The Product Support Triad: A Critical Convergence

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In the "bad old days" of the Cold War, the United States relied on a strategic deterrence "triad:" long-range bombers, land-based intercontinental ballistic missiles (ICBMs), and mobile nuclear submarine-based ballistic missiles. The combination of these deterrents ensured that a viable strategic deterrence was always maintained.

Similarly, effective product support relies on a triad of focused (and carefully chosen) sustainment outcome metrics, effective interaction among the integrated product support (IPS) elements, and appropriately comprehensive governance.

Over the past several years, statute and DoD policy changes have significantly reinforced product support activities and procedures that, while always acknowledged as best practices, have often fallen victim to budget constraints and real-world events. The enhancements facilitated by the 2009 Weapon Systems Acquisition Reform Act (WSARA), OSD policy memoranda, the *Weapon System Acquisition Reform Product Support Assessment*, and

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implementing DoD and Service guidance are not radical; the cumulative effect has been to significantly strengthen the role of life cycle logisticians in weapon systems acquisition and to strongly re-emphasize the need to design for support, design the support, and support the design. In other words, deliver affordable readiness to the warfighter—and "affordable" in this case applies not only to the acquisition of the weapon system itself, but to its sustainment "tail." How does the triad enable these best practices?

Why Are Sustainment Outcome Metrics So Important?

Most acquisition professionals are aware that sustainment outcome metrics are focused on warfighter requirements, principally the availability components as well as materiel reliability, mean down time, and ownership cost. The sustainment key performance parameter (KPP) and key system attributes (KSAs) form the basis for development of performance-based life cycle product support metrics.

It is an article of faith in the life cycle logistics community that emphasis on reliability early in the life cycle will pay substantial supportability (and availability) dividends once a system is operational. Of particular note is the *Reliability, Availability, Maintainability–Cost* (RAM–C) *Rationale Report Manual*. The purpose of this manual is to assist combat developers, program managers, engineers, and life cycle logisticians in designing RAM into systems early in a program affordably, helping reduce overall life cycle costs.

Whether purely organic, purely commercial, or (most likely) a combination of public and private product support arrangements, DoD's clear preference for performance-based product support, articulated in DoD Directive 5000.01 and DoD Instruction 5000.02, dictates a careful selection of life cycle sustainment outcome metrics upon which these arrangements can be based. Great care must be exercised in determining these metrics; they must reflect and support the warfighter's requirements, particularly those contributing to operational availability, while bearing in mind the axiom, "Be careful what you ask for; you may get it."

Why Are integrated product support (IPS) Elements So Important?

The 12 recently established IPS elements, outlined in the April 2011 DoD *Product Support Manager Guidebook* (https://acc.dau.mil/psm-guidebook), serve as a powerful enhancement and update to the traditional ten Integrated Logistics Support (ILS) elements. Why was this done? The two additional elements, product support management and sustaining engineering, reflect the PSM and life cycle logistician's enhanced enterprise roles and responsibilities that transcend the traditional logistics domain.

The PSM, a key leadership position established by Congress in Public Law 111-84, Section 805, needs to be able to interface effectively with senior leaders from other functional domains including program management, contract management, business and financial management, and systems engineering, in order to develop and implement a viable product support strategy. The IPS elements not only address this need by identifying and defining the associated activities of the PSM, but more importantly convey how these activities are to be accomplished. Furthermore, the product support management element in particular provides the framework for the integration of all the other 11 IPS elements so that the product support solution that is delivered to the warfighter is fully integrated and meets the warfighter's needs in terms of readiness, reliability, and affordability.

Sustaining engineering, another of the 12 IPS elements, reflects the full life cycle focus of the PSM and the kinds of design interface activities, including reliability (the ability of a system and its parts to perform its mission without failure under a prescribed set of circumstances), availability (the degree to which an item is in an operable state and can be committed at the start of a mission at a random point in time), maintainability (the ability of an item to be retained in, or restored to, a specified condition), supportability (includes design, technical support data, and maintenance procedures to facilitate detection, isolation and timely repair or replacement of system anomalies), and affordability (the degree to which the life-cycle cost of an acquisition program is in consonance

Sustainment Metrics Definitions

Availability KPP: Mandatory for ACAT I; sponsor decision for ACAT II/III. Two components:

- **Materiel Availability:** Percentage of the total inventory of a system operationally capable of performing an assigned mission at a given time (Number of Operational End Items/Total Population)
- **Operational Availability:** Percentage of time a system or group of systems within a unit are operationally capable of performing an assigned mission (Uptime/(Uptime + Downtime))

Mandatory KSAs:

- **Materiel Reliability KSA:** Probability that system will perform without failure over a specified interval. MTBF = (Total Operating Hours/Total # of Failures)
- **Ownership Cost KSA:** Based on Cost Analysis Improvement Group (CAIG) elements: unit operations, energy/POL, maintenance, sustaining support, continuing system improvements, regardless of funding source (O&S Costs Associated w/ Materiel Readiness)

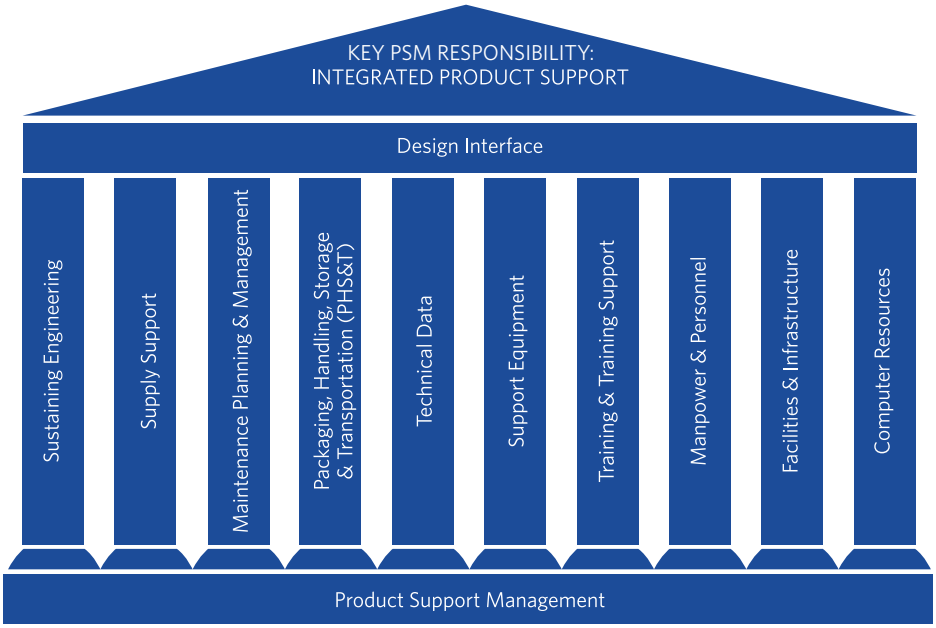
Plus a fourth Sustainment Outcome Metric: Mean Down Time

- A measure of average Total Downtime required to restore an asset to its full operational capabilities. MDT = (Total Down Time for All Failures/Total Number of Failures)

with the long-range investment and force structure plans), which carry over into the operations and support (O&S) phase of the life cycle. Other modifications to the traditional 10 ILS elements include:

- Maintenance planning transitions to maintenance planning and management, to incorporate maintenance management and execution activities along with the maintenance planning activities
- Training and training equipment becomes training and training support, emphasizing the life cycle focus of the training strategy and implementation
- Facilities becomes facilities and infrastructure, highlighting the fact that facilities are more than simply "brick and mortar" buildings
- Computer resources support changes into computer resources, bringing the computer resources support ILS element up to date by providing more focus on the information technology aspects of computer resources.

Figure 1. IPS Element 'Pillars'



To facilitate implementation, execution, and understanding of these 12 elements, the *IPS Element Guidebook*, fielded by DAU in November 2011, provides detailed information about each of the 12 elements and complements Appendix A of the *PSM Guidebook* by providing definitions for each IPS element and sub-element. It also identifies key activities and products for each IPS element and provides a much-needed "how to" for these activities throughout the life cycle. The guidebook is an invaluable reference in helping the program logistician answer the "what, how, and when" product support planning and execution questions.

Key Product Support Governance References

DoD Directive 5000.01
https://acc.dau.mil/CommunityBrowser.aspx?id=314789

DoD Instruction 5000.02
https://acc.dau.mil/CommunityBrowser.aspx?id=332529

Defense Acquisition Guidebook, Chapter 5
https://dag.dau.mil/

Product Support Manager Guidebook
https://acc.dau.mil/psm-guidebook

Business Case Analysis (BCA) Guidebook

Reliability, Availability, Maintainability, and Cost Rational Report Manual
https://acc.dau.mil/CommunityBrowser.aspx?id=298606

Integrated Product Support Element Guidebook
(link to be provided—not published as of 11-15-11)

Why Is the Added Emphasis on Governance So Important?

What exactly is governance? For our purposes here, "governance" relates to "consistent management, cohesive policies, guidance, processes and decision-rights for a given area of responsibility." Simply put, the increased emphasis on life cycle management governance is intended to both improve product support and enhance the tool kit available to program product support personnel. As a life cycle logistician in weapon system acquisition, what am I supposed to be doing—and when? The recent emphasis in public law, OSD policy, and specific areas addressed by the new guidebooks all strive to answer not only the "what?" but also the "how?" Outcomes are critical, but we also need to make sure our workforce knows routes as well as destinations.

The recent emphasis on product support and life cycle management governance can be categorized as both strategic and tactical. The strategic governance addresses—among other topics—the increased emphasis on affordability in the acquisition of weapon systems, initiatives grouped under the broad rubric of better buying power. Strategic governance also continues to emphasize and clarify the roles and responsibilities of key program personnel (e.g., the product support manager). As another example, the sustainment "quad chart" (Figure 2) mandated by DoD policy for major defense acquisition programs (MDAPs), focuses on those areas key to effective product support: the sustainment approach and related issues, schedule, metrics, and cost. While required only for MDAPs, the focus areas actually apply equally to all programs; the chart provides an excellent "snapshot." Is any of this re-

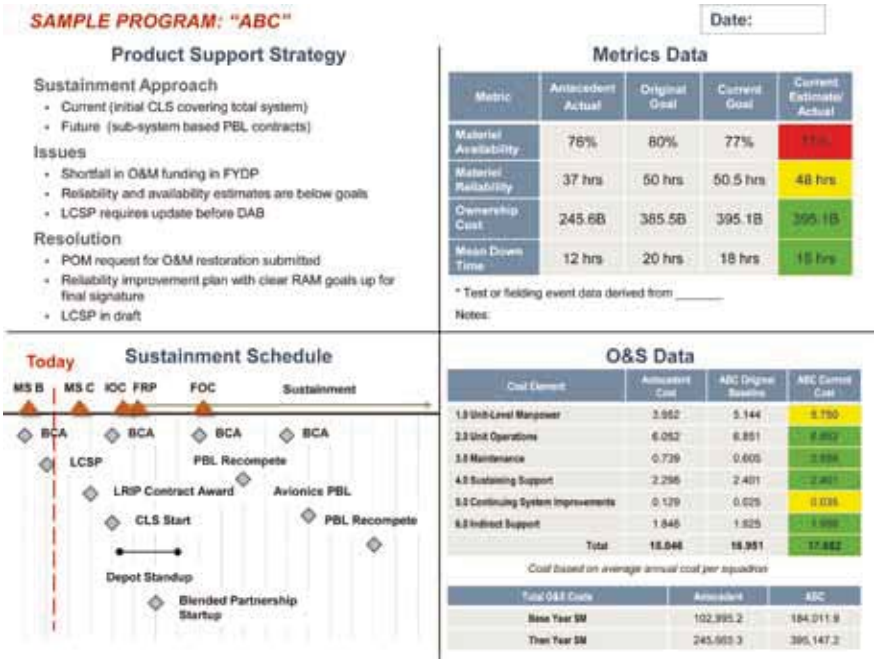
ally new? Generally not; most of the recently issued product support governance policy seeks to reinforce and reemphasize practices and procedures that experience has taught will lead to effective and affordable supportability. The "quad chart" has become a critical component of major program reviews as well as milestone decision reviews; the emphasis on planning for affordable sustainment has migrated from "the last bullet on the last chart in 'backup'" to the forefront of acquisition decisionmaking.

The governance tactical focus is on "news you can use." *The PSM Guidebook, the BCA Guidebook, the Logistics Assessment Guidebook*, and others still in development (all of which can be accessed at https://acc.dau.mil/productsupport) each concentrate on the "how to and when" aspects of product support planning and implementation. See sidebar for a list of some of these important tools. Again, most of the content of these documents is not radically new—but for the first time, the life cycle logistician and program leadership have comprehensive, detailed resources that will lead to supportability success.

Three-Legged Stools Are the Most Stable

The renewed—and increased—emphasis on metrics, integrated product support, and product support governance is important to the program logistician, certainly. But this emphasis also benefits the customer, the program manager, the system engineer—basically all stakeholders—because it focuses activities and resources on a common goal and contributes directly to integrating program efforts toward a common goal.

Figure 2. Sample Quad Chart



These three key areas—sustainment metrics, the integrated product support elements, and governance—meld together to provide program managers, product support managers, system engineers, and life cycle logisticians a detailed structure and body of process knowledge leading to our ultimate goal: delivering to the warfighter weapon systems that meet their validated requirements, and which the taxpayers can afford.

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Leveraging Better Buying Power to Deliver Better Product Support Outcomes

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How often have you heard the expression that systems are "thrown over the fence" from acquisition to sustainment? Or that systems which transition from acquisition to sustainment often didn't adequately plan for and fund sustainment? As a result of this real or perceived scenario, the under secretary of Defense for acquisition, technology and logistics (USD(AT&L)) has been elevating the prominence of sustainment planning in requirements and acquisition, and instantiating it in policy documentation.

The import of sustainment planning and implementation is also reflected in the Sept. 14, 2010 USD(AT&L) memorandum, *Better Buying Power: Guidance for Obtaining Greater Efficiency and Productivity in Defense Spending*, which requires programs to establish an affordability target for a system's life cycle cost at Milestone A. It specifically states that in addition to a program's acquisition cost, the affordability calculation must include the system's operations and support (O&S) costs.

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The Nov. 3, 2010 USD(AT&L) memo, *Implementation Directive for Better Buying Power—Obtaining Greater Efficiency and Productivity in Defense Spending*, provides implementation detail that is more tactical and establishes the O&S cost baseline to be the "…average annual operating and support cost per unit." This requires a disciplined process to assess the new system's O&S cost for use in the "…quantitative analysis of the program's portfolio or mission area across the life cycle of all products in the portfolio or mission area."

The memo goes on to mandate that for new programs, specific adjustments to portfolio or mission areas will be identified to absorb the new program. This requires strong and detailed communication between the three communities of the DoD Decision Support System—the Joint Capabilities Integration and Requirements System (requirements), the Defense Acquisition System, and the Planning, Programming, Budgeting and Execution System.

For Milestone B, the memo changes the affordability target to an affordability requirement and further illuminates the O&S element; it also requires programs to document the affordability requirement in the Acquisition Decision Memorandum (ADM) and ensures linkage to the O&S cost element of the Acquisition Program Baseline (APB). While some may perceive this as a new requirement, it is not; rather, it builds on existing statutory language in Title X, Section 2435, baseline description, which specifically cites supportability as a parameter to be included in the baseline (e.g., acquisition program baseline). This has also long been reflected in the selected acquisition reports (SAR) within the report's O&S cost section.

Another cited element in the Better Buying Power memos that specifically affects sustainment is open systems architecture and the related acquisition of technical data rights. This is an integral element of the engineering tradeoff analysis that will be completed and presented at a program's Milestone B. A major purpose for the two elements is to ensure the government has the right information to compete future contracts (i.e., design documentation, interfaces, tools and information that can be shared with others). The data rights included in this element are not new, though arguably they may represent a poorly understood area, especially with respect to the sustainment aspects of technical data. Title X, Section 2320, Rights in Technical Data, has been in force for many years and instantiated in various Defense Federal Acquisition Regulation Supplement sections, and is dependent on multiple factors:

- Rights granted to the government depend on the nature of the data (form, fit, function, operations, maintenance, installation, and training)
- The source of funding for the item, process, or computer software (100 percent government, 100 percent private, mixed)
- Whether the government secured data rights through other agreements (cooperative research and development agreements)

Although planning and implementation of technical data rights is not the primary purpose of this article, data rights decisions made during acquisition do have far-reaching implications over the system's life cycle including sustainment activities. Specifically, the Better Buying Power memos require a business case analysis (BCA) that includes "…acquiring technical data rights to ensure sustained consideration of competition in the acquisition of weapon systems." By extension, the information in the initial BCA for technical data rights should inform the sustainment BCA completed to support Milestone B; the sustainment BCA was mandated in the same legislation and subsequent directive type memo that established the product support manager. As programs progress through the acquisition cycle, there exists a deliberate and effective review process that in the year since the BBP memos release, has now grown to include most or all of the major tenets of BBP. This includes the sustainment aspects of BBP which linked directly with ongoing sustainment governance and visibility improvements in the acquisition process.

The integrated process team (IPT) system has been one of the primary beneficiaries of BBP changes. From the lowest-level working IPT (WIPT), through the more senior Integrating IPT (IIPT) and overarching IPT (OIPT), up to the Defense Acquisition Board (DAB), BBP initiatives are now mandatory reporting elements for each program. All programs report on will cost/should cost implementation initiatives. Will cost/should cost is an analytical process that seeks to preclude cost overruns from exceeding the independent cost estimate (will cost) at which the program is funded, by conducting disciplined analysis of all government and contractor cost elements to arrive at a should-cost figure. Portfolio reviews for all systems within a given commodity group are mandatory briefing elements. Presentations on the development and status of affordability targets are now required.

While the primary focus of these particular BBP directives has been in the acquisition realm, there are a number of examples of programs applying them to sustainment, which is becoming the norm for programs coming before IPT or DAB meetings. The OHIO Class ballistic missile submarine replacement program is a prime example. The OHIO Replacement (OR) went through its Milestone A decision in late 2010, following a lengthy analysis of alternatives review. In the procession of meetings leading up to the DAB, it was evident that both the acquisition and sustainment cost projections were becoming unaffordable. The OR program became the first major program to have the BBP initiatives applied to it.

At the OR DAB, the USD(AT&L) cited the Navy's unit costs and O&S costs as too high and unaffordable. Using the new affordability target mandate for Milestone A, USD(AT&L) and the Navy worked to shed additive capabilities beyond the mini-

mum requirements for national security to lower the unit cost. Additionally, the Navy's assumptions on their average annual O&S cost per boat were declared unaffordable, and the Navy committed itself to a target that will match or improve upon current OHIO class O&S costs. Similarly, the littoral combat ship (LCS) program had a hard requirement for annual support costs set at their Milestone B decision in early 2011. These actions were merely the first examples of the enhanced amount of attention that sustainment and sustainment affordability now receive at programmatic reviews.

Another review forum that has seen increased sustainment focus and attention is the Defense Acquisition Executive Summary (DAES) meeting. All major defense acquisition programs (MDAPs) submit quarterly DAES reports, which are also assessed by OSD, and then a review is held monthly on select programs. The DAES process is used by DoD to monitor and assess the health of programs and identify and resolve risks before they become issues. Use of the DAES meeting as a forum for programmatic decision-making has been growing over the last 2 years to the point where DAES meetings have become equal to OIPTs in the amount of detail covered. Sustainment is not lacking for emphasis in this expansion.

Sustainment issues are primarily addressed on the Sustainment Quad Chart (Figure 1). The quad chart, which covers sustainment strategy, schedule, sustainment metrics performance and O&S costs, was mandated for all programmatic reviews in April 2010 by the USD(AT&L). It proved extremely popular in OSD management of sustainment issues, and its use was mandated for all DAES reviews. At the DAES meetings, sustainment performance and overall affordability are considered on par with all other programmatic decision making. Affordability targets/requirements are tracked directly in the O&S cost portion of the quad chart, tying directly into the other mandatory BBP slides in the DAES brief. The product support manager (PSM) needs to be an activist in ensuring the chart reflects the current sustainment picture. It is an opportunity to highlight issues that require resolution or show off where a program has excelled in sustainment.

The acquisition phase has been the primary focus of the other initiatives of BBP. From mandatory reviews of should cost/will cost to portfolio views of similar systems, acquisition costs currently receive most of the attention. This should not be the case. The PSM should be actively seeking to find sustainment savings in a should-cost environment. When the CAPE gives their O&S cost projection in the independent cost estimate (ICE), the PSM should treat this as a challenge to provide the required sustainability at a better cost relative to the ICE. The majority of expenditure for a program will be O&S dollars, so a true affordability focus cannot overlook sustainment costs.

Similarly, a true portfolio view of costs would look at O&S expenditures, not just the acquisition budget. In a period of flat or declining budgets, fielding a new system that costs more than what it replaces is probably not affordable. An excellent example of this type of concern is the Army's cost control efforts on the Ground Combat Vehicle ahead of the Milestone A decision in mid-2011. Emphasis on affordability across the life cycle led the Army to review and agree to an annual support cost per vehicle in consumables and repairables, compared to both what it was replacing, and the total expenditures in their heavy brigade portfolio.

Understanding the overall affordability now leads to better decision-making and a more supportable and affordable capability for the future warfighter. The Sustainment Quad Chart is the PSM's primary tool for highlighting the sustainment elements of a program, but a PSM's role does not end there. Capitalizing on the initiatives in the BBP memos, the PSM needs to understand how they affect their engagement in the program and its review process. While the largest potential savings are in the sustainment phase, an activist PSM should develop and present their program manager alternatives and analyses on the BBP tenets during the acquisition cycle. The current fiscal and political climate is ripe for aggressive promotion of affordability initiatives, with sustainment having an equal seat at the table for the first time.

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Figure 1. Sample Sustainment Quad Chart