

## Recommendation 41: Establish a sustainment program baseline, implement key enablers of sustainment, elevate sustainment to equal standing with development and procurement, and improve the defense materiel enterprise focus on weapon system readiness.

### Problem

Defense sustainment is a highly complex system of systems operating without fully coordinated requirements, under multiple commands and departments, receiving separate funding streams, often yielding disconnected decisions on total weapon system readiness, operating without sufficient data intelligence, with success graded on disconnected measures. The current state of readiness is driven by structure and strategy implications of decisions that focus on business concepts rather than the required outcome or customer measure of success or failure. Accountability is diffused to the point that no single authority is responsible for material readiness to meet operational requirements.

DSS suffers from shortcomings that inhibit its performance:

- There is no single document that governs sustainment costs, schedule, and performance throughout the lifecycle of a program (weapon system).
- Sustainment leadership expertise on SAE staffs is not given the same credence as acquisition and procurement.
- Issues in cost estimation, contracting, *color of money*, intellectual property (IP) and data rights, and metrics and data analytics impede sound sustainment decisions and timely actions.
- The Defense Materiel Enterprise (DME) is not sufficiently focused on weapon system readiness.

### ***Lack of Governance for Sustainment***

During development and production, the APB constrains a program's cost, schedule, and technical performance in terms of objectives and thresholds, but the APB provides little governance over the sustainment phase of a program's lifecycle. The APB is the governing document from program start (Milestone B) through full-rate production (FRP), yet this critical document pertains to less than one-third of the program's lifecycle costs and an even smaller portion of its life.<sup>1</sup> The PM reports program progress toward the thresholds in the APB to the MDA, the SAE, and Congress. Exceeding APB thresholds can cause a statutory Nunn–McCurdy breach and possible program cancellation. The APB, with its consequences for failure, has proven to be a strong motivator for the DAS. There is no equivalent governing document for programs in sustainment. Once fielded, a weapon system is supported by multiple individual sustainment organizations, each providing singular product support elements. Because there is no coordinated and constrained governance for program sustainment, weapon system readiness has become the unpredictable outcome of an unconstrained and unfocused

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<sup>1</sup> O&S costs are estimated to make up as much as 70 percent of the total lifecycle cost of DOD's major weapon systems. S. Report 112-26, *Report to Accompany the National Defense Authorization Act for Fiscal Year 2012*, June 22, 2011, 136.

defense sustainment system. As a result, PMs can find their programs affected by external budgetary and policy decisions with little opportunity to recover in a timely manner.

By DoD policy (DoDI 5000.2), PMs are responsible for cost, schedule, and performance management of their programs throughout the lifecycle. Although PMs can appropriately manage development and procurement during acquisition, they do not have the authority or capability to manage weapon system sustainment that delivers readiness. Instead, readiness is controlled by the sustainment *silos* providing the product support elements within the DoD sustainment system.

### ***Standing of Sustainment***

Sustainment does not stand on equal footing with development and procurement during the acquisition phase of a program. Responsibility and accountability for sustainment management do not converge on any single organization or individual focused on weapon system readiness. Sustainment costs are born out of design trades and decisions made during a program's development and procurement. Sustainment funding has often been used as the PM's *management reserve* (MR) to meet unplanned program issues during development and production, likely because deferment of product support activities is believed to be recoverable later in the program. Delays in planned product support investments affect reliability and maintainability and substantially increase support costs and affect readiness. Requirements officials tend to focus more on traditional operational performance factors (i.e., speed, range, firepower) and less on sustainability (i.e., availability, reliability, maintainability, ownership costs). As a result, the latter often are subsumed by design trades and unforeseen cost increases during acquisition.

### ***Sustainment Activities Lack Modern Enablers***

Planning and investments for sustainment activities are further inhibited by issues with funding types and obligation rates, procurement restrictions, cost modeling, IP and data rights, and lack of knowledge sharing across the enterprise. Cost estimating tools for total lifecycle costs have not evolved as much as those used to calculate development and production costs. As a result, models used to determine lifecycle costs do not produce reliable calculations. Unlike commercial counterparts, military systems in general lack sufficient data to support use of data analytics. Commercial entities warehouse system performance data and constantly analyze it looking for trends that can help predict when preventive maintenance can be done to avoid costly, sometimes catastrophic repairs. This same data can be used to support effective decision making throughout the system's lifecycle.

### ***Defense Materiel Enterprise Lacks Alignment***

Readiness shortfalls can be seen in every Military Service. GAO reports for several years have documented critical readiness issues. Factors such as 17 years of war and the effects of the Budget Control Act of 2011 (resulting in sequestration) have led to the readiness state decried by the Service Vice Chiefs in their recent testimony before Congress.<sup>2</sup>

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<sup>2</sup> Statement of General Stephen W. Wilson, Vice Chief of Staff, U.S. Air Force, before the Senate Armed Services Subcommittee on Readiness and Management Support, February 14, 2018, accessed January 4, 2019, [https://www.armed-services.senate.gov/imo/media/doc/Wilson\\_02-14-18.pdf](https://www.armed-services.senate.gov/imo/media/doc/Wilson_02-14-18.pdf).

Sustainment issues were highlighted by USD(A&S) Ellen Lord when she said, “sustainment costs for the F-35 are unaffordable.”<sup>3</sup>

In implementing the Goldwater–Nichols Act of 1986, development and procurement were separated from sustainment within DoD. One of the principle intents of this legislation was to clearly reassert civilian control of the military. An unintended consequence, however, was a disenfranchisement of the sustainment community.

## Background

DoD must be able to immediately counter multipronged, sustained threats, yet the current logistics and sustainment system lacks the agility needed to do so. For decades, product support and sustainment management have been secondary to development and procurement within the DAS. Military systems have remained in service far longer than originally planned. Maintaining required spares for postproduction systems has been challenging as the government and industry have placed higher priority on new acquisitions. This lack of attention to product support and sustainment management has led to degraded weapon system readiness, rising sustainment costs, and insufficient supply support, and in parallel created suboptimal conditions in maintenance training, maintenance publications, provisioning, and repair capability.

DAS is focused on program development and procurement and is governed by the APB. Weapon systems sustainment is funded and managed by the operational side of DoD. Separation of sustainment from development and procurement yields an approach to acquisition that focuses on technical solutions for a program, at the expense of balanced weapon systems sustainment throughout the lifecycle.

Existing regulations and policies establish reviews at each program milestone to ensure adherence to all aspects of defense acquisition. These reviews are supported by senior level staffs with expertise regarding the operational environment, requirements, and defense acquisition. Senior officials at levels equivalent to those for development and procurement—with the requisite expertise for product support management—are less represented. The system’s focus on development and procurement, with an attendant lack of appreciation, expertise, and accountability for weapon systems sustainment can preclude needed discussion on the supportability aspects of a system at these milestone reviews.

Program funding flows from Congress to the Military Services through a variety of appropriations and is channeled not only to the program but also to siloed organizations that will ultimately support the product. This partitioning of program sustainment funding leads to an incomplete accounting of

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<sup>2</sup> Statement of Admiral William F. Moran, Vice Chief of Naval Operations, U.S. Navy, before the Senate Armed Services Subcommittee on Readiness, accessed January 4, 2019, [https://www.armed-services.senate.gov/imo/media/doc/Moran\\_02-14-18.pdf](https://www.armed-services.senate.gov/imo/media/doc/Moran_02-14-18.pdf).

<sup>2</sup> Statement of General James C. McConville, Vice Chief of Staff, U.S. Army, before the Senate Armed Services Subcommittee on Readiness, accessed January 4, 2019, [https://www.armed-services.senate.gov/imo/media/doc/McConville\\_02-14-18.pdf](https://www.armed-services.senate.gov/imo/media/doc/McConville_02-14-18.pdf).

<sup>2</sup> Statement of General Glen M. Walters, Assistant Commandant, U.S. Marine Corps, before the Senate Armed Services Subcommittee on Readiness, accessed January 4, 2019, [https://www.armed-services.senate.gov/imo/media/doc/Walters\\_02-14-18.pdf](https://www.armed-services.senate.gov/imo/media/doc/Walters_02-14-18.pdf).

<sup>3</sup> “Pentagon ‘can’t afford the sustainment costs’ on F-35, Lord says,” Aaron Mehta, *Defense News*, accessed March 29, 2018, <https://www.defensenews.com/air/2018/02/01/pentagon-cant-afford-the-sustainment-costs-on-f-35-lord-says/>.

critical resources such as manpower, training, spares, engineering, depot repair, and support equipment.

With each element of the sustainment organization devising, constructing, and implementing its own data and metrics, contradictory objectives can arise. The result is an incomplete set of metrics and an inability to use shared data visible to all stakeholders and to provide a reliable indication of sustainment health for weapon systems or the overall condition of the capability portfolio within which the platforms reside.

The DME consists of the materiel systems and supply commands and the DoD industrial base that comprise product support and sustainment management for DoD. Membership in this enterprise is not officially designated but is understood to mean everything and everyone associated with developing, procuring, storing, distributing, repairing, and supporting DoD's warfighting capability. It includes contracted support but, historically, industrial base assessments have not included the contractor element. This approach presents an incomplete picture of the DME's capacity.

## **Discussion**

Several key shortcomings exist regarding sustainment management:

- There is a lack of alignment and governance of program sustainment cost, schedule, and performance over the entire lifecycle.
- The SAE staffs do not include sustainment professionals at an equivalent level of authority to the development and procurement senior staff and leadership.
- Key enablers for modern sustainment are missing across the enterprise.

### ***Establish a Sustainment Program Baseline***

The PM's focus during development and production is on meeting the APB's cost, schedule, and performance thresholds. The effects of these shortfalls and trade-offs are not generally realized until years later, after the successful milestone decision and following the tenure of the PM who made the decision. The DAS focuses more on ensuring the program is meeting the requirements of the APB and less on the ability to sustain the system in the future.

Warfighters receive weapon systems as a product of the DAS and depend on the sustainment system to provide the product support required for operational readiness of the weapon system. On average, approximately 72 percent of weapon systems lifecycle costs are in sustainment, yet there is no mechanism for coordinated governance of this critical operational program phase. The Section 809 Panel researched major defense programs and found the APB to be an effective tool for guiding, governing, and constraining the development and production of major weapon systems.

During design, alternatives are weighed for performance and affordability. The PM must balance these factors and make decisions that will affect supportability and sustainment costs, both of which are outside the APB constraints. Small design trade-offs rarely affect total lifecycle costs enough to cause a program cost breach. Programs typically do not fail a milestone or breach the APB because of underfunded or delayed product support.

During development and procurement, PSMs are planning for and engaged in activities that will provide for the effective sustainment of the system after fielding. Critical product support milestones occur after the APB's final milestone review: the FRP decision. Critical sustainment milestones such as the material support date (MSD) and depot stand-up require planning, coordination, and funding years in advance of fielding, but they fall victim to design trades and budget reallocations to meet performance needs. Accordingly, early funding for sustainment investments is at risk because it is used as a source to fund development cost growth.

Despite efforts to increase visibility of design decisions affecting product support requirements, when technical or budgetary challenges arise during development and procurement, PMs have at times been forced to trade off programs' future (outside the APB) to solve a current problem (inside the APB). The consequences of these deferrals and trade-offs are not realized until years later, after weapon systems are fielded and milestones completed. Decisions on program requirements, performance, and configurations made early in the acquisition process will largely determine a system's Operating and Support (O&S) costs, and opportunities to reduce or avoid O&S costs diminish as a program advances through the lifecycle.

KPPs and key system attributes (KSAs) for system lifecycle management are being included in program APBs; however, once a program has passed Operational Test and the FRP milestone decision, the APB is no longer a strong motivator for the PM or RM (A8/G8/N8).

PMs are responsible for the program's development and procurement and have the authority, autonomy, tools, and funding to manage to the parameters specified in the program's APB, which is approved by the resource manager, MDA, and the PM. DAS is program-focused with the following characteristics:

- It is a highly complex system of systems with one primary governing program document: the APB.
- There are clearly defined and accountable officials: the PM, the MDA, and the resource manager.
- Funding streams are directed to the program per APB thresholds.
- Programs are *strongly* managed, funded, and measured to specific outcomes: Operational Test and Evaluation and FRP.
- Program success is measured by meeting APB thresholds and achieving milestone approval.
- The organizations' objectives, metrics, and funding are focused on program success.

In post-production, the PM and PSM are responsible for sustainment, but do not have sufficient authority, requirement, or funding to successfully manage the independent product support elements amongst the sustainment silos. With rare exception, there is actually no one individual truly responsible or empowered to manage a program's sustainment for operational readiness; no single

official is held accountable for readiness shortcomings. Some of the challenges within the sustainment system include the following:

- The system includes process-focused sustainment silos that are *not* program-focused.
- It is a system that is *not* managed, funded, or measured by the outcome: program readiness.
- There are multiple funding streams to independent organizations without regard for program readiness requirements.
- Organization objectives, metrics, and funding are self-reflecting.
- It is a highly complex system of systems consisting of disconnected sustainment silos.
- There is no accountable official for programs' readiness.

The following are significant challenges in the acquisition and sustainment systems:<sup>4</sup>

- Product support is a low priority and often becomes the funding source for unplanned program shortfalls, because there are no consequences for the PM or the program under the APB.
- Supportability KPPs and KSAs are not well used during weapon system design and are not measured or evaluated during the sustainment phase.
- The sustainment system is a collection of independent and specialized organizations that lack governance and accountability for the weapon systems readiness it supports.
- The acquisition system is program focused and governed by the APB.

Program offices lack appreciation of the effects of delaying sustainment planning. Issues that were consistently expressed by subject matter experts (SMEs) include the following:

- Resources for product support and sustainment planning were not allocated and controlled early in the development process.
- Funding requirements for minimum capability for product support and maintenance were ill defined.
- Warfighters were not sufficiently engaged to address product support and sustainment requirements.
- Government and industry were not aligned regarding product support planning, incentives to improve reliability and maintainability, and sustainment.

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<sup>4</sup> Information gathered during Section 809 Panel Sustainment Workshops, February–March 2018.

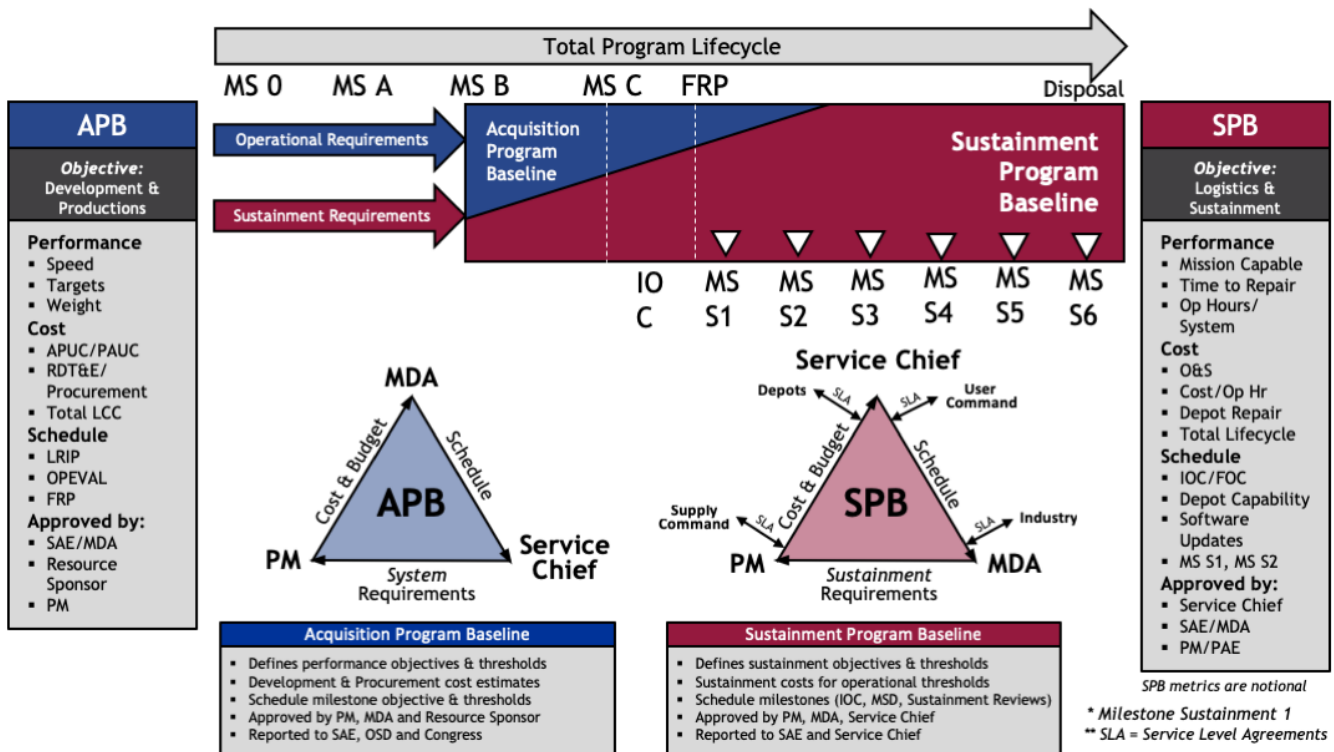
SPB would improve the current shortcomings outlined in both the acquisition and sustainment systems that are affecting both operational costs and readiness. The SPB would be the governing document for product support and sustainment over the entire program lifecycle. The SPB would have the same three stakeholders as the APB: the PM, the resource sponsor, and the MDA – facilitating a long-term commitment that will enhance readiness.

**The SPB in Development and Procurement**

The SPB would be generated during concept exploration and consider the key cost and readiness drivers that would influence trade-off considerations. During this early phase, sustainment goals could include annual operating costs, security, maintainability, transportability, mobility, availability, personnel, and the support and repair concepts. The APB would remain the key document during development and production. The importance of the SPB would increase over time. The relationship between SPB and APB is depicted notionally in Figure 2-16.

The SPB would mature with the program and product development. Sustainment performance requirements would start out as estimates and be further refined through the course of a program. As the strategy, costs, and performance parameters of the program’s plan for sustainment evolve, the SPB would capture the critical parameters to govern the program’s sustainment strategy after FRP. The budget and funding for *all* product support requirements and lifecycle costs would be identified in the SPB to reflect the strategy, plans, and milestones outlined in the lifecycle sustainment plan (LCSP). The critical product support milestones from the LCSP would be reflected in the SPB. The APB and SPB would be reviewed and approved at program acquisition milestones.

**Figure 2-16. Sustainment Program Baseline in the Acquisition Lifecycle**



### ***The SPB During Sustainment and Disposal***

As the program support concept matures, the SPB would provide the PM and PSM with the authority to govern the product support requirements, funding, and performance of the program in the sustainment system. As shown in the diagram above, the PM would develop service-level agreements (SLAs) with the product support providers. SLAs would be binding agreements between the organizations outlining requirements, funding, and performance outcomes to achieve the thresholds in the SPB. SLAs should be updated annually with 5-year forecasts.

After FRP, the SPB would be updated, reviewed, and approved biennially for the remainder of the program's lifecycle by the PM, MDA, and resource sponsor at the sustainment program milestone. A breach to the SPB thresholds for cost, schedule, or performance would be reported to one level above the stakeholders within 30 days.

The SPB would capitalize the value of early sustainment planning, devise budgets to support the necessary planning, and integrate the cost, performance, and accountability of a program throughout the lifecycle.

Incorporating both the APB and SPB into program development and production provides the needed transparency, outcome-based results, and full accountability for the PM to manage the program across the entire lifecycle. This approach is applicable in the current PEO structure as well as the portfolio management construct.

Although creation of this document adds to the program office workload, the value it adds in establishing early sustainment performance goals and protecting sustainment funding offsets the additional effort. Because sustainment funds are often used as a source of MR, the SPB may also be viewed as limiting the PM's flexibility to move funding to address emerging issues. The document would force a contract with the key program stakeholders that would prevent outside agencies from raiding program funding. By ensuring the stakeholder network is involved in funding allocation, the program would also benefit from added influence and support to replace reallocated sustainment funding should it be necessary to move those funds to address an emergent development or production need.

Establishing and maintaining the SPB would improve governance and management of programs' product support and sustainment by doing the following:

- Developing sustainment performance requirements that influence design.
- Balancing trade-offs between development, production, and sustainment.
- Protecting requirements and funding that impact future readiness and sustainment costs
- Empowering the PM to manage sustainment to the SPB cost, schedule, and performance thresholds through SLAs with product support providers.
- Enabling and instituting governance and accountability of weapon system sustainment and readiness.



### ***Elevate Sustainment***

Better management of product support should start with mandating that the PSM be a direct report to the PM. Establishing a PSM position was intended to bring product support and sustainment experience and expertise to the upper management levels of the program office. Although the PSM roles and responsibilities are clearly defined, no specific resources are identified to support these efforts. Having the PSM as a direct report to the PM would signal to the entire program office the importance placed on sustainment management.

Elevating sustainment would also require a larger and more experienced staff within the PAE organization. The deputy PAE for sustainment would lead a team of product support experts who would provide guidance for individual programs and oversight of the entire portfolio. They would be the first level advisors for the PAE making trade-off decisions to achieve portfolio objectives.

At the SAE level, a deputy for sustainment would lead senior product support and sustainment experts who would be advocates for successful sustainment decisions throughout the acquisition process. The sustainment deputy would guide the Military Services' strategy and governance of sustainment and also advise the SAE on sustainment. They would also provide inputs for both the PAE and ECP regarding sustainment.

### ***Key Enablers for Modern Sustainment are Missing***

A number of key enablers are absent from the sustainment system:

- There is no stable funding for sustainment planning and execution that is budgeted at the program level and then directly controlled by the PSM.
- Contractual vehicles do not incentivize key partners to meet long-term sustainment goals.
- IP and data rights are not appropriately addressed.
- O&S cost modeling is inadequate.

PMs have historically been forced to make design trades-offs, favoring operational requirements early in a program's lifecycle and consuming resources that would otherwise have been used to cover sustainment needs. PMs favor technical requirements over sustainment planning in the early stages of a program. Technical issues are not clearly understood until design work can be completed and sustainment planning impacts will not be seen until years later. There are no sustainment requirements in either the APB or the acquisition strategy that must be fulfilled prior to each milestone decision.

The PSM must compete for program funding to achieve appropriate levels of sustainment planning and performance. Funding is often provided only in the year of execution, further hampering the PSM's ability to establish long-term strategies to improve sustainment performance or incentivize lifecycle cost reductions.

### ***Sustainment Funding***

Sustainment is often allocated Operations and Maintenance (O&M) funding that expires each year. Solving obsolescence issues, particularly for avionics parts, is constrained by real or perceived

regulations or policies that govern the funding source. With rapid technology advances, the capability of replacement avionics, as well as other categories of components, usually exceeds that of the item it is replacing. Because replacement technology typically increases speed, throughput, or some other aspect of performance, it is perceived as adding functionality. This perception often drives procuring agencies to determine that R&D funds are required to counter the obsolescence, adding unnecessary time and complexity to the sustainment process. Without budgeted resources, identifying funding to correct obsolescence becomes exacerbated by short response time.

Interpretation of the regulations and policies governing obsolescence has been incorrect.<sup>5</sup> A research project initiated by DAU, in conjunction with Hacking 4 Defense (H4D), showed that procurement activities were using an interpretation fostered by an incorrect application of the Financial Accounting Regulation regarding *capability improvements* resulting from redesigns due to obsolescence issues. Interviews with more than 100 individuals throughout the acquisition community revealed that an incorrect interpretation had been circulated throughout DoD. DAU and H4D investigated the regulations and policies, finding them essentially silent on this matter, and recommended a new training element quickly disseminate the correct information and updates to the regulation.

The variety of funding sources (commonly called color of money issues) and expiration periods applied create sustainment issues as well. An example of why the potential for confusion exists can be found in funding for spare parts. Spare parts may be considered provisioning, replenishment, depot-level repair, or obsolescence. Spares for provisioning may be purchased through a program office with procurement funds for initial sparing. Replenishment may constitute additional purchase of spares or depot-level repair may be executed to support replacement of worn or damaged parts. Obsolescence may result from failure in reliability or diminishing manufacturing sources. Each of these possibilities could require funding by a different appropriation, with each funding source governed by a different expiration period.

Financial Management Regulations (FMRs) can be confusing, arcane, and subject to interpretation, as in the obsolescence example above. The result is delayed decision making and lack of agile support to warfighters. Asset visibility is also affected. Long-term contracting is impeded, which inhibits depot maintenance organizations (both organic and commercial) from developing well established relationships with suppliers.

### ***IP and Data Rights***

Program management has not addressed the IP issue in sustainment adequately.<sup>6</sup> PMs and PSMs share responsibility for ensuring weapon systems receive appropriate and competitive component repair. To maintain competition throughout the lifecycle, data rights and IP—as applicable to both hardware and software—must be addressed up front. Obtaining IP and data rights has become a complex issue for most major programs, resulting in dissatisfaction within both the organic and commercial depot

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<sup>5</sup> Information gathered during Section 809 Panel Sustainment Workshops, February–March 2018.

<sup>6</sup> Richard Van Atta et al., *Department of Defense Access to Intellectual Property for Weapon Systems Sustainment*, IDA Paper P-8266, May 2017, Institute for Defense Analysis (IDA), accessed May 30, 2018, [https://www.ida.org/idamedia/Corporate/Files/Publications/IDA\\_Documents/SFRD/2017/P-8266.pdf](https://www.ida.org/idamedia/Corporate/Files/Publications/IDA_Documents/SFRD/2017/P-8266.pdf).

organizations. Data rights and IP should be made available when needed, where needed, and for the specific purpose needed while also protecting the IP and data rights of industry partners.

### ***Software Sustainment***

Organic software sustainment is determined by platform requirements. There is no organic software sustainment strategy today, and considering the rapidly evolving nature of software development and maintenance tools, the government needs to increase attention here. The complexity of acquiring data and data rights regarding commercial products, incorporated into either purpose-built or hybrid platforms, requires development of policy, regulations, and statutes. The government should leverage the strengths of both organic and commercial software organizations in this effort.

### ***Depot Maintenance***

Little knowledge sharing occurs among the Military Services and between organic depot organizations and commercial maintenance, repair and operations (MRO) facilities. Differences in execution of sustainment support among the Military Services do not promote active sharing of ideas, methods, and technologies. The degree of sharing is driven by personal relationships. Organic depots and commercial MRO facilities consider themselves competitors; consequently, knowledge sharing regarding repair methods, tooling concepts, and processes is rare. Successful programs find ways to overcome these obstacles, but responsiveness was forced by the program office rather than incentivized through appropriate contract vehicles. An example of this is the F-22 program for which specific expertise to support depot level repair at an organic depot is supported by manpower detailed by the original equipment manufacturer (OEM).

### ***Metrics and Data Analytics***

SMEs have identified several shortfalls in metrics:<sup>7</sup>

- Tools to enable model-based engineering for sustainment are needed.
- Total lifecycle analysis tools are needed, such as better tools to model reliability and maintainability, determine optimum product support, forecast demand profile, and perform predictive manpower analysis.
- Model-based engineering is used extensively during development. Modeling of sustainment to include such items as transportation, deployed repair capability, and manpower are seldom used.

Reliability estimates are calculated during proposal development and are measured during technical maturation. Actual reliability seen in combat operations is often substantially different from the early estimates or even measurements taken in a laboratory environment. Maintainability is judged during technical evaluation through a maintenance demonstration. Results may not be representative of the final delivered product. Tools that allow modeling of reliability and maintainability characteristics would allow identification of the effects of early development decisions. For example, a model that included the required maintenance-free operation time following deployment would drive reliability

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<sup>7</sup> Information gathered during Section 809 Panel Sustainment Workshops, February–March 2018.

and provide assessment of the time required to deliver deployed repair capability to a combat theater of operations. Predictive manpower analysis tools, applied early in the development phase, would provide lead time for training and documentation requirements to be established and appropriate planning, budgeting, and forecasting applied.

Demand signals provided to repair activities (whether organic or commercial) drive investments in training, tooling, manpower, and spare parts availability. SMEs from both organic facilities and industry spoke about the demand signal quality, which can impede execution of depot-level repairable (DLR) actions.<sup>8</sup> Tools providing visibility of demand signal to all stakeholders are not in place. Reports regarding metrics within the organic industrial base are replete with recommendations and suggestions for improvements. Although some recommendations and suggestions have been adopted, the current readiness state indicates that more can be done.

Use of predictive analytic tools is in its infancy within DoD but widely used by industry. Data from each Military Service is controlled, stored, and manipulated internally. Each DME element has its own information technology department, but there has not been a requirement for them to be interoperable or for the data to be collectively warehoused. Efforts to compile all the data, collectively analyze it, and make decisions at the DoD level requires numerous data calls, manual information transmission, and considerable time.

O&S costs equate to 42 percent of the FY 2019 DoD budget request, more than double the investment in research and procurement. Whether funding is being applied correctly must often go unanswered for lack of effective data analytics.

### ***Improve Focus of Defense Materiel Enterprise on Weapon System Readiness***

The DME's lack of focus regarding weapon system readiness is manifested in four key areas:<sup>9</sup>

- Product support provided by individual, internally focused organizations in the DME to weapon system readiness does not receive the attention or visibility needed.
- PMs have little insight regarding decisions made by suppliers of the various product support elements and have little opportunity to influence these decisions or to assess the impacts in a timely manner.
- Total industrial capacity and capability has not been assessed in many years.
- Overall depot maintenance strategy is not aligned to the NDS.

### ***Product Support***

Product support organizations in DoD are focused on single elements such as manpower, training, systems engineering, mission software, depot repair, spares and consumables, or technical publications, as shown below (see Figure 2-17). Operating in sustainment silos, these organizations

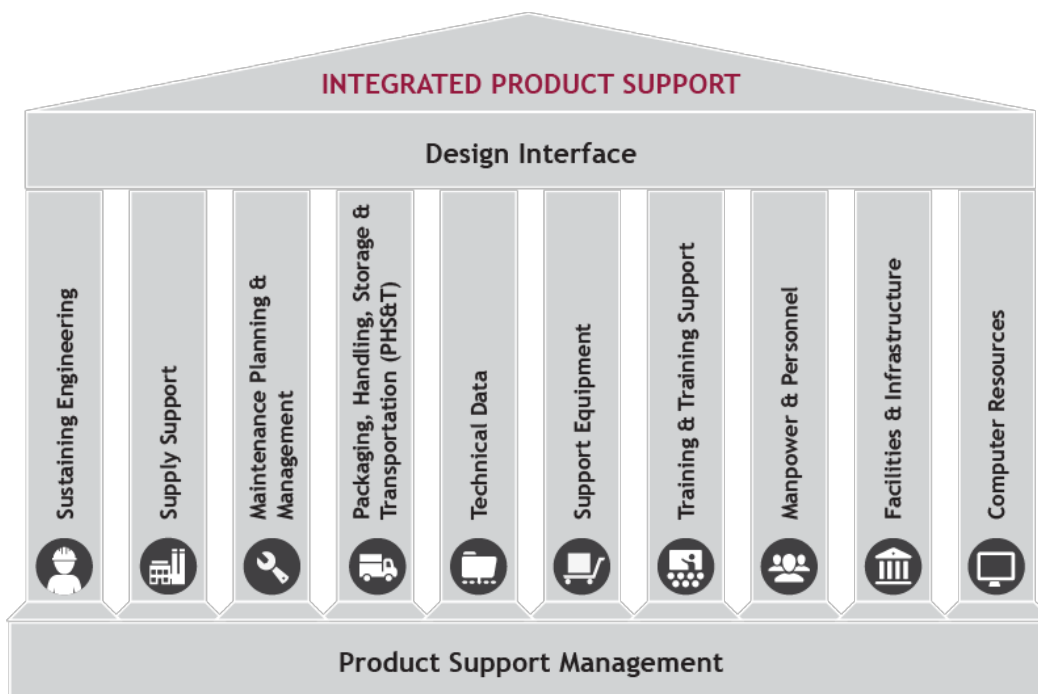
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<sup>8</sup> Ibid.

<sup>9</sup> Ibid.

tend to make independent decisions based on anticipated outcomes beneficial to the organization without regard for requirements, budgets, funding levels, or readiness effects. The system lacks a controlling mechanism for the required output—weapon system readiness. When isolated mandates, such as military end strength, are issued, the down-stream effects of such decisions are felt throughout the defense sustainment system for years. Weapon system sustainment requires a system-of-systems approach to plan, manage, and control the interdependencies of the product support elements contributing to a program readiness. Figure 2-17 depicts the product support elements, each of which is funded differently, operates on metrics with little or no direct correlation to readiness, and is internally focused rather than outcome focused.

**Figure 2-17. Product Support Elements**



SMEs repeatedly described situations in which organizations within the integrated product support elements either executed or failed to execute decisions based solely on their own internal policies, direction, or even personal biases without regard for the effect on readiness.<sup>10</sup> An example is the anecdotal information provided by one PSM who stated that a supply-chain element failed to initiate a contract for replacement spares for an item that was rendering a number of his platforms non-mission capable (NMC).<sup>11</sup> When he investigated, he determined that a key contract was being withheld over a negotiation on allowable profit regarding a 1 percent difference in price for a piece-part worth less than \$1,000. Further research found a number of platforms had been declared NMC awaiting resolution of a price difference measured in tens of dollars. This put weapon system readiness in jeopardy when a premium to a contractor or supplier could have quickly resolved the problem and met warfighter needs. (See the panel’s recommendation on value analysis in Recommendation 38.)

<sup>10</sup> Ibid.

<sup>11</sup> Ibid.

### ***Program Manager Insight Regarding Product Support***

One stakeholder held up the USAF model as a positive example of product support.<sup>12</sup> This model depicted a feedback mechanism from the sustainment enterprise to the Program Management Office (PMO). The USAF model resulted from a reorganization that provides periodic program reviews by all levels of the acquisition system—from the SAE, PEO, PMO, Systems Commands, and warfighters. Other stakeholders indicated the USAF model should be replicated in the other Military Services.<sup>13</sup>

A governance process that is inclusive of stakeholders, is transparent in intent and purpose, and allows for Military Service-level redistribution of funds to address emerging needs while ensuring program needs are considered would be a step toward better sustainment management. Failure to better manage and invest in product support has a two-fold effect: It increases future operations costs and reduces funds available to invest in new capabilities and recapitalization.

### ***Total Industrial Capacity and Capability***

With respect to maintenance, total industrial capacity of the United States has not been accurately assessed in many years. Depot maintenance capacity, to include both commercial and organic organizations, is not aligned to the NDS because there has been no requirement to do so. Organic depot maintenance organizations are generally aligned to the needs of the Military Service they support, except in rare cases in which Military Services have agreed to satisfy joint needs. Commercial depot maintenance organizations are profit motivated but have more flexibility to respond to changing requirements. Lack of a complete industrial capability and capacity assessment and determination of overall required capacity has resulted in duplication of capability in some areas and gaps in others. For example, each Military Service addresses the issue of diminishing manufacturing sources and material shortages (DMSMS). The Army and Air Force their own respective unique software tools. The Navy has distributed capability across five different organizations.

### ***Depot Maintenance Strategy***

10 U.S.C. § 2464 requires DoD to maintain core depot capabilities for key weapon systems sufficient to support expansion for wartime operations. 10 U.S.C. § 2466 places a 50 percent limitation on the funds made available to Military Services or Defense Agencies that can be used to contract for performance by nongovernment personnel, commonly known as the *50/50 rule*. Up to 50 percent of the total depot maintenance budget is thus an entitlement for the government maintenance organizations. Throughout its history, 10 U.S.C. § 2466 has been changed several times to ensure a balance between organic depot funding and contracted performance to optimize efficiency of the overall repair network.

Organic depot maintenance remains an important capability. During World War II, IP developed by one company was often handed over to another company to enable increased production rates. Modern weapons systems have become so complex that rapidly increasing productions rates in this manner would be nearly impossible for many reasons, including time. International conflicts are now more often a *come as you are* evolution. Organic depot maintenance has evolved from a manufacturing

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<sup>12</sup> Ibid.

<sup>13</sup> Ibid.

capability to MRO capability. Title 10 requires an organic depot capability to provide surge capacity but primarily for component repair to support already fielded equipment.

Some older industrial capabilities are not available through industry or are sufficiently critical that a government source must be maintained. For example, the major producer of gun tubes for cannons, mortars, and tanks for the Army is Watervliet Arsenal. Similarly, the primary producer of arresting gear for use aboard Navy aircraft carriers is at Lakehurst, NJ.

## **Conclusions**

DAS is focused on the development and production of weapon systems and governed by the APB. This system has governance and controls to manage the cost, schedule, and performance required. The sustainment of DoD's weapon systems, which accounts for more than 70 percent of weapon system lifecycle costs, lacks the required governance and accountability, and is a system of independently operated silos that compete for limited dollars. DoD's sustainment system lacks the alignment of investments, enablers, data, metrics, and management to enable affordable and effective weapon system readiness.

### ***Implement a Sustainment Program Baseline***

Improving weapon system readiness will require implementing the alignment, governance, and visibility of the sustainment costs, requirements, and funding over the entire lifecycle, to enable the development, execution, and support of the system's operational readiness, directly managed by the PM and the PSM as approved by the SPB. The PM must be aware of and able to directly influence decisions regarding the program by other elements of the Defense Materiel Enterprise. To address this issue, the following should occur:

- Establish the PM as the single responsible authority for ensuring material readiness to the established requirements in the SPB.
- Require the SPB for all program acquisition milestones and biannually after Milestone C.
- Align funding, requirements and expectations for provider organizations to execute the sustainment strategy to improve, obtain, and monitor weapon system readiness through service provider agreements.

### ***Elevate Sustainment to an Equal Standing with Development and Procurement***

Changes in the existing organizational structures are needed throughout DAS to enable sustainment to gain the visibility and stature afforded to development and procurement. Such change will require strengthening the authority of sustainment officials from the SAE to the program office.

The PSM needs to be a direct report to the PM and part of the PAE's organization. Empowerment and appropriate incentives for the PM and the PSM can be accomplished by making changes that provide stable funding and having the PSM become a direct report to the PM. This action would highlight the importance of sustainment management to the entire program office.

Equally important is having sufficient expertise and authority in the PAE and SAE organizations to ensure implications of program and enterprise decisions that will affect sustainment of a program

going through decision reviews will be understood. To address this concern, the following should occur:

- Establish sufficient expertise on the PAE staff to facilitate and govern product support and sustainment decisions across the portfolio.
- Establish expertise on the SAE staffs with the necessary knowledge and sufficient authority to provide inputs for both portfolio- and enterprise-level decisions regarding sustainment within the Military Services and across DoD.

### ***Key Enablers are Required to Improve Sustainment Management***

Enablers for sustainment management are needed to improve the information, modeling, and metrics used across the defense enterprise to manage this extremely complex and costly system. To address this concern, the following should occur:

- Implement improvements in cost modeling for sustainment. Decisions made within the first 30 percent of development and procurement determine 70 percent of the lifecycle cost. Establishing a SPB early and allowing the PSM to drive sustainment costs through reliability and maintainability improvements during design will create long-term benefits.
- Prescribe and allow programs to budget for obsolescence. Tools for predicting obsolescence, particularly in electronic components, are readily available. Ensuring programs have properly estimated and budgeted for obsolescence management will enable proactive planning and response to this issue faced by all programs.
- Promote knowledge sharing among organic depot maintenance activities and commercial MRO activities.
- Clarify statutes, regulations, and policies regarding sustainment funding. Training related to such clarifications will be needed to improve standardization, promote flexibility in interpretation, and provide more agile sustainment response to warfighters.
- Develop and use sustainment metrics and data analytics for cost estimating, modeling, and performance.

### ***Align the DME to Strategic Weapon System Readiness***

Current material readiness and sustainment costs are driven by the DME's structure and strategy decisions without established responsibility and accountability for desired outcome tied to readiness requirements. Changes to both the structure and strategy should be focused on increasing agility and flexibility of the system to provide better warfighter support. To address this concern, the following should occur:

- Develop an integrated national industrial-base strategy, encompassing both organic and commercial organizations, aligned with current NDS.



- Conduct an end-to-end material readiness process assessment to provide alternatives to improve the effectiveness, efficiency, and affordability of the overall system.
- Make organic depot determinations within the industrial base (organic and commercial), focused on warfighting requirements.
- Develop a DoD vision for the industrial base regarding organic and commercial technology to take best advantage of all capabilities.
- Develop a strategy for organic software engineering capability and requirements.

## Implementation

### *Legislative Branch*

- Direct DoD to implement an SPB to govern product support cost, schedule, and performance of the weapon system throughout the lifecycle. Require the development of an SPB—concurrent with the development of the APB—that is updated and approved at each program acquisition milestone and then biennially following FRP at the sustainment milestone reviews.
- Direct DoD to update and strengthen lifecycle cost estimating methodologies to support development of the SPB. Obsolescence affects all programs; proactive planning and requiring programs to budget for obsolescence would improve readiness.
- Direct DoD to propose specific changes to statutes to clarify sustainment funding that are needed to improve standardization, promote flexibility in interpretation, and provide more agile sustainment response to warfighters. Congress should also direct DoD to implement changes to update regulations and policies and conduct training related to the changes to statutes.
- Direct DoD to conduct and report to the congressional defense committees, an assessment of the defense sustainment enterprise to include balance of leadership attention among acquisition and sustainment, organizational structures, national industrial base, and alignment of DME to weapon system readiness and support of the NDS. The assessment should include the following: end-to-end material readiness process assessment to provide alternatives to improve the effectiveness, efficiency, and affordability of the overall system. The industrial base strategy should do the following:
  - Encompass both organic and commercial organizations in the national industrial base.
    - Right size and composition of the industrial base regarding organic and commercial technology to take best advantage of all capabilities in view of the NDS.
  - Focus depot determinations within the industrial base (organic and commercial) on warfighting requirements.
  - Tie accountability for outcome to readiness requirements.
  - Maintain DME agility and flexibility for warfighter support.
  - Include other activities and/or entities as identified to provide a full and accurate assessment of the defense sustainment enterprise.

### ***Executive Branch***

- Elevate sustainment to an equal standing with development and procurement by adequately funding, manning, and overseeing sustainment in accordance with the recommendations of the panel.
- Improve sustainment management through key enablers.
  - Improve the data and information, modeling, and metrics across the defense sustainment enterprise to manage this extremely complex and costly capability. To address this concern, the following focus areas require attention:
    - Employ cost modeling for sustainment being mindful of the fact that decisions made within the first 30 percent of development and procurement determine 70 percent of the lifecycle cost.
    - Develop a strategy for organic software engineering capability and requirements.
    - Create long-term benefits by ensuring the PSM drives sustainment costs through reliability and maintainability improvements during design.
    - Establish an SPB early.
    - Share knowledge promptly among organic depot maintenance activities and commercial MRO activities.
    - Maintain sustainment metrics and data analytics for cost estimating, modeling, and performance.
- Address the following in DoD and Military Service/Agency directives and instructions:
  - Policies and processes to implement enhanced sustainment management per statutory requirements.
  - SPB as the baseline requirements document for funding and staffing sustainment activities.
  - Sustainment billet structures across DoD appropriate to challenges of the sustainment enterprise.
  - Sufficient expertise on the PAE staff for product support and sustainment.
  - Management of programs to the thresholds in the SPB and development of service provider agreements with major stakeholders.
  - Empowerment of the PM, with direct input from the PSM, to manage the sustainment of the program from cradle to grave, through the SPB.
  - Situating the PSM as a direct report to the PM.
- Empower the PSM to develop and execute the lifecycle sustainment plan to meet the cost, schedule, and performance requirements of the SPB.
- Incorporate above Executive Implementation recommendations in revision to DoDD 5000.01, The Defense Acquisition System and operating instructions.

### ***Implications for Other Agencies***

- There are no cross-agency implications for this recommendation.