 12.1.12.2. CSCI operating environments 12.1.12.3. CSCI user/maintainer manuals 12.1.12.4. CSCI computer code 12.1.13. Automated Identification Technology management 12.1.14. Electronic Data Interchange (EDI) management 12.1.15. Service Level Agreements (SLAs) management 12.2. Electromagnetic Interference (EMI), Electromagnetic Pulse (EMP) 12.3. System Security/Information Assurance

2.1.1 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 weapon system product support across all Integrated Product Support (IPS) Elements

2.1.2 Design Interface

Objective: Participate in the systems engineering process to impact the design from its inception throughout the life cycle, 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 logistics 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
- Maintainability
- Supportability
- IPS Elements
- Affordability
- Configuration Management
- Safety requirements
- Environmental and HAZMAT requirements
- Human Systems Integration
- Anti-Tamper
- Habitability
- Disposal
- Legal requirements

2.1.3 Sustaining Engineering

Objective: Support in-service systems in their operational environments.

Description: This effort 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 life cycle. Sustaining Engineering both returns a system to its baselined 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 case analysis 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 key sustainment health metrics. This includes:

- Collection and triage of all service use and maintenance data

- Analysis of environmental and 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
- Other activities necessary to ensure cost-effective support to achieve peacetime and wartime readiness and performance requirements over a system's life cycle

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.

2.1.4 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 TOC.

Description: 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.

2.1.5 Maintenance Planning and 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: Establishes maintenance concepts and requirements for the life of the system for both hardware and software. Includes, but is not limited to:

- 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

2.1.6 Packaging, Handling, Storage, and Transportation (PHS&T)

Objective: Identify, plan, resource, and acquire packaging/preservation, handling, storage and transportation (PHST) requirements to maximize availability and usability of the materiel to include support items whenever they are needed for training or mission.

Description: 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).

2.1.7 Technical Data

Objective: Identify, plan, resource and implement management actions to develop and acquire information to:

- Operate, install, 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: Represents recorded information of 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 (TMs), including Interactive Electronic Technical Manuals (IETMs) 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. Address data rights and data delivery as well as use of any proprietary data as part of this element. Establish a data

management system within the IDE that allows every activity involved with the program to cost-effectively create, store, access, manipulate, and exchange digital data. This includes, at minimum, the data management needs of the system engineering process, modeling and simulation activities, test and evaluation strategy, support strategy, and other periodic reporting requirements.

Also includes as maintained bills of material and system configuration by individual system identification code or "tail number."

2.1.8 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 TOC.

Description: 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, program managers 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.

2.1.9 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 life cycle.

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: Consists 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 shall be validated during system evaluation and test at the individual, crew, and unit level.

2.1.10 Manpower and Personnel

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: 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 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.

2.1.11 Facilities & 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.

2.1.12 Computer Resources

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: Encompass the facilities, hardware, software, documentation, manpower, and personnel needed to operate and support mission critical computer 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. It is standard practice to establish some form of computer resource working group to accomplish the necessary planning and management of computer resources support to include management of weapon system information assurance across the system life cycle. Computer programs 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 operation and maintenance 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. Computer resources 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. 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 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.

3 Appendix B – Typical Supporting Performance Metrics

Performance and cost attributes that should be measured are listed in the table below. As stated the required sustainment metrics are the Materiel Availability (KPP), Materiel Reliability and Ownership Cost (KSA) along with the suggested Mean Down Time. The below list contains other supporting performance metrics which can be used to support achievement of the overarching required sustainment metrics. This is not an all-encompassing list, though it does present attributes that have been shown to lead to improved Warfighter outcomes when managed.

- Reliability: Mission reliability (i.e., Mean Time Between Mission Critical Failure, Mean Time between Abort, Mean Time Between Operational Mission failure, Mission Completion Rate, etc.) and Logistics Reliability (Mean Time Between Failure, Mean Time Between Unscheduled Maintenance Action, etc.)
- Availability/Readiness: Not Mission Capable Rate, Not Mission Capable Maintenance, Fully Mission Capable Rate, Time on Wing, Ready for Tasking, Operational Availability, Sortie Generation Rates, etc.
- Maintainability: Corrective Maintenance (Mean Time to Repair, Mean Corrective Maintenance Time, etc.), Maintenance Support (i.e., Maintenance Man-Hours per Operating Hour, Depot Maintenance Man-Hours, etc.) and Diagnostics (i.e., Fault Detection, Fault Isolation, Cannot duplicate discrepancies, False Alarms per Operating Hour, etc.)
- Supply: LRT, CWT, Issue Effectiveness, NMCS, Backorders,, Requisition Fill Rate, Order Cycle Time, Perfect Order Fulfillment, Mean Logistics Delay Time, Logistics Response Time, Back Order Rate
- Transportation: Delivery Time for high/medium/low priority items, Percent In-Transit Visibility, Retrograde Time, Shopping Time, Delivery Accuracy, Damage in Transit, Mean Logistics Delay Time
- Cost: Dollar per unit of operation (flying hour); reduction in Operations and Sustainment cost

Note that these metrics must be mathematically and qualitatively described before they are useful. Additionally, they should be:

- Linked to system level required sustainment metrics objectives
- Appropriate to scope and responsibility
- Specify unit of measure
- Specify acceptable range or threshold
- Motivate desired long-term behavior
- Understood and accepted
- Easy to collect data and verify

- Can be readily assessed
- Provide timely feedback

4 Appendix C – Sustainment Chart Usage Instructions

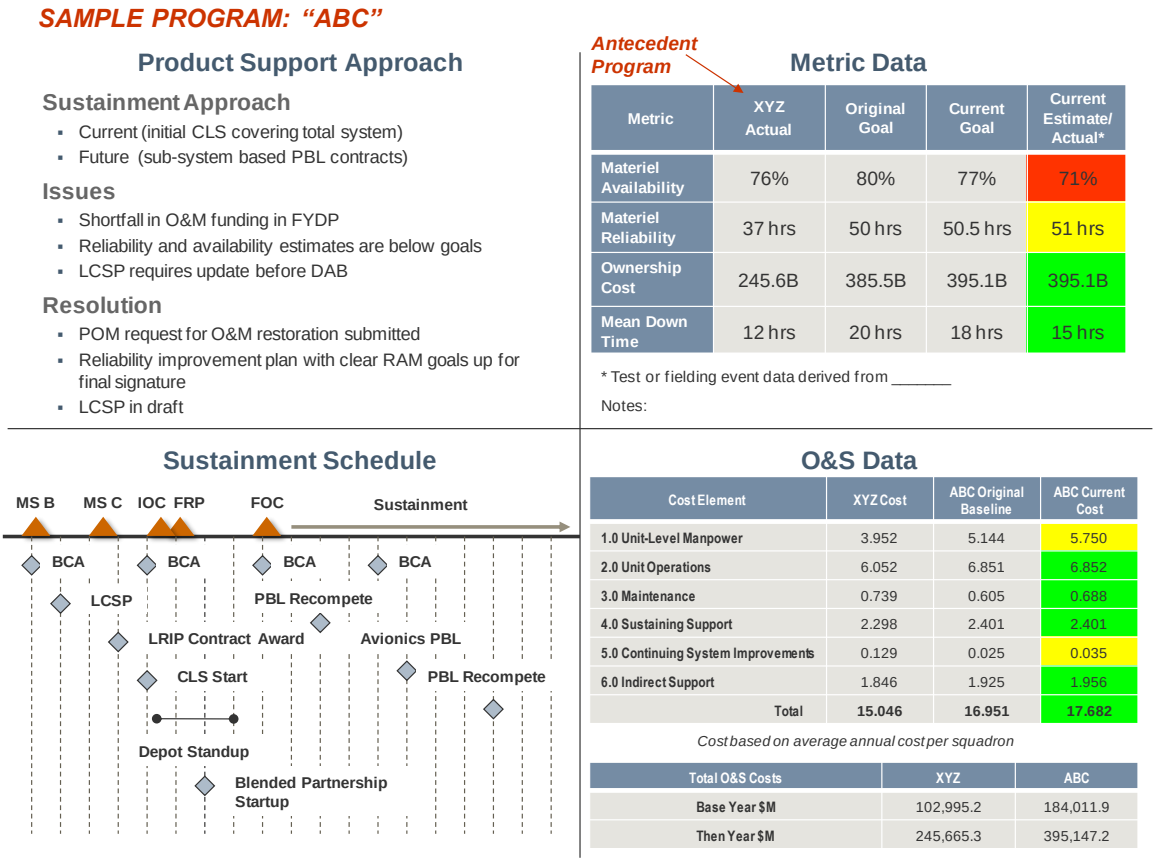


Figure 14. The Sustainment Chart helps explain program status at decision points and executive reviews

Sustainment Chart Instructions

Top Left Quad: Product Support Approach

Purpose: Program cite their sustainment philosophy at the present and any future differences

Fields:

- **Sustainment Approach**
  - **Current:** State what the current planned or actual maintenance strategy is (i.e.,: Initial 4-year CLS period)
  - **Future:** State planned strategy for future if different than current strategy (i.e.,: Migrating to a Depot/Industry partnership)
- **Issues**
  - Cite any issues program is currently experiencing or projected risks
- **Resolution**

- List planned or potential remedies to issues noted

Bottom Left Quad: Sustainment Schedule

Purpose: Display Planned Sustainment Schedule Milestones

Field:

- **Top Bar (Milestones)**
  - This field should be started from current time (or slightly earlier) until disposal.
  - Major events such as Milestones, IOC, FOC, etc. displayed with chips
- **Events**
  - Important sustainment events through the system life cycle should be listed here.
  - Examples include but are not limited to: BCAs, PBL decisions, CLS periods, depot standup, sustainment re-competes
  - Use of existing program sustainment schedules in this field is acceptable

Top Right Quad: Metrics Data

Purpose: Display current estimates of sustainment metrics vs. goals and antecedents

Fields:

- **Metrics**
  - The Materiel Availability subcomponent of the availability KPP, Materiel Reliability and ownership cost KSA's as defined in the CJCSI 3170.01G and the additional encouraged Mean Down Time metric submitted by programs into DAMIR
- **Antecedent Actual**
  - Evaluation of the four metrics on the preceding system (i.e., F-15 vs. F-22 or SSN 688 vs. SSN 774)
  - Antecedent is example cited in Selected Acquisition Report (SAR) to Congress
- **Original Goal**
  - Value for each metric according to the original baseline goal submitted for the first sustainment metrics transmittal
  - Can be set from an existing sustainment goal in a program or the figure cited in the first sustainment metrics submission
- **Current Goal**
  - Value for each metric according to the current baseline goal submitted for sustainment metrics transmittal
- **Current Estimate**
  - Program evaluation of system performance or projected performance (if still in development) for each metric
  - Color rating assigned by PM, based on estimate vs. goal
    - Green: At or exceeding goal
    - Yellow: Below goal by < 5%

        - Red: Below goal by > 5%
- **Test or Fielding Event Data Derived From**
    - Cite the event (OPEVAL, IOT&E, etc.) or modeling and simulation that led to the current estimate
- **Notes**
    - Any relevant notes, including pertinent information on metrics definitions

Bottom Right Quad: O&S Data

Fields: (Fields are primarily pulled from the SAR O&S section formatting)

- **Cost Element**
    - These are the six cost elements taken from the 2007 CAPE life cycle costs
- **Antecedent Cost**
    - Cost of the existing system according to the CAPE cost elements
        - Costs are based on average annual cost per hull, squadron, brigade, etc.
        - Use the SAR as the basis for determining the unit level and cite beneath first box what costs are based on
- **Program Original Baseline**
    - Current system average annual cost broken out over the CAPE cost elements, according to their original SAR submission.
        - Purpose is to compare original O&S cost assumptions vs. current
- **Program Current Baseline**
    - Current system average annual cost broke out over the CAPE cost elements according to present projections – not last SAR submission
- **Total O&S Costs**
    - Comparison of current program vs. antecedent's O&S present cost totals in both TY$ and BY$
        - Use SAR submission as guideline for formatting
        - Present O&S totals, not last SAR values, are required

5 Appendix D – Weapon System Diagnostic (WSD) Process

5.1 Section 1: JSCA Overview

The Joint Supply Chain Architecture (JSCA) is a methodology developed by the Joint Chiefs of Staff and the ODUSD(L&MR) that uses a process reference model, metrics, and benchmarking to drive process improvements within a supply chain. It has been proven to be a viable methodology but is not policy. However, it can be a powerful sustaining engineering tool when integrated with a program's sustainment metrics within the Supportability Analysis process. JSCA provides a common Department of Defense (DoD) supply chain lexicon that can assist the PSM in making informed decisions for designing and managing the supply chain. JSCA allows supply chain owners to understand the impact of decisions on their supply chain's speed, reliability, and efficiency. JCSA consists of three component parts: Benchmarking, Diagnostic Tools, and Metrics. The Weapon System Diagnostic (WSD) is a tool that was developed to examine and assess a supply chain using JSCA on joint and non-joint programs that have reached their Initial Operating Capability (IOC). The WSD will work effectively using SCOR®, as well, meaning that though the WSD methodology assumes the use of the JSCA supply chain metrics, this process works equally effectively for any set of product support metrics that examine a system's supply chain speed, reliability, and efficiency.

5.2 Section 2: Weapon System Diagnostic (WSD) Methodology

The Weapon System Diagnostic (WSD) helps Product Support Managers (PSMs) understand their end-to-end supply chain and determine how they can improve it to drive better materiel and operational availability, reliability, and cost. There are nominally 13 steps in the WSD process.

Weapon System Diagnostics Steps
1. Determine scope and breadth of analysis of selected weapon system
2. Identify primary points-of-contact for all stakeholder organizations
3. Establish project governance
4. Determine the order in which organizations will be assessed
5. Determine data requirements
6. Identify interview participants
7. Identify the points of contact and data sources for data gathering
8. Develop interview guides and conduct interviews
9. Perform the "As-Is" analysis
10. Validate "As-Is" findings
11. Conduct Opportunity and Configuration analyses based on data collected during interviews
12. Validate opportunity and configuration analysis findings
13. Develop recommendations for improving supply chain performance and a

roadmap for recommendation implementation across the weapon system

For further clarification for how to successfully employ the WSD, a hypothetical weapon system called WS1 has been created. The WS1 is a system used by Navy, Army, and Air Force.

1. Determine scope and breadth of analysis

A complete analysis should include an end-to-end review of each of the supply chains of the Services, Agencies, Combatant Commands (COMCOMs), as well as the industrial base that employ the selected weapon system. The review team should prioritize organizations by the number of parts they manage, relevant PICA-SICA[28] relationships, and the complexity of analysis. The review team should investigate the organization with the primary authority over the largest number of parts first. Because a simultaneous analysis of both consumables and reparables provides the best results, in most cases this initial review will also include DLA.

For the WS1, the review team evaluated the Navy because it makes up a large portion of the WS1's end-to-end supply chain. The analysis only focused on procurement of parts for the system, not procurement of WS1 itself.

2. Identify primary points-of-contact at HQ/Program Manager level for all stakeholder organizations

The review team should establish a primary point-of-contact (POC) at each identified organization. This POC should have a deep level of familiarity with all aspects of supply management within his/her respective organization.

3. Establish project governance

The review team should also establish a senior governing body, here called an Executive Advisory Committee (EAC) that consists of key stakeholders from each involved organization. The EAC should meet at major project milestones to discuss recommendations and associated implications.

For WS1, the EAC was composed of flag officers from USN. They were requested for meetings to provide feedback regarding scope, intent, and plan for the project initially. Later, the EAC convened for updates which helped to maintain momentum.

4. Determine the order in which organizations will be assessed

The review team should take care when determining the order of evaluation. Criteria for order can be based on size of supply chain (larger is usually better to evaluate first), location of organization in supply chain, and type of product (consumable or reparable).

[28] Based on **AMC-R 700-99/NAVSUPINST 4790.7/AFLCR 400-21/MCO P4410.22C,** PICA is the Primary Inventory Control Activity and has the primary planning role for a given item. SICA is Secondary Inventory Control Activity.

5. Determine data requirements

Metrics Discussed for the WS1

	Costs	CycleTimes (CT)	Performance
Plan	Plan Supply Chain $ Plan Source $ Plan Repair $ Plan Deliver $ Plan Return $	Plan CT Order Fulfillment CT	Forecast Accuracy
Source	Source Identification $ Receive/Verify/Transfer $ Supplier Payment $	Source Identification CT Receive/Verify/Transfer CT	% Orders Perfectly Received
Maintain/Repair	Finalize Engineering $ Build Schedule $ Capacity Utilization Issue $ Maintain/Repair $ Release Product $	Finalize Engineering CT Build Schedule CT Issue CT Repair/Test/Package CT Release CT	Schedule Achievement Part Reliability
Deliver	Order Processing $ Consolidation/Packing $ Transportation Execution $ Pick/Pack/Ship $ Deliver $ Receipt/Billing $	Order Processing CT Consolidation/Packing CT Transportation Execution CT Pick/Pack/Ship CT Receipt CT	Commit Accuracy % Deliver to Commit % Documented % Orders Receipted % Orders Accepted
Return	Determination $ % Returns Discarded Authorization $ Transport $ Receipt $	Return CT Authorization CT Transport CT	% Authorizations Error-Free % Returns Perfectly Completed
JSCA Top-Level Metrics	*Total Supply-Chain Management Costs*	*Order Fulfillment Cycle time*	*Perfect Order Fulfillment*

The JSCA end-to-end metrics are found in the proposed JSCA Metrics Guide contained in Appendix E and prescribe the data that will be needed to conduct much of the quantitative analysis. If other non-JSCA metrics are being used, refer to those metrics. The review team should also use the JSCA process model (Exhibit 1) to identify needed elements of the end-to-end supply chain. Use the detailed process elements and developed metrics to determine data requirements for analysis (See Appendix E for detailed description of JSCA process model elements).

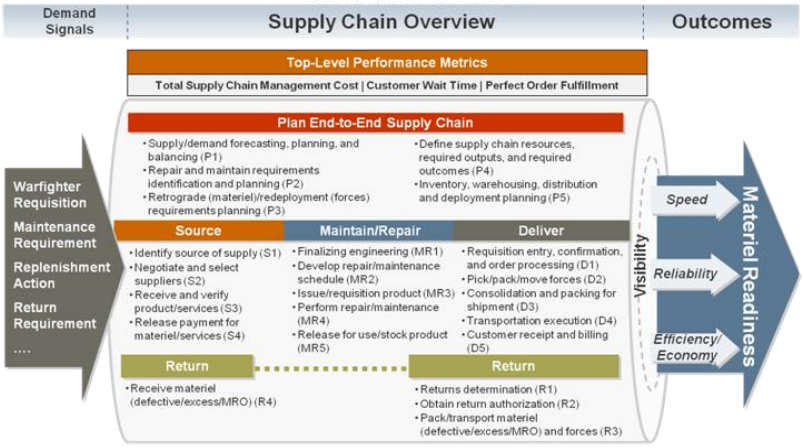


Exhibit 1. JSCA Process Model

6. Identify interview participants[29]

When identifying interviewees, a review team should look for individuals with specific knowledge in each process elements being examined.

While the initial list of individuals or groups covers a large portion of those that have a role in the management or execution of a particular process area, other entities may also be involved and participants may vary between weapon systems. The review team must be as comprehensive as possible during the interview process to gain a complete understanding of an organization's supply chain management practices to include users of different segments of the supply chain.

7. Identify points of contact and data sources for data gathering

Prior to conducting interviews, the review team should review the metrics that are measuring the processes being examined by the WSD and identify which interview participants might have access to the required data elements. The primary POC at each organization should be able to provide guidance on what entities may have visibility or control over certain elements.

8. Develop interview guide and conduct interviews

The final step in interview preparation involves developing an interview guide which is specific to the weapon system. The interview guide should include questions about current supply processes, communication flows, and data requirements. It should be quantitative and qualitative. The JSCA process elements should serve as a basis for understanding the processes being executed as well as how they relate to other parts of the supply chain. Once the interview guide has been developed, the team can begin conducting interviews.

Sample Questions for the WSI Questionnaire

- PLAN: *Define supply chain resources, required outputs, and required outcomes.*
- SOURCE: *What challenges do you have selecting sources of supply?*
- MAINTAIN/REPAIR*: How is the repair and maintenance schedule determined?*
- DELIVER: *How are requisitions received?*
- RETURN: *Are policies, rules, and*

9. Perform "As-Is" analysis

Once interviews have been conducted and data has been gathered, the review team can commence with the "As-Is" analysis. The purpose of the "As-Is" analysis is to document the current state and ensure a thorough understanding of the current operating environment and any challenges that might exist with regard to management and communication, so that the team can propose any needed configuration change recommendations. At the culmination of "As-Is" analysis, the review team should be able to describe the following aspects of a given weapon system's supply chain operations.

a. Identify Activities Performed and Associated Funding

[29] Depending on the desired participants, it may be worthwhile to complete this step prior to step 5 to schedule appointments in advance.

		Activities Performed	USN
WS1 System	Unit	Unit Level maintenance	ABC
	Intermediate	Intermediate level maintenance	ABC
	Reset	Teardown, repair, rebuild	ABC
	Recap	Complete overhaul of system	ABC
	Crash / Battle Damage	Repair as required	ABC
Component	Recap	Complete overhaul of component	LMR
	Overhaul	Repair as required, depot level	LMR

As a result of the interviews conducted, review teams should be able to identify the activities that comprise the weapon system's end-to-end supply chain and associated funding. The WS1 example provides a starting point in conducting analysis.

As a result of interviewing, the team identified various activities performed and the funding involved which can be seen in the adjacent chart. For example, the review team determined that at the unit level, maintenance was performed and funding came from ABC for the WS1 system.

b. Understand the Weapon System's Functional and Operational Construct

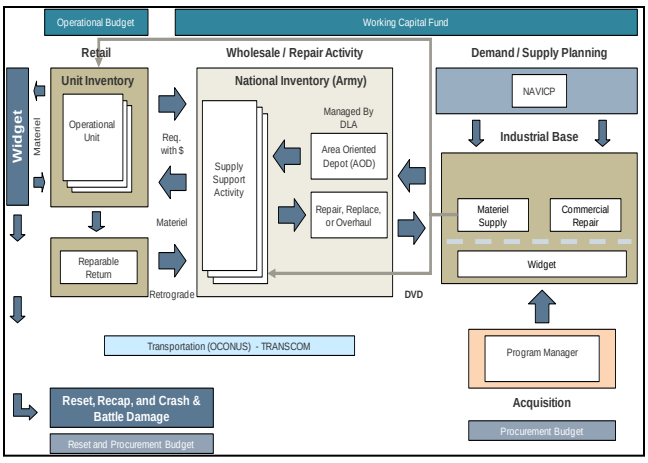
Because supply chain ownership is typically fragmented or "stove-piped" by Service, participants may perform redundant functions. Therefore, the review team should understand the functional and operational construct of a weapon system in order to identify possible areas of redundancy.

In the case of the WS1, only one organization is in charge of acquisitions, whereas three are responsible for sustainment.

End Item Type	PM USN	NAVICP	DLA	TRANSCOM	Industrial Base [Organic]	Industrial Base [Commercial]
Widget	Plan Source				Maintain	Maintain
Reparables		Plan Source Return		Deliver	Maintain	Maintain
Consumables			Plan Source Return	Deliver		

Primary Activities						
Acquisition of weapon system	X					
Sustainment management for weapon system		X	X		X	
Supply process owner			X			
Deliver process owner				X		
Repair, reset, and overhaul of aircraft and components					X	X

Notes:
[1] Global Logistics Support Center



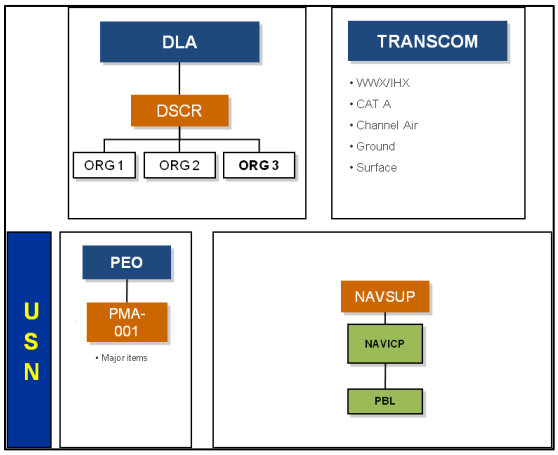
Upon completion of the interviews, the review team should diagram the supply chain

of the weapon system to show product and information flow. By understanding the operational construct, the review team will have greater insight into the data gathered, which may help to better explain performance metrics.

After the interviews, the review team put together this supply chain map. It became apparent that the WS1 system supply chain has many players.

c. Understand the Weapon System's Organizational Structure Construct

The review team must assess each entity's organizational structure to ensure that all relevant supply chain participants have been identified and associated governance structures evaluated. Fragmented ownership may be common to other weapon systems and in the worst case scenario can act as a barrier to visibility, communication, and implementation of joint solutions. Review teams should understand the impact of organizational structure on recommended solutions when developing implementation plans.



As depicted, DLA, TRANSCOM and USN all have different organizational structures associated with the management of the WS1 supply.

d. Understand Weapon System Demographics

Because of differing missions and operational environments, Services use a mix of configurations for a given weapon system which are supported by the supply chain in different ways. Newer configurations may employ a different mix of parts than legacy systems, and such parts may not have the demand history required for accurate forecasting. Understanding the distinction between different weapon systems configurations can give the review team a more accurate understanding of performance. The review team should focus on how configuration control across models can drive more findings.

For the WS1, DLA manages 5,000 consumable NSNs where NAVICP manages 3,501 reparable NSNs.

In addition to understanding the mix of configurations used by a specific weapon system, review teams must also understand the scope of involvement of the various players. In general, DLA is responsible for managing most consumable parts, while Services have control over most

reparables. With implementation of BRAC recommendations and other organizational re-alignments, DLA is responsible for procurement of reparables.

The review team should be able to identify the roles and responsibilities of each supply chain participant. Through the course of interviews, the review team should inquire about supply chain responsibilities, associated customers and/or suppliers, and metrics used to assess performance. By identifying roles and responsibilities, the review team can ask more tailored questions and submit data requests accordingly.

Finally, the review team should be familiar with the various avenues of communications that exist between all supply chain participants, both formal and informal. More specifically, the team should understand the impact of communication on supply chain operations. Forecasting is an area where organizations have communication mechanisms; however, not all organizations make use of the forecasts that they receive. Organizations are more likely to collaborate on major bottlenecks and emergency response to operations, especially with regard to items that cause stock-out or non-mission capable situations. Ideally, more and better advanced planning will mitigate this reactionary approach.

10. Validate "As-Is" findings

Upon completion of the "As-Is" analysis, review teams should meet with the primary POCs for the study to review the findings and ensure they have a proper understanding of the current state supply chain operations. Since the "As-Is" analysis is the basis for identifying possible configuration impediments and supply chain improvement opportunities, it is important that review teams accurately understand all aspects of operations.

11. Conduct opportunity and configuration analyses based on data collected during interviews

Once the review team has validated its understanding of the current state of supply chain operations with relevant POC, it can begin searching for specific and quantifiable opportunities for improvement.

a. Develop a Metrics Scorecard

To begin the opportunity analysis, the review team should use the data gathered during the "As-Is" analysis study to calculate metrics. The scorecard will include a computation of all metrics, either as defined by the architecture or interim metrics developed by review teams and weapon system owners, and will be compared against available benchmarks to develop an understanding of supply chain performance.

b. Identify Benchmark Industry

The review team must take care to choose a benchmark industry where operations are closely related to that of the supply chain being analyzed. The review team should contact groups that have a mature and standardized methodology for measuring supply chain performance to obtain benchmarking data. The review team can also speak with performance measurement experts to

gain greater insight into how commercial performance is assessed, and for help in making comparisons to DoD operations.

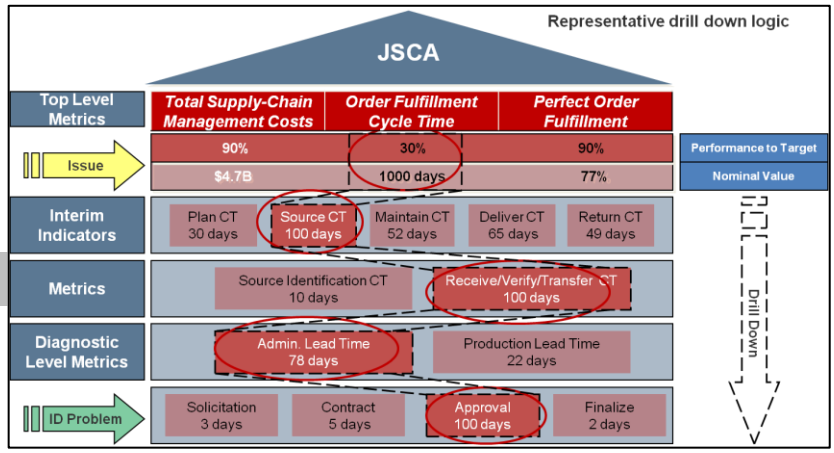
c. **Measure Performance Against Benchmark Population**

Metrics are used to benchmark performance against similar industries or peer groups and can be used as a tool to identifying improvement opportunities. Using similar-industry commercial comparisons can be useful to identify areas of opportunity beyond those from a comparison again DoD peer group. Qualitative assessments and anecdotal evidence derived from the "As-Is" analysis can also help to identify areas requiring further analysis.

d. Perform a Drill-down Analysis

Once the review team identifies a potential problem area, it must drill down to find the root cause of the issue.

Example of drill-down analysis for WS1.



e. Case Study Opportunity Analysis

From the drill-down analysis, the review team can target Order Fulfillment Cycle Time as an opportunity for improvement. Bases on the JSCA diagram above, ways to do this are reducing the Receive/Verify/Transfer time, the Admin Lead Time, and Approval.

Use the information to understand where areas of improvement opportunity exist.

12. Validate opportunity and configuration analyses findings

As with the "As-Is" analysis, the review team should meet with its primary POCs to validate the findings from the Opportunity and Configuration Analyses prior to developing recommendations. This ensures proper interpretation of data and helps identify other considerations that may not have been addressed by the analysis.

13. Develop recommendations for improving supply chain performance and a roadmap for recommendation implementation across the weapon system

Once the review team has thoroughly analyzed the weapon system's supply chain and has validated findings with appropriate parties, the review team should develop a set of recommendations along with key actions required for implementation. The review team should

also develop a roadmap for implementation and should determine the broader implications for each recommendation. The roadmap and the analysis of the broader implications will help the Department to prioritize suggested recommendations and key actions.

The following are what the review team recommended for the WS1 weapon system.

Recommendation	Key Actions	Expected Benefits
1. Implement processes and continuous improvement cycle to improve demand plan accuracy.	Plan data capture strategy Calculate baseline; refine DPA calculation Institute improvements	More efficient distribution of inventory Enable collaborative demand planning
2. Improve collaborative demand planning.	Define scope, participants, collaborative process and governance Pilot collaborative process Refine, then expand collaboration	Improved support from wholesale supply system
3. Balance repair capacity with rest of supply chain elements.	Identify key drivers for unserviceable inventory levels Explore commercial "bundling" opportunities and additional alternate courses of actions Develop plan to reduce level of unserviceable inventory	Improved repair throughput and reduced levels of unserviceable inventory
4. Actively manage the Return process.	Measure current process to understand opportunity Develop process recommendations Develop business case for consideration of new practices	Improved accountability and throughput back to repair depots
5. Optimize inventory levels (spiral)	After each improvement cycle (e.g., demand planning, differentiation, etc.) assess current inventory levels and positions and develop plan to define and draw down excess	More efficient use of inventory dollars

5.3 Section 3: WSD Success Factors

A number of factors will determine the success of a WSD. Success criteria include the following:

- The review team must obtain top-level support from all participating organizations and drive participation;

- Sufficient data and personnel must be made available for the review team to analyze weapon system processes and performance, and to develop a business case for recommendations;
- Findings must be socialized, validated, and re-validated to ensure that all considerations have been taken into account;
- All organizations must be briefed on the results of the analysis and associated recommendations; and
- Implementation planning must take into account the organizational and operational structure of each participant, as well as resource requirements.

6 Appendix E – Proposed Joint Supply Chain Architecture (JSCA) Supply Chain Management Metrics

1. Introduction

This appendix provides a high-level overview of the Joint Supply Chain Architecture (JSCA) process reference model and its proposed end-to-end supply chain metrics. It provides PSMs a proven model to use in designing and improving their supply chain and a balanced set of metrics to measure a weapon system's end-to-end supply chain. For additional information, contact the Office of the Deputy Assistant Secretary of Defense for Supply Chain Integration (ODASD(SCI)). The key is to ensure a direct relationship between the JSCA metrics and the program's Sustainment KPP and KSAs.

2. JSCA Process Reference Model

The JSCA is a process reference model that employs an end-to-end perspective to achieve/improve materiel readiness at best value. The JSCA is derived from the Supply-Chain Operations Reference-model (SCOR®), a commercial framework that links business process, metrics, best practices and technology features into a unified structure to improve the effectiveness of supply chain management and related supply chain improvement activities. Figure 15 below provides an overview of the JSCA process reference model.

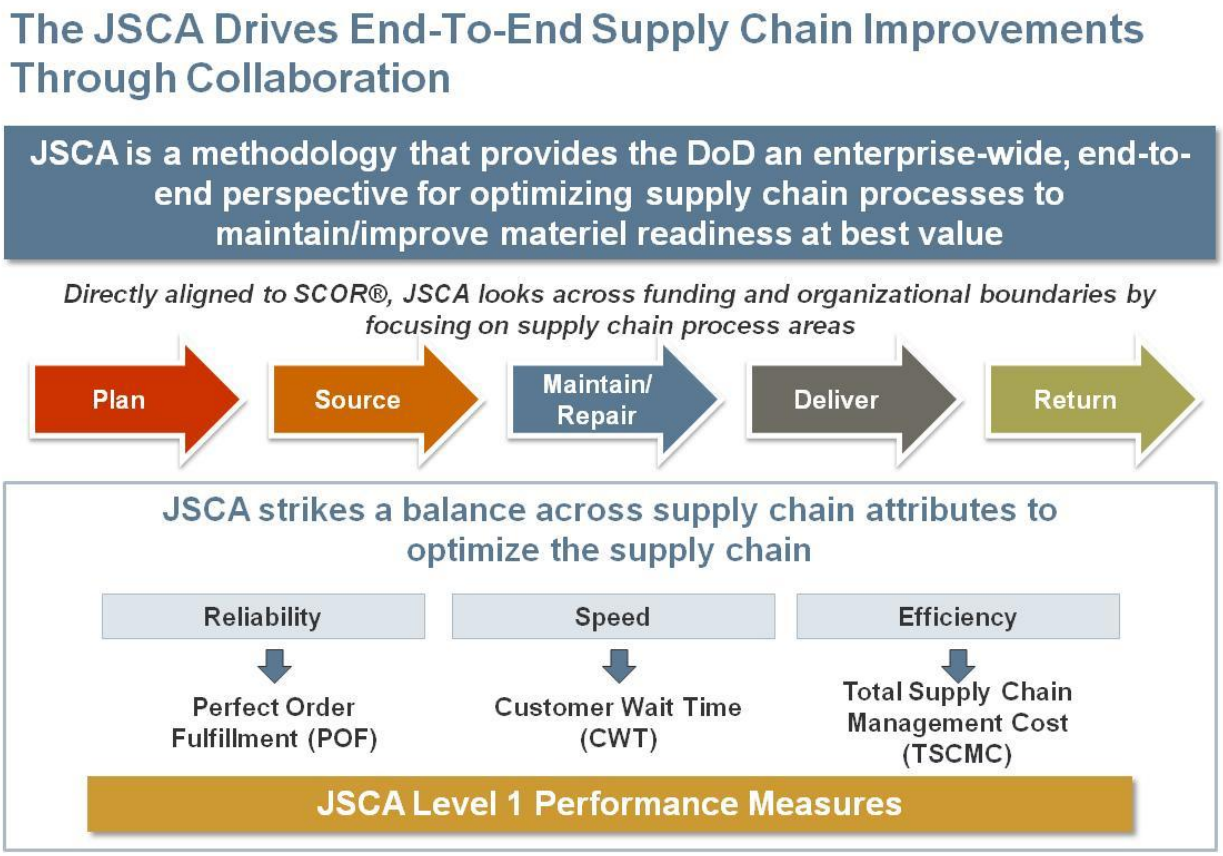


Figure 15. The JSCA process reference model provides the PSM with a model that can be used as a template to design supply chains and identify improvement opportunities in existing supply chains.

The process names describe their functions. The PSM should understand the interrelationships between each process to understand and be able to manage or transform their weapon system's supply chain into an asset that enables materiel availability.

The PSM can also use the process reference model to understand which processes in their supply chain are particularly critical to measure. This is important because legacy systems already have some supply chain measurement in place and any investments in additional process measurement should only be done where it makes sense. New programs, however, have not yet made their complete IT investment and should ensure that they are measuring their supply chain from a complete end-to-end perspective, especially since they have little operational data to indicate which processes are critical to their system's materiel availability.

The end-to-end supply chain metrics span across organizational boundaries by focusing on the five major supply chain process areas: Plan, Source, Maintain/Repair, Deliver, and Return. The entire set of end-to-end metrics are organized around three top-level metrics:

- Reliability, which is measured by Perfect Order Fulfillment (POF)
- Speed, which is measured by Customer Wait Time (CWT)
- Efficiency, which is measured by Total Supply Chain Management Cost (TSCMC)

Figure 16 below provides an overview of the top-level metrics, how they differ from the way the DoD currently measures supply chain reliability, speed, and efficiency, and the value that capturing and assessing these metrics adds to the DoD and the weapon system program.

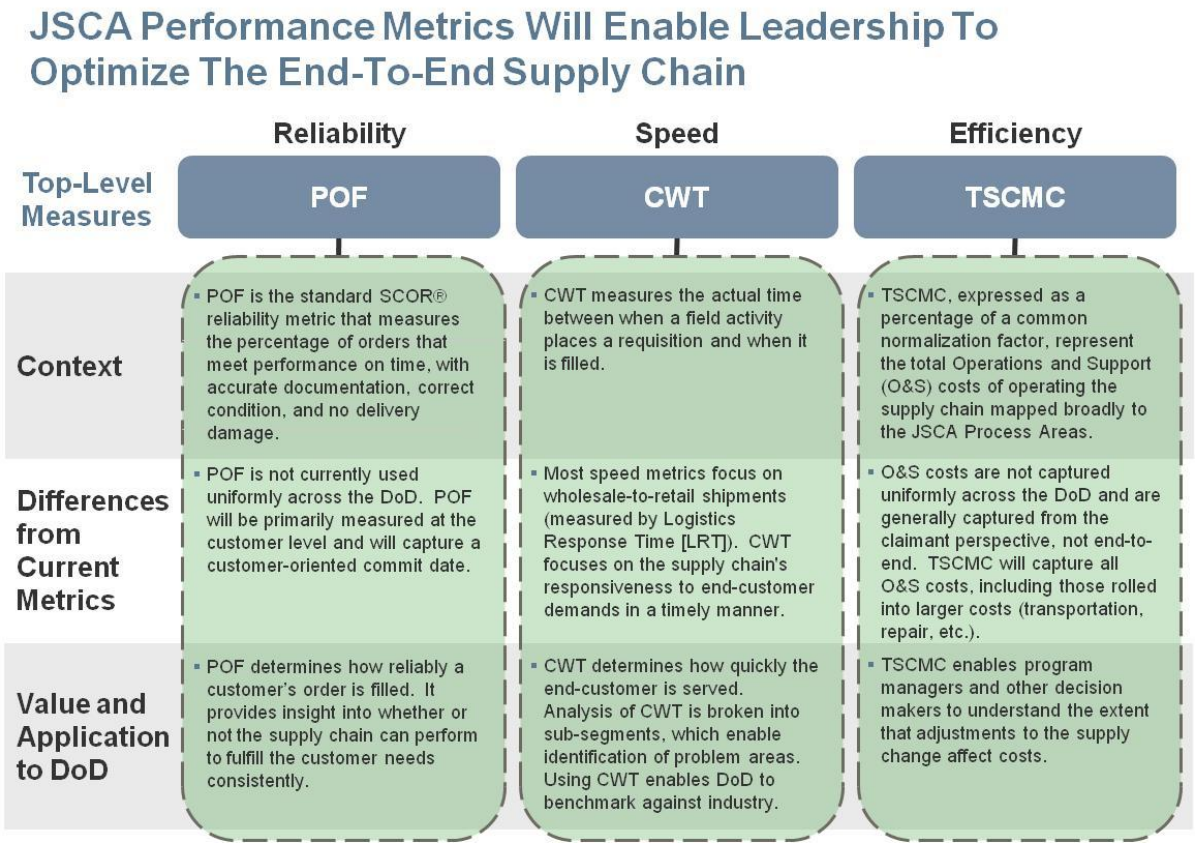


Figure 16. JSCA metrics are based on SCOR® and are tailored to fit the uniqueness of DoD supply chains.

Each top-level metrics has corresponding lower-level metrics which detail supply chain reliability, speed, and efficiency, as shown in Figure 17. Similar to the SCOR® model, creating a hierarchy of metrics provides leadership the context to identify issues within a holistic perspective so that decisions can be made that best lead to improved enterprise performance.

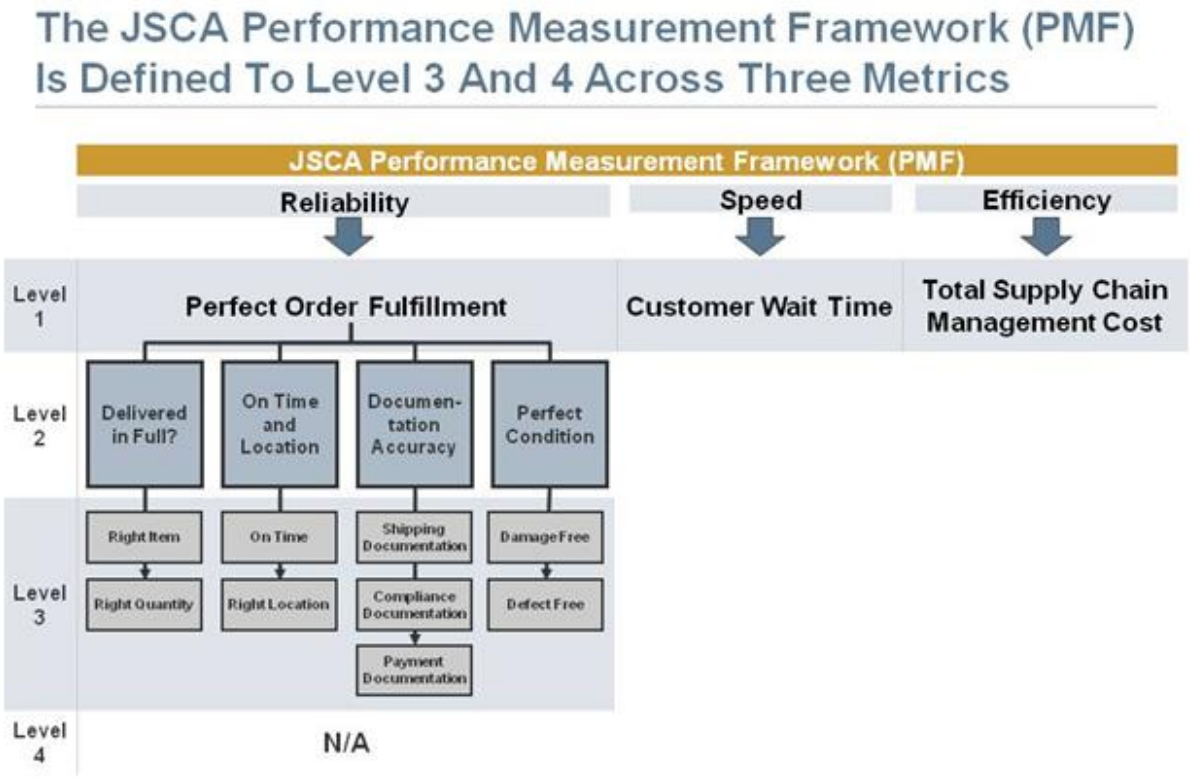


Figure 17. Useful metrics hierarchies tie directly to the processes they measure and allow drilling down from top-level overarching metrics to granular task-centric metrics.

The JSCA metrics are useful tools in assessing operational performance. As resources are constraints tradeoffs between supply chain attributes reliability, speed, and efficiency become necessary. The PSM can use these tools to achieve materiel readiness at the best value.

PSMs can use these metrics for new weapon systems by designing the supply chain and the IT systems around the five main supply chain process areas. Similarly, PSMs can use these metrics as a reference to better understand their supply chain and identify opportunities for improvement.

Performance data help show the PSM which supply chain processes are driving overall performance. This information helps to determine which areas of the supply chain warrant further exploration to determine if a problem exists. Figure below provides an illustrative example to show how the performance metrics can be used as indicators to identify problems in the supply chain.

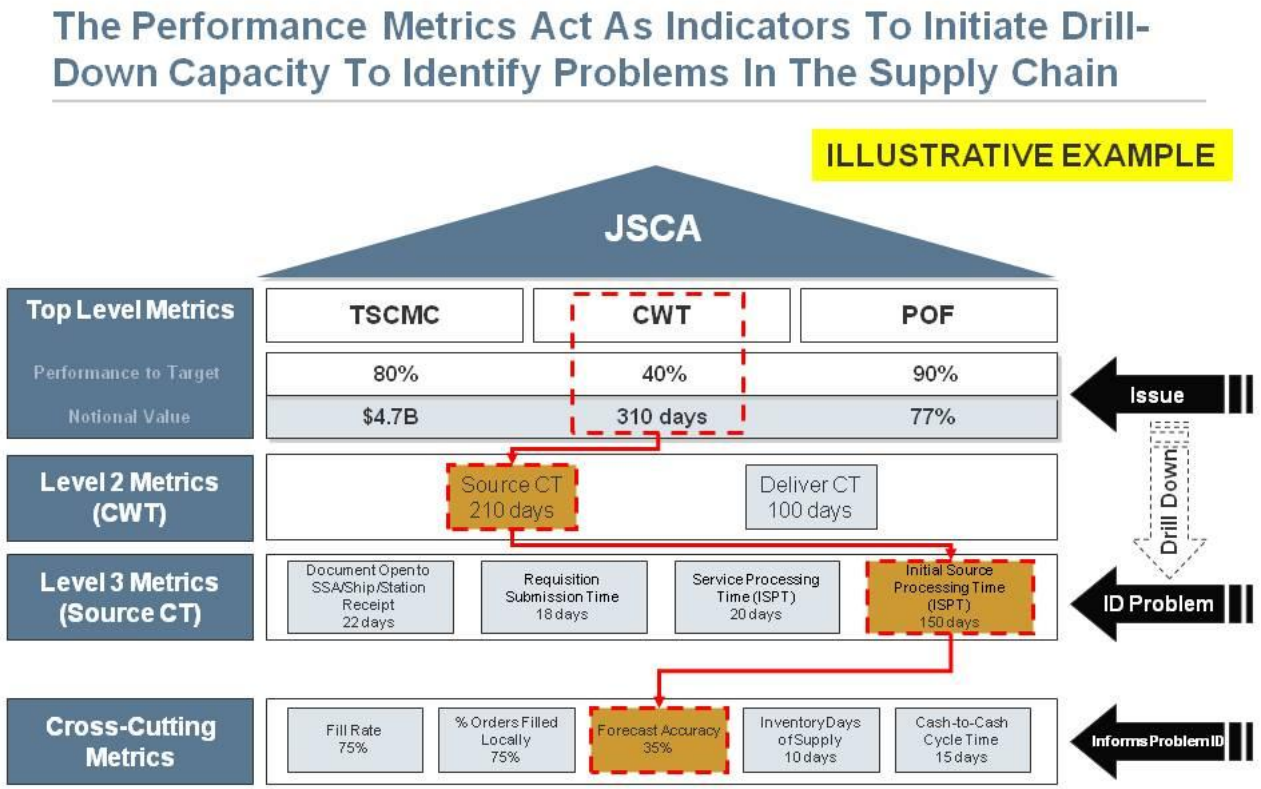


Figure 8. Drilling into the metrics hierarchy allows PSMs to identify the root causes of their supply chain challenges.

In the illustrative example above, the PSM identified a potential problem with CWT. Upon further investigation, the PSM discovered that an overly long sourcing process was the cause of much of the delay in delivery. By drilling even further down, it becomes evident that the initial sourcing time was delayed because of the poor Forecast Accuracy and the fact that the right items were not in stock. By using this type of analysis to seek out root causes, the PSM was able to use the supply chain performance metrics to identify targeted opportunities for enhancing weapon system supply chain performance.

The use of this drill-down methodology is strongly encouraged for PSMs to truly understand the causes of problem areas throughout the supply chain. Simply treating the symptoms of supply chain inefficiencies, without understanding the underlying cause, may result in problems being transferred to other organizations, which will result in further supply chain performance issues.

7 Appendix F – Product Support Arrangement (PSA) Types

Product Support Arrangement is a generic term that includes a wide range of relationships between organizations associated with product support. PSAs encompass the full range of formal agreements, including but not necessarily limited to contracts, Memorandums of Agreement (MOA), Memorandums of Understanding (MOU), Service Level Agreements (SLA), and Commercial Services Agreements (CSA). PSAs are used with organic and commercial sources and reflect a range of support levels. Product Support Arrangements may be transactional or performance based. When the PSA is tied to system or a subsystem/component level performance that describes measurable service and performance level parameters based on customer requirements and expectations, it is known as a Performance Based Agreement. The PSA should incorporate the results of the BCA, Supportability Analysis, and other product support planning. The agreement(s) become the execution vehicle for the entire orchestra of stakeholders and is the governing foundation. Strong and clear product support arrangements are responsible for communicating interpretable terms for successful product support.

PSAs begin with Warfighter (user) defined performance requirements that are initiated through the Joint Capability Integration and Development System (JCIDS). The PSM, acting on behalf of the PM, incorporates the appropriate needs and constraints in arrangements with PSIs (or with PSPs as applicable). PSIs, in turn, ensure that the necessary performance requirements to meet their arrangements are properly passed to the PSPs, who accomplish the product support activities. PSAs should be used to ensure performance expectations of all product support entities are clearly articulated.

In most cases commercial organizations use their contract as the PSA. For support provided by organic organizations, the PSA will typically be a MOA, MOU, or SLA. Discussion of typical PSAs follows:

Contracts

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 preference is for contracts that are performance based, which will inherently incentivize industry to invest in the continual improvement of performance while optimizing support cost (reducing the rate of cost growth, reducing overall support cost). Though specific application of these practices will vary based on the specific requirements of an individual program, analysis of performance based contracts and lessons learned have shown a preferred contracting approach that characterizes the contract conditions and terms which best motivate this contractor behavior:

- Long term contractual relationships sufficient to enable contractor investment with confidence of achieving a return on that investment;
- Stable cash flow, usually enabled by Fixed Price contracts such as Fixed Price per Flying Hour, to enable confidence in cash flow needed to motivate contractor investment;

- Incentives for performance where meeting specified objective and subjective outcome metrics result in explicit (i.e., incentive fee, award fee, award term) or implicit (fixed price contract) financial incentives for achievement; and
- Alignment of authority for product support functions and providers under the PSI sufficient to enable achievement of the specified metrics by the PSI.

Memorandums of Agreement (MOA)

MOAs are agreements in which there is a reciprocal relationship in which the actions of both parties are dependent on actions by the other party; example: an organic repair function is dependent on a contractor for the timely delivery of spares needed to accomplish the repairs

Memorandum of Understanding (MOU)

MOUs are agreements in which 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 Repairable Units (SRUs) 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.

Service Level Agreement (SLA)

SLAs are agreements to achieve a specified level of service; for example, a depot makes a commitment to repair a specified number of items per time period.

Commercial Service Agreement (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.

7.1 PBA Incentives and Remedies

One of the key characteristics of performance based product support strategies and their supporting PBAs is that they are based on a private sector business model—paying for performance. As is often done in commercial contracts, incentives are included to motivate support provider behavior. It is not uncommon for contractors engaged in product support contracts to have most or all of their profit tied to meeting performance metrics. Organic product support providers, such as repair and maintenance depots, also may have future workload and investment tied to meeting performance outcomes. Both organic and commercial providers need well defined and documented performance metrics and performance incentives. PBA incentives can include:

- Award fee earned based on subjective assessment by Government on how well contractor meets/exceeds performance standards;
- Incentive fee based upon the control of costs in the performance of a cost-plus-incentive-fee contract;
- Award additional periods of performance based on contractor performance;
- Expand range of workload, award additional current-year workload, or award additional following-year workload;
- Shared savings (implemented within an Award Fee or Incentive Fee structure) whereby contractor and Government share in any savings reductions achieved by the contractor resulting from cost or other efficiencies, design improvements, or performance/producibility enhancements;
- Reliability-based profits whereby firm-fixed price contracts may be structured to provide an inherent profit incentive for a product support provider to lower operating costs by achieving higher product reliability and to retain all or a portion of the savings achieved as a result of providing a better product;
- Positive past performance ratings (Contractor Performance Assessment Reports or other inputs such as questionnaires provided to source selection Past Performance Evaluation Teams), which increase the chances of being awarded competitive contracts or follow-on efforts;
- Investment by the industry prime in technical infrastructure that enhances the public partner's ability to perform (e.g., applications, computers, network services, tooling);
- Encouraging investment in training, certification, education;
- Encouraging investment in reliability and maintainability enhancements;
- Encouraging investment in proactive obsolescence and DMSMS mitigation;
- Encouraging investment in best business practices such as continuous process improvement and continuous modernization principles; and
- The award of additional business.

Remedies for non-performance under PBAs can include:

- Requiring the contractor to perform a service at no additional cost;
- Reducing the price;
- Reducing/eliminating award fee or profit earned under an incentive fee arrangement;
- Losing award-term points, which may, in turn, lead to loss of contract performance years in accordance with award term contract provisions;
- Exercise pre-planned Award Term Off Ramp if performance goals are not met;
- Unfavorable Contractor Performance Assessment Report (CPAR) ratings that become part of the contractor's past performance formal record in the DoD Past Performance Automated Information System (PPAIS) database;
- Terminating the contract;

- Terminating the contract and re-awarding the effort to be performed at the original contractor's expense.

Remedies for non-performance by organic product support providers can include:

- Requiring the organic provider to perform services at no additional cost until performance metrics are met;
- Reducing the price;
- Discounting cost-reimbursement payments as a result of non-performance within established metric time frame;
- Exercise pre-planned Award Term Off Ramp if performance goals are not met;
- Terminating the arrangement without losing provider termination fees;
- Terminating the arrangements and transitioning the effort to an alternate provider; and
- Transition to be performed at the expense of the default organization.

8 Appendix G – Using the Independent Logistics Assessment (ILA) Assessment Criteria as a Product Support Management Tool

The PSM should use the ILA criteria as a step-by-step guide to maximize the likelihood that the product support organization will achieve the Warfighter-required outcomes. Each row of the criteria is phrased as a leading statement to inspire further thought and investigation and is not intended to simply be a compliance statement.

Note that the ILA aligns with the IPS elements but that Program Support Budgeting and Funding and Environmental Safety and Occupational Health (ESOH) are broken out separately. Budgeting and funding is aligned with IPS element "Product Support Management," and ESOH is aligned with "Environmental Management" and "Safety and Occupational Health" in the "Design Interface" IPS element of the DoD Product Support Manager Guidebook; however, they are broken out as individual IPS elements in this handbook since they typically require a subject matter expert (SME) specific to that area.

Also note that the IPS element Assessment Tables provide standard assessment criteria applicable to all the Service's systems. These criteria are neither platform nor system specific; rather, they are critical evaluation factors, which may be further defined in the respective Services' guides to identify Service specific or platform-unique requirements. For the purposes of the PSM, these criteria translate into a red, yellow, or green rating for each IPS element, with red indicating an unsatisfactory status for an IPS element, yellow indicating that work is needed to improve that IPS element, and green indicating that the IPS element is addressed satisfactorily for that phase of the system life cycle.

9 Appendix H – Sustainment Maturity Levels (SMLs)

9.1 Introduction

The Sustainment Maturity Level (SML) concept was established to help the PSM identify the appropriate level of maturity the support plan should achieve at 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."[30] Achieving the levels will help the Product Support Manager evolve the program's product support approach to achieve the best value support solution. The SMLs provide a uniform metric to measure and communicate the expected life cycle sustainment maturity as well as provide the basis for root cause analysis when risks are identified and support OSD's governance responsibilities during MDAP program reviews. Focus is on assessing the sustainment strategy development and implementation status towards achieving Full Operational Capability and, where applicable, determining the risk associated with achieving the sustainment KPP.

The SMLs were crafted to address the full range of support options, from traditional organic based to full commercial based product support. They provide a standard way of documenting the product support implementation status that can be traced back to life cycle product support policy and guidance without prescribing a specific solution. SMLs provide the PSM a disciplined structure and rigor for assessing program performance based product support implementation status and is compatible with the design evolution of the system being supported.

9.2 Overview

The logistics community has the challenge of assessing risks associated with achieving and maintaining full operational capability as programs advance through the design, production, deployment and O&S phases. The Sustainment Maturity Levels were developed to provide a guidepost for the PSM as he/she matures the LCSP. They also assist in assessing sustainment strategy implementation status across programs in a consistent manner.

The product support package cannot fully evolve to maturity until the operational environment is defined, the sustainment requirements established and the design is stable. The SML definitions are developed to take into account a nominal level of design stability as a prerequisite for the levels. Consequently, SMLs can be a powerful tool in determining the appropriate sustainment concept based on the system's design stability and the immediacy of the required support.

9.3 Outcomes

Table 1 describes key sustainment outcomes necessary to achieve the requisite criteria for each Sustainment Maturity Level. The description is focused on broad "outcomes" or accomplishments, not intent or plans. The outcomes identified in Table 1 are important because they are critical in achieving the end-state sustainment concept and convincingly demonstrating maturity in the implementation process.

[30] Public Law 111-23

Table 1 is not meant to imply the various functional area levels are reached at a specific point in time. However, following the principles spelled out in DoDI 5000.02 and the Defense Acquisition Guide, the levels would be expected to be achieved in the corresponding life cycle phase and by the indicated events. By the same token, just because a program reaches a specific milestone or event does not mean that the specific SML has been reached. Achievement is based on specific accomplishments vice specific events.

Implementing a plan to achieve the SMLs will help the Product Support Manager to develop and field the best value support solution making the program more affordable. Up front it will help in designing out support degraders that contribute to system downtime and to reduce Total Ownership Costs. During the testing and operations phases achieving the SMLs will ensure continual process improvements and design changes are made based on actual experience.

This outcome based approach also makes it easier to articulate risks when various levels are not achieved by specific milestones, as well as, form the foundation for root cause analysis. In the event they are not reached, understanding and mitigating the associated risks greatly increases the probability of fielding mitigation strategies to provide the Warfighter suitable product support. In addition, by identifying the risk area(s) early, the program can formulate and execute mitigation strategies before risks are realized and adversely affect the Warfighter.

9.4 Program Reviews

In addition to providing PMs flexibility in developing and implementing their sustainment strategy, the SMLs have been developed such that no additional work is required by programs or the DoD Components. OSD will use existing program documents when assessing sustainment maturity at program reviews. The primary documents include, but are not limited to, the Analysis of Alternatives, Systems Engineering Plan, Test and Evaluation Master Plan, Acquisition Strategy, Acquisition Program Baseline, and the Life Cycle Sustainment Plan.

9.5 Assessing Levels

Rarely does the product support package for a system's sub-systems or components mature at the same time. For example, the design maturity for a specific sub-system may be lagging the others. Some components may be off-the-shelf, standard hardware, or made with well-established materials and processes from reliable suppliers, thus demonstrating a stable, mature design. Other components may incorporate new design elements that move well beyond the proven capabilities of a key technology resulting in a still evolving design.

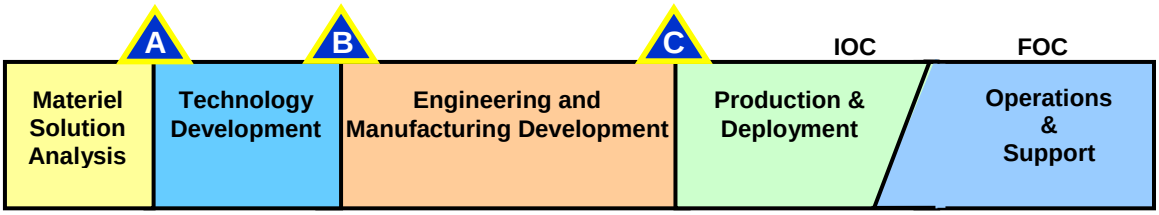
Using a "weakest link" basis, a system would receive an overall maturity level that reflects the element of the system with the lowest level of maturity. In many instances, this can be effective for the simple system, but for more complex systems this approach could be misleading and give the impression of an overall level of risk greater than the actual situation. Consequently, for assessments of more complex systems, assigning a single SML to an entire system may have little value. It may be more useful to address SML by major sub-systems. A determination still needs to be made on the overall maturity of the support solution and LCSP development.

9.6 Table 1

Sustainment Maturity Level (SML) Descriptions

(09-14-10)

The latest criteria based on lessons learned can be found at http://atl.mil/sml



Level	Program Acquisition Phase	Sustainment Maturity Level (SML) Overview	SML Description
1	Materiel Solution Analysis (Pre-Milestone A)	Supportability and sustainment options identified.	• Basic supportability and sustainment options identified based on War fighter requirements and operational concept • Potential support and maintenance challenges due to anticipated technology or operational environment identified (Also see DAG 5.4.1.4)
2	Materiel Solution Analysis (Pre-Milestone A)	Notional product support and maintenance concept identified.	• Potential product support and maintenance concept alternatives evaluated and notional concept identified as part of the Analysis of Alternatives • User needs and environmental constraints impacting sustainment are identified. (Also see DAG 5.4.1.2.1)

3	Materiel Solution Analysis (Pre-Milestone A)	Notional product support, sustainment, and supportability requirements defined and documented to support the notional concept. (Occurs in the AoA)	• Basic product support, sustainment, and required supportability capabilities identified and documented in programmatic documentation including, but not limited to Analysis of Alternatives (AoA), Acquisition Strategy, Initial Capabilities Document (ICD), and Test & Evaluation Strategy. • Life cycle cost estimates are used to assess affordability. (Also see DAG 5.4.1.3)
4	Materiel Solution Analysis (Pre-Milestone A)	Supportability objectives and KPP/KSA requirements defined. New or better technology required for system or supply chain identified (Occurs at ASR)	• Preliminary Sustainment Planning, Supportability Analysis, Reliability, Availability, and Maintainability (RAM) analysis, used to identify required developmental efforts. • Test & Evaluation Strategy addresses how required enabling technology and KPP/KSAs will be verified. (Also see DAG 5.4.1.2.3.2)

5	Technology Development (Pre-milestone B)	Supportability design features required to achieve KPP/KSA incorporated in Design Requirements (Occurs at SRR)	• Initial system capabilities have been analyzed and initial supportability objectives/requirements, and Initial Reliability, Availability, & Maintainability (RAM) strategy have been formulated and integrated with the Systems Engineering process via System Engineering Plan and Life Cycle Sustainment Plan. • Design features to achieve the product support strategy, including diagnostics and prognostics, are incorporated into system performance specifications. • Test & Evaluation Master Plan addresses when and how required sustainment related design features and KPP/KSAs will be verified. (Also see DAG 5.3 and 5.4.2.2.3.1)
6	Technology Development (Pre-milestone B)	Maintenance concepts and sustainment strategy complete. Life Cycle Sustainment Plan approved. (Occurs at PDR)	• Life Cycle Sustainment Plan (LCSP) written and approved documenting the Product Support Sustainment Strategy. • Supply Chain performance requirements identified and documented in the LCSP. • Logistics risks identified and risk mitigation strategies identified and documented in the LCSP. • Preliminary Support Strategy leveraging a best value mix of organic and contractor support and associated logistics processes, products, and deliverables identified and documented in the LCSP. • Sustainment contracting strategy, including the extent PBL Contracts will be used, documented in the Acquisition Strategy. (Also see DAG 5.4.2.3)

7	Engineering & Manufacturing Development (EMD) (Pre-Milestone C)	Supportability features embedded in design. Supportability and Subsystem Maintenance Task Analysis complete. (Occurs at CDR)	• Product Support Package element requirements are integrated, finalized and consistent with the approved system design and Product Support Strategy. • Validation that the design conforms to support requirements. • Sustainment metrics are predicted based on CDR results, the approved Product Support Package element requirements and projected Supply Chain performance. (Also see DAG 5.4.3.2.2.1)
8	Engineering & Manufacturing Development (EMD) (Pre-Milestone C)	Product Support capabilities demonstrated and supply chain management approach validated.	• Sustainment and product support planning complete identifying the sustainment strategy roles, responsibilities, and partnerships that will be implemented. • Sustainment and product support capabilities (including associated logistics processes and products) tested and demonstrated. • Supply Chain performance validated. • Budget requirements are adjusted based on the design and test results

9	Production & Deployment (Post-Milestone C)	Product Support Package demonstrated in operational environment (Occurs at IOT&E)	• Representative Product Support Package fielded to support operational tests. • Sustainment and product support capabilities (including associated logistics processes and products) demonstrated through successful tests and demonstrations in an operational environment. • Plans are developed and implemented to address any issues or "weak spots" identified in IOT&E (Also see DAG 5.4.4.2.6)
10	Production & Deployment (Post-Milestone C)	Initial Product Support Package fielded at operational sites. Performance measured against availability, reliability and cost metrics. (Occurs at IOC)	• Support systems and services delivered to each category of operational site. • Sustainment and product support capabilities (including associated logistics processes and products) proven in an operational environment. • Sustainment and product support measured against planned Materiel Availability, Materiel Reliability, Ownership Cost and other sustainment metrics important to the War fighter. Needed improvement actions are taken based on performance data. (Also see DAG 5.4.4.3)

11	Production & Deployment (Post-Milestone C) and Operations & Support	Sustainment performance measured against operational needs. Product support improved through continual process improvement.	• Sustainment and product support performance regularly measured against sustainment metrics and corrective actions taken. • Product support package and sustainment processes are refined and adjusted based on performance and evolving operational needs. • Initiatives to implement affordable system operational effectiveness are implemented. (Also see DAG 5.4.5.5)
12	Production & Deployment (Post-Milestone C) and Operations & Support	Product Support Package fully in place including depot repair capability. (Occurs at FOC)	• Support systems and services delivered and fully integrated into the operational environment. • Depot maintenance performed. • Sustainment and product support performance regularly measured against sustainment metrics and corrective actions taken. • Product improvement, modifications, upgrades planned. • The support strategy is refined leveraging the best value mix of organic and contractor support for logistics processes, services and products. • Equipment retirement/disposal planning is implemented as required. (Also see DAG 5.4.5.1)

10 Appendix I: Product Support Strategy Process "Fold-Out"

1. *Integrate Warfighter Requirements and Support*

Translate system operational requirements into the necessary sustainment strategy that will effectively deliver those requirements. The objective of Product Support is to develop, enable, and execute a sustainment strategy that will deliver optimum operational readiness to the Warfighter, consistent with Warfighter requirements, at an affordable, best value cost. Warfighter requirements are expressed in operational terms. Those requirements must be interpreted and translated if/as necessary into sustainment objectives that will drive the achievement of those outcomes.

2. *Form the Product Support Management IPT*

Form the PSM team that will develop, implement, and manage the Product Support. The PSM is charged with the responsibility to plan, develop, implement, and execute the product support strategy. Product support encompasses a range of disciplines including,

but not limited to, logistics, requirements, operational mission planning, financial, contracts, legal, and integrated product support elements functional subject matter experts.

3. *Baseline the System*

Collect the data (or begin data collection for new systems) that will be needed to assess and analyze support decisions, including inputs from Supportability Analysis (e.g., Failure Modes Effects & Criticality Analysis (FMECA), Failure Reporting and Corrective Action System (FRACAS), Level of Repair Analysis (LORA), Maintenance Task Analysis (MTA), Reliability Centered Maintenance (RCM) analysis, and other key maintenance planning tasks), as well as Reliability, Availability and Maintainability (RAM) and Life Cycle Cost (LCC) analyses

4. *Identify/Refine Performance Outcomes*

Using your product support criteria, develop a process for identifying critical product support outcomes and how you will measure success. Identify the critical behaviors that must be influenced by your metrics to achieve your product support strategy outcomes. The starting points for metrics identification are Warfighter outcomes and OSD's specified top-level weapon system metrics. Each product support strategy, as it evolves, must be tailored consistent with the maturity of data and existence of in-place support infrastructure and capabilities. The metrics defined as accountable outcomes must be tailored accordingly, with an objective to maintain a close correlation with, and enable the achievement of, the Warfighter and OSD top-level outcomes.

5. *Business Case Analysis*

Assess the cost, competencies, capabilities, and process efficiencies to identify the optimum best value product support solution.

6. *Product Support Value Analysis*

Best Value analysis to optimize long-term life cycle costs and benefits. Would include: Optimum level of support (System, Sub-system, or component level), evaluation of product support strategy considerations related to the 12 Integrated Product Support (IPS) Elements, Supply Chain Management strategy, Workload allocation strategy (including depot maintenance Core, 50/50, $3M Rule, and Public-Private Partnering (PPP) considerations), refinement of program data management strategy (DMS), strategies for continuous modernization and improving system reliability, availability and maintainability (RAM), and proactively addressing obsolescence, Diminishing Manufacturing Sources & Material Shortages (DMSMS), and corrosion issues.

7. *Determine Support Acquisition Method(s)*

Determine whether support will be acquired from the Product Support Providers using an outcome based or transactional based acquisition method. Decision(s) are validated or made using a best value analysis consistent with the BCA.

8. *Designate Product Support Integrator(s)*

For outcome based support, identify the Product Support Integrator(s) who will be delegated the responsibility to integrate support providers to deliver the specified outcomes assigned consistent with the scope of their delegated responsibility. Decision(s) are validated or made using a best value analysis consistent with the BCA.

9. *Designate Product Support Provider(s)*

Utilizing BCA value analysis as well as PSI discretionary decisions for lower tiered supplier support, select the best mix and blend of sources to perform the product support functions. Decision(s) are validated or made using a best value analysis consistent with the BCA.

10. *Identify/Refine Financial Enablers*

Identify the range, types, and amount of funding required to accomplish the required support consistent with the terms, conditions, and objectives of the Product Support Agreements.

11. *Establish/Refine Product Support Agreements*

Document the implementing support arrangements (contract, MOA, MOU, PBA, CSA, SOO/SOW for the Performance Work Statement, etc.) that assign and delineate the roles, responsibilities, resourcing, and reciprocal aspects of product support business relationships.

12. *Implement and Oversight*

Implement and manage the product support, including documenting updates to the Life Cycle Sustainment Plan (LCSP), conducting and implementing recommendations from Logistics Assessments (LA), and maturing the Sustainment Maturity Level (SML). Includes the continuous, ongoing assessment of Product Support effectiveness vis-à-vis the established governance mechanisms driving decisions and actions to review, modify, revise, or evolve product support strategies and business arrangements.

11 Appendix J – Key Product Support Considerations

The items below are other items of interest not addressed in the body of the guidebook that the PSM will want to be familiar with. A short discussion of each topic is provided.

Configuration Management. Configuration Management (CM) is a process for establishing and maintaining the consistency of a product's physical and functional attributes with its design and operational information throughout its life.

Configuration management and control are important factors to consider when designing the PBL strategy. In order to create the appropriate support environment and to be responsive to evolving technology and changing Warfighter capabilities, the providers assigned the responsibility for delivering the weapons system capability must have the appropriate level of CM and control. Integral to successful CM is the development of a CM plan. PMs establish and maintain a configuration control program. The PSM and program life cycle logisticians are a key participant in the CM process. The approach and activity that have responsibility for maintaining configuration control will depend on a number of program-specific factors, such as design rights, design responsibility, support concept, and associated costs and risk. The Government maintains nominal configuration control of the system performance specification, and the contractor(s) perform CM for the design. The Government retains the authority/responsibility for approving any design changes that impact the system's ability to meet specification requirements. The contractor(s) have the authority/responsibility to manage other design changes. The Government maintains the right to access configuration data at any level required to implement planned or potential design changes and support options. Configuration Management of legacy systems should be addressed on a case-by-case basis as design changes are contemplated. The following are key attributes of the CM process:

- **Configuration Identification**: uniquely identifying the functional and physical characteristics of an item;
- **Configuration Change Management**: controlling changes to a product using a systematic change process;
- **Configuration Status Accounting**: capturing and maintaining metadata about the configuration of an item throughout the life cycle;
- **Configuration Verification and Audit**: ensuring product design is accurately documented and achieves agreed-upon performance requirements.

The PM/PSM should consider both government and industry standards and best practices including:

- American National Standards Institute/Electronic Industry Alliance (ANSI/EIA) 649A, *Configuration Management,* located on the Government Electronics &

Information Technology Association (GEIA) Web site, http://www.geia.org, and click on STANDARDS.

- International Organization for Standardization (ISO) 10007, *Quality Management – Guidelines for configuration management*
- EIA 836, *Configuration Management Data Exchange and Interoperability*, located on the GEIA Web site, http://www.geia.org, and click on STANDARDS.
- Handbook (HDBK) 649, *Configuration Management* — (in development, expected 12/05).
- MIL-HDBK-61A *Configuration Management*

Corrosion Prevention and Control. The cost of corrosion to DoD amounts to billions of dollars annually. Therefore, corrosion control can contribute significantly to the total cost of system ownership and is a key element of system supportability. Corrosion is a long-term issue that usually impacts system operation after the system is procured, but the optimal time to address the impact of corrosion is early in system development. Proper consideration of corrosion in the design phase of a system will lead to significant cost savings over the life of the system. Product support strategies should include the tracking, costing, and prevention or control of systems and structures corrosion. PMs/PSMs must concentrate on implementing best practices and best value decisions for corrosion prevention and control in systems and infrastructure acquisition, sustainment, and utilization. All programs that are subject to Defense Acquisition Board (DAB) review are also required to demonstrate Corrosion Prevention and Control (CPC) planning implementation. For this review, PMs must prepare a CPC Plan (CPCP) document, which should be completed as early as possible, but in the case of weapons systems, no later than Milestone B. The plan should:

- Define CPC requirements;
- List applicable specifications and standards;
- Address facility or system definition, design, engineering development, production/construction, and sustainment phases, consistent with the design life and affordability of the system; and
- Establish the management structure to be used for the specific system being designed, procured and maintained, including a Corrosion Prevention Advisory Team (CPAT).

Before beginning any CPC program, PMs should consult the *Corrosion Prevention and Control Planning Guidebook* available at http://www.corrdefense.org/Key%20Documents/CPC%20Planning%20Guidebook%20Spiral%203%20Final.pdf for policies regarding corrosion prevention and examples of ways to implement a CPCP. Additionally, PMs/PSMs should also consult the DoD Corrosion Exchange (http://www.dodcorrosionexchange.org), which provides a forum for the DoD corrosion prevention community to exchange helpful information.

Data Management. Data Management (DM) is an important part of life cycle management and product support strategy development, and should be considered early and throughout in the system life cycle. Data systems supporting acquisition and sustainment should be connected, real-time or near real-time, to allow logisticians to address the overall effectiveness of the logistics process in contributing to weapons system availability and Life Cycle Cost (LCC) factors. Melding acquisition and sustainment data systems into a true total life cycle integrated data environment provides the capability needed to reduce the logistics footprint and plan effectively for sustainment, while also ensuring that acquisition planners have accurate information about total LCCs.

Data created during the design, development, and manufacturing of a system have value to both the data provider and the PM. The PM should adopt a performance based approach to identify the minimum data required to cost-effectively maintain the fielded system and foster source of support competition throughout the life of the fielded system. Access to data via the contractor's data system may be the best solution. The PM should determine the system's competition strategy early in the life of the program and determine minimum data needs to support the strategy and a performance based approach to managing the data over the life cycle of the system. Planning should include possible Foreign Military Sales (FMS) applications including applications after the system is out of the DoD inventory.

Should the PM select data access versus delivery, provisions should be made for future availability of data to support competitive sourcing decisions; maintenance and sustainment analyses; conversion of product configuration technical data to performance specifications when required for enabling technology insertion to enhance product affordability and prevent product obsolescence; and contract service risk assessments over the life of the system. When future delivery is required, the PM should require final delivery of data in both its native and neutral digital formats. The PM should never require paper or hardcopy delivery of data created in a digital format. Regardless, the program's Data Management Strategy and Life Cycle Sustainment Plan should capture the planned approach for product/engineering data management, and how it will be used in product support strategy implementation.

Earned Value Management (EVM). Earned Value Management (EVM) is a program management tool that integrates the functional stovepipes of cost, schedule, and work scope to create an aggregate picture of performance. EVM provides an early warning system for deviations from plan and quantifies technical problems in cost and schedule terms, providing a sound objective basis for considering corrective actions. EVM gives the OSD Cost Assessment and Program Evaluation (CAPE) the data necessary to provide accurate estimates of total program cost. Through EVM reporting, the contractor provides cost data as required by the contract to ensure implementation of program objectives and to facilitate PM oversight responsibilities as required by the CAIG and DODI 5000.02. PMs must ensure earned value data reporting is specified in the contract and in DODI 5000.02. Requiring an EVM for all firm fixed-price contracts, subcontracts, and other

arrangements is a risk-based decision left to the discretion of the PM and requires a business case analysis.

Obsolescence/Diminishing Manufacturing Sources & Materiel Shortages (DMSMS) Mitigation. According to the *SD-22 Diminishing Manufacturing Sources and Material Shortages: A Guidebook of Best Practices and Tools for Implementing a DMSMS Management Program, Diminishing Manufacturing Sources and Material Shortages (DMSMS),* the loss of sources of items or material, surfaces when a source announces the actual or impending discontinuation of a product, or when procurements fail because of product unavailability. DMSMS may endanger the life cycle support and viability of the weapon system or equipment. Compared with the commercial electronics sector, the Department of Defense (DoD) is a minor consumer of electrical and electronic devices. While the electronic device industry abandons low-demand, older technology products, DoD seeks to prolong the life of weapon systems. These conflicting trends cause DMSMS problems as repair parts or materials disappear before the end of the weapon system life cycle. While electronics are most likely to be discontinued, obsolescence of non-electronic and commercial off the shelf (COTS) items also poses a significant problem to weapon systems. In short, DMSMS is a threat to system supportability. Solving DMSMS is complex, data intensive, and expensive. The program manager and PSM have two approaches to solving DMSMS in a system: reactive (address DMSMS problems after they surface) and proactive (identify and take steps to mitigate impending DMSMS problems). Examples of proactive approaches to mitigate DMSMS problems include life of system buys, managing the supplier base in concert with the Prime Contractor, and having technical data and the accompanying data rights available early in the acquisition phase to ensure the ability to re-manufacture items as necessary. DoD policy prescribes the proactive approach.

Reliability, Availability, and Maintainability (RAM). The Department of Defense (DoD) expects to acquire reliable and maintainable products that are of high quality, readily available, and able to satisfy user needs with measurable improvements to mission capability and operational support, in a timely manner, and at a fair and reasonable price. Developers of Joint Capabilities Integration and Development System (JCIDS) requirements documents (hereafter referred to as combat developers) and program managers must work together in developing mission and sustainment requirements that facilitate achieving this objective throughout the system life cycle. Additional information and guidance is available in the DoD Reliability, Availability, Maintainability, and Cost Rationale (RAM-C) Report Manual available at https://acc.dau.mil/CommunityBrowser.aspx?id=298606&lang=en-US.

Supply Chain Management (SCM). Product Support in the DoD is heavily reliant on an effective and efficient supply chain. The DoD supply chain differs from a commercial supply chain in several critical processes:

- DoD supply chains encompass inventory management and maintenance, repair, and overhaul (MRO) functions. This is due to DoD supply chains fulfilling most

of their Wholesale stock inventory from the MRO process rather than outside procurement of items as is done by commercial supply chains.

- DoD supply chains are subject to greater variability in demand than commercial supply chains. DoD systems operate in remote, harsh environments under significant duress at high OPTEMPOs, precipitating rapid changes in equipment condition and failure rates.
- DoD supply chains face greater challenges in the distribution and tracking of items, with large numbers of deployed assets located OCONUS, often in remote locations, which stress the capability of distribution systems and asset tracking systems
- The sheer size of the DoD supply system precipitates difficulty in accomplishing accurate demand forecasting, efficient lead times for procurement of needed spares, and difficulty in identifying potential inventory shortfalls or excessive inventory levels
    - DoD supply chains may be required to support systems well beyond their expected life and must sustain systems even if the original manufacturer either no longer chooses to support or is able to support the system.

The above challenges notwithstanding, the DoD supply chain, including MRO, is the single most contributing factor to the operational readiness of defense systems. The need for an efficient, effective, and timely supply chain is critical to the ready availability and consistent performance of Warfighter systems. It is imperative that the PSM give careful consideration to structuring an optimum supply chain strategy. The model for effective sourcing of supply chain functions is evident from past precedent best practices over the last decade. The introduction of Depot Maintenance Public-Private Partnerships in 1998 defines the parameters of this sourcing, merging the best capabilities of both the public and private sectors. Title 10 requirements for Core and 50/50 compliance generally dictate that the majority of "touch labor" for MRO will be accomplished by organic government personnel at DoD Depot Maintenance Activities (DMAs). After satisfaction of Core requirements, the PSM has the option (again, considering 50/50 compliance) to source "above Core" MRO workloads to a commercial source. Of critical importance to efficient depot maintenance is the assurance of a ready and available supply of spares needed to accomplish the MRO function. This includes the requirement to have rights to form, fit and functional technical data as spelled out in Title 10 section 2320, and when appropriate, more detailed technical data necessary for re-manufacturing, re-procurement and/or sustainment engineering as needed to ensure full life cycle sustainment and disposal/demilitarization. Consistent with the 1999 (and continuing) emphasis on a shift of the DoD role to "managing suppliers, not supplies", the use of commercial supply chain management for Wholesale inventories has proven to be a successful model, leveraging industry's capability to shorten procurement lead times, develop more efficient demand forecasting processes, and in general reduce the non-repair portion of the supply chain process to lower the total repair turnaround time for MRO items. While the exact tailoring of the supply chain sourcing strategy is dependent on the BCA

analysis, the objective should be to utilize the best competencies of organic and industry resources.

Identification of a Supply Chain Management strategy is critical to the success of any product support strategy BCA 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 target for utilizing industry flexibility, capability, and proprietary spares support. DoD Materiel Management usually addresses four categories of supply support items:

- **Unique Repairable Items**: These are repairable (subject to repair) parts that are unique to the system (not common with other DoD systems). They are often sourced by the Prime Vendor/Original Equipment Manufacturer (OEM) of the system. Strong consideration should be given to allocating responsibility for wholesale support of these items to the OEM, who has readily available technical data and identified sources.
- **Common Items**: These parts are common with other systems and may have a variety of sources. They are usually managed organically within the DoD materiel management process but are also candidates for commodity-level and/or corporate product support arrangements.
- **Unique Consumable Items**: These are consumable (discarded after use) items that are used only on the target system and are usually sourced by the Prime Vendor/OEM of the system. Strong consideration should be given to allocating responsibility for acquisition of these items to the Prime Vendor, which may elect to use the Defense Logistics Agency (DLA) as the preferred source of supply.
- **Common Consumable Items**: These are consumable items used across more than a single system and are generally managed and provided by DLA. It may be viable to allow the Prime Vendor to procure these items, as appropriate, should DLA be unable to meet time, cost, or quantity requirements. If needed, the PM should encourage establishing a PBA between DLA and the vendor when total private support is chosen.

Unique DoD Inventory should always be considered, and a plan for draw down in place, prior to implementing decisions to draw spares and repairs from private sources. Transfer of ownership of spares and equipment, when necessary to support a contract during Low Rate Initial Production (LRIP) or Interim Contract Support (ICS), needs to be managed appropriately to ensure equitability of capitalization and credit issues. Supply chain management includes the distribution, asset visibility, and obsolescence mitigation of the spare parts. From a Warfighter's perspective, transportation and asset visibility have a substantial impact on high-level metrics and should be emphasized in the product support strategy.

Workload Allocation and Public-Private Partnering (PPP). DoD policy requires that "Sustainment strategies shall include the best use of public and private sector capabilities through Government/industry partnering initiatives, in accordance with statutory requirements." (Ref (6) An effective support strategy considers best competencies and partnering opportunities. Building on the previously developed System Baseline, the PM/PSM and the Product Support Management IPT must consider each discrete workload and assess where, how, and by whom it can best be accomplished, while considering statutory (i.e., Ref (30) Title 10 of the United States Code (10 U.S.C.)), regulatory, and pertinent DoD/Military Service guidance such as Depot Source of Repair (DSOR) determinations and Depot Maintenance Interservice Support Agreements (DMISA). In general, support workloads should include system-unique subsystems, commodities, or components; and common subsystems, commodities, and components. Within these categories, there should be various characteristics to be considered as the workload allocation and sourcing decisions are accomplished, to include:

- Title 10 U.S.C. applicability (Core, 50/50);
- Existing support process (e.g., contract, organic);
- Existing support infrastructure (in-place, to be developed);
- Best capabilities evaluation (public, private sector market research);
- Opportunities for Public/Private Partnering;
- Similar factors.

The development of an effective support strategy should consider all of these factors in arriving at best value decisions, using decisions tools, including BCAs, to develop the optimum support sourcing decisions.

12 Appendix K – Key References and Resources for the PSM

1. 2010 National Defense Authorization Act (NDAA), Public Law 111-84, Section 805, http://thomas.loc.gov/cgi-bin/t2GPO/http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=111_cong_bills&docid=f:h2647enr.txt.pdf
2. John Warner NDAA of 2007 Section 820a, http://thomas.loc.gov/cgi-bin/t2GPO/http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=109_cong_bills&docid=f:h5122enr.txt.pdf
3. November 2009 Weapon System Acquisition Reform: Product Support Assessment, https://acc.dau.mil/CommunityBrowser.aspx?id=328610
4. 2010 DoD Quadrennial Defense Review
5. Requirements for Life cycle Management and Product Support
6. DoD Directive 5000.01 - www.dtic.mil/whs/directives/corres/pdf/500001p.pdf
7. DoD Instruction 5000.02 - www.dtic.mil/whs/directives/corres/pdf/500002p.pdf
8. DoD Instruction 4140.1-R - www.dtic.mil/whs/directives/corres/pdf/414001r.pdf
9. Defense Acquisition Guidebook (DAG) Chapter 5 - https://acc.dau.mil/dag_5
10. DAU Logistics Community of Practice (LOG CoP) - https://acc.dau.mil/log
11. Product Support Manager (PSM) Homepage - https://acc.dau.mil/psm
12. PSM ACQuipedia Site - https://acc.dau.mil/CommunityBrowser.aspx?id=375980
13. Performance Based Life Cycle Product Support (PBL) Toolkit - https://acc.dau.mil/pbl
14. Life Cycle Sustainment Plan (LCSP) - https://acc.dau.mil/lcsp
15. DoD Logistics Human Capital Strategy (HCS) - http://www.acq.osd.mil/log/sci/hcs.html
16. Life Cycle Logistics ACQuipedia Repository - https://acquipedia.dau.mil/log_lcic.aspx
17. Life Cycle Logistics Blog - https://dap.dau.mil/career/log/blogs/default.aspx
18. SD-22 Diminishing Manufacturing Sources and Material Shortages: A Guidebook of Best Practices and Tools for Implementing a DMSMS Management Program - http://www.dau.mil/pubscats/PubsCats/Guidebooks.aspx
19. DoD Reliability, Availability, Maintainability-Cost (RAM-C) Report Manual - https://acc.dau.mil/CommunityBrowser.aspx?id=298606&lang=en-US
20. Corrosion Prevention and Control Planning Guidebook - http://www.corrdefense.org/Key%20Documents/CPC%20Planning%20Guidebook%20Spiral%203%20Final.pdf
21. Recommended Reading List - https://acc.dau.mil/CommunityBrowser.aspx?id=383460
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23. DAU Life Cycle Logistics Media Library - http://www.dau.mil/mpi/default.html
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13 Appendix L – List of Acronyms

3PL	Third Party Logistics
A_M	Materiel Availability
ANSI/EIA	American National Standards Institute/Electronic Industry Alliance
AOA	Analysis of Alternatives
APB	Acquisition Program Baseline
APU	Auxiliary Power Unit
ASL	Authorized Stockage List
ASTK	Acquisition Sustainment Tool Kit
BCA	Business Case Analysis
BFM	Business Financial Manager
CAIV	Cost as an Independent Variable
CAPE	Cost Assessment and Program Evaluation
CBM+	Condition Based Maintenance Plus
CCB	Configuration Control Board
CDA	Core Depot Assessment
CEA	Cognizant Engineering Activity
CITE	Center of Industrial and Technical Excellence
CLA	Core Logistics Analysis
CLS	Contractor Logistics Support
CM	Configuration Management
COCOM	Combatant Command
COTS	Commercial off the Shelf
CPAR	Contractor Performance Assessment Report
CPAT	Corrosion Prevention Advisory Team
CPC	Corrosion Prevention and Control
CRR	Cost Recovery Rate
CRSMP	Computer Resources Support Management Plan
CSA	Customer Service Agreement or Customer Support Agreement
CSA	Commercial Service Agreement
CSCI	Computer Software Configuration Item
CWT	Customer Wait Time
DAAS	Defense Automatic Addressing System
DAB	Defense Acquisition Board
DAG	Defense Acquisition Guidebook
DAMIR	Defense Acquisition Management Information Retrieval
DET	Displaced Equipment Training
DFAS	Defense Finance and Accounting Service
DID	Data Item Description
DISN	Defense Information System Network
DLA	Defense Logistics Agency
DLR	Depot Level Reparable

DM	Data Management
DMA	Depot Maintenance Activity
DMS	Data Management Strategy
DMSMS or DMS/MS	Diminishing Manufacturing Sources and Material Shortages
DoD	Department of Defense
DPO	Distribution Process Owner
DSOR	Depot Source of Repair
DVD	Direct Vendor Delivery
DVD	Direct Vendor Delivery
DWCF	Defense Working Capital Fund
EAC	Executive Advisory Committee
EDD	Estimated Delivery Date
EDI	Electronic Data Interchange
EMD	Engineering and Manufacturing Development
EMD	Engineering and Manufacturing Development
EMI	Electromagnetic Interference
EMP	Electromagnetic Pulse
ERP	Enterprise Resource Planning
ESOH	Environmental Safety and Occupational Health
EVM	Earned Value Management
FAR	Federal Acquisition Regulation
FCA	Functional Configuration Audit
FISC	Fleet and Industrial Supply Center
FMECA	Failure Mode, Effects, and Criticality Analysis
FMS	Foreign Military Sales
FOC	Full Operational Capability
FRACAS	Failure Reporting and Corrective Action System
FRP	Full Rate Production
FTA	Fault Tree Analysis
GEIA	Government Electronics & Information Technology Association
HCS	Human Capital Strategy
HSI	Human Systems Integration
ICE	Independent Cost Estimation
ICP	Inventory Control Point
ICS	Interim Contractor Support
IDE	Integrated Data Environment
IETM	Interactive Electronic Technical Manual
ILS	Integrated Logistics Support
IMA	Intermediate Maintenance Activity
IOC	Initial Operating Capability
IOT&E	Initial Operational Test and Evaluation
IPG	Issue Priority Group
IPS	Integrated Product Support
IPT	Integrated Product Team or Integrated Process Team

ISO	International Organization for Standardization
ISP	Information Support Plan
IUID	Item Unique Identification
JCIDS	Joint Capability Integration and Development System
JROC	Joint Requirements Oversight Council
JSCA	Joint Supply Chain Architecture
KPP	Key Performance Parameter
KSA	Key System Attribute
LA	Logistics Assessment
L&MR	Logistics and Materiel Readiness
LCC	Life Cycle Cost
LCM	Life Cycle Management
LCSP	Life Cycle Sustainment Plan
LECP	Logistics Engineering Change Proposal
LHA	Logistics Health Assessment
LORA	Level of Repair Analysis
LRIP	Low Rate Initial Production
LRT	Logistics Response Time
MIP	Materiel Improvement Plan
MOA	Memorandum of Agreement
MOSA	Modularity and Open Systems Architecture
MOU	Memorandum of Understanding
MRL	Manufacturing Readiness Level
MRO	Maintenance, Repair, and Overhaul
MS	Milestone
MSA	Materiel Solution Analysis
MTA	Maintenance Task Analysis
MTIS	Material Turned-in to Store
NAVICP	Naval Inventory Control Point
NDA	Non-Disclosure Agreement
NDAA	National Defense Authorization Act
NET	New Equipment Training
NMCS	Not Mission Capable Supply or Non-Mission Capable Supply
NWCF	Navy Working Capital Fund
O&M	Operations and Maintenance
O&S	Operations and Sustainment or Operations and Support
OASDOASD (L&MR)	Office of the Assistant Secretary of Defense, Logistics and Materiel Readiness
OEM	Original Equipment Manufacturer
OJT	On-the-Job Training
OPEVAL	Operations Evaluation
OPLAN	Operations Plan
OPORD	Operations Order
OSD	Office of the Secretary of Defense

P&D	Production and Deployment
PBA	Performance Based Agreement
PBBM	Performance Based Business Model
PBH	Power by the Hour [©Rolls-Royce]
PBL	Performance Based Logistics
PCA	Physical Configuration Audit
PEO	Program Executive Office or Program Executive Officer
PESHE	Programmatic Environmental, Safety and Occupational Health Evaluation
PHS&T	Packaging, Handling, Shipping, and Transportation
PM	Program Manager
PMF	Performance Measurement Framework
POC	Point of Contact
POF	Perfect Order Fulfillment
PPAIS	Past Performance Automated Information System
PPBE	Planning, Programming, Budgeting, and Execution
PPP	Public-Private Partnership
PQDR	Product Quality Deficiency Report
PSA	Product Support Agreement
PSBM	Product Support Business Model
PSDM	Product Support Decision Matrix
PSI	Product Support Integrator
PSM	Product Support Manager
PSP	Product Support Provider
R&M	Reliability and Maintainability
RAM	Reliability, Availability, and Maintainability
RBS	Readiness Based Sparing
RCM	Reliability Centered Maintenance
RDD	Required Delivery Date
RDT&E	Research, Development, Test, and Evaluation
RFID	Radio Frequency Identification
ROI	Return on Investment
RSSP	Replaced System Sustainment Plan
RTAT	Repair Turn Around Time
SAR	Selected Acquisition Report
SCM	Supply Chain Management
SCOR®	Supply Chain Operations Reference-model
SDR	Supply Discrepancy Report
SEP	Systems Engineering Plan
SIM	Serialized Item Management
SLA	Service Level Agreement
SLEP	Service Life Extension Program
SME	Subject Matter Expert
SML	Sustainment Maturity Level

SOO	Statement of Objectives
SOW	Statement of Work
SRT	Stock Repositioning Time
SRU	Shop Repairable Unit
SSA	Supply Support Activity
SSA	Strategic Supplier Alliance
STO	Stock Transfer Order
TADSS	Training and Training Aids Devices Simulators and Simulations
TD	Technology Development
TDD	Time Definite Delivery
TDR	Transportation Discrepancy Report
TEMP	Test and Evaluation Master Plan
TI	Technology Insertion
TM	Technical Manual
TOC	Total Ownership Cost
TPM	Technical Performance Metric
TRL	Technology Readiness Level
TSCMC	Total Supply Chain Management Cost
TWCF	Transportation Working Capital Fund
USTRANSCOM	US Transportation Command
VAMOSC	Visibility and Management of Operation and Support Cost
WCF	Working Capital Fund
WSD	Weapon System Diagnostic
WSRT	Wholesale Stock Replenishment Time