

Recommendation 42: Reduce budgetary uncertainty, increase funding flexibility, and enhance the ability to effectively execute sustainment plans and address emergent sustainment requirements.

Problem

Budgetary uncertainty and limited funding flexibility have hampered the ability to effectively execute sustainment plans and address emergent sustainment requirements. DoD sustainment suffers for the following reasons:

- Sustainment is underemphasized in the lifecycle cost estimate (LCCE) during program planning.
- Trades are made during early phases of development that could negatively affect the program in the sustainment phase.
- Sustainment receives inadequate attention in the early acquisition phases.
- The sustainment phase lacks adequate planning, programming, and budgeting.
- Decisions are made by higher authority in response to emergent requirements.
- Ambiguity in DoD financial regulations causes sustainment requirements to be budgeted in the wrong appropriation account.
- Programs cannot be supported because funding in the correct appropriation is not available during execution years.
- Sustainment requirements budgeted in an O&M appropriation are affected by the availability of funding when they are needed in execution year.

Background

In the defense acquisition community, several terms are used to refer to the costs associated with maintaining weapons systems. It is a common mistake that the acquisition community believes that O&S and the appropriation O&M are interchangeable, but they are not. There is also a misperception that all O&S activities are only funded with the O&M appropriation and that is not true either.

O&M is a category of appropriations accounts enacted by Congress each year as part of the annual defense appropriations law. O&M funds *some* of O&S functions but not all of them. O&M appropriations also provides funding for some civilian employee salaries; military base operations to include utilities, security, and building maintenance and repairs; medical care; IT infrastructure; recruitment activities; training; and other needs.

O&S refers to the category of *costs* that are used for program sustainment. O&S is not a standard part of appropriations law, but is referenced in law and DoD policy. DoD is explicitly required to collect data

on O&S costs, but there is no reference to operating and sustainment in 10 U.S.C. § 101, Definitions.¹ The DoD D/CAPE defines O&S costs as those for “personnel, equipment, supplies, software, and services associated with operating, modifying, maintaining, supplying, and otherwise supporting a weapon system in the DoD inventory.”² These costs can be funded with O&M, Research, Development, Testing, and Evaluation (RDT&E), or Procurement appropriations.

Sustainment refers generically to the process of keeping a weapons system or other technology in good working condition. For many complex or technologically advanced systems, sustainment represents the largest single portion of the total cost over the life of the system. Again, these activities can be funded with O&M, RDT&E, or Procurement appropriations.

Cost Categories

The total cost of a DoD acquisition program varies depending on the definition of *cost*. The *procurement cost* of a program refers to the amount expended from the procurement appropriation account for prime mission equipment, support items, and initial spares. *Program acquisition cost* refers to the combined procurement cost; research, development, and testing cost; and military construction costs. Program acquisition cost can also include some O&M costs, referred to as *acquisition O&M*. The *lifecycle cost* consists of the program acquisition cost, operating and support costs, and disposal cost. The operating and support cost and disposal cost are generally funded from the O&M appropriation accounts.

Former USD(AT&L) Frank Kendall includes lowering lifecycle cost among 10 principles for achieving better buying power in DoD. Kendall wrote that “controlling life-cycle cost is one of our jobs; staying on budget isn’t enough,” and warned against “poor decisions that result in short-term savings at the expense of high long-term costs.”³

Underemphasis on Lifecycle Cost

With respect to the cost thresholds, these different definitions are important because they affect whether or not programs experience Nunn–McCurdy breaches.⁴ If a program’s per-unit procurement cost or program acquisition cost exceeds certain thresholds, the program faces termination.⁵

The fate of programs can depend on both procurement cost and program acquisition cost—but not lifecycle cost. Although deferring costs into the longer term may in some cases be the most effective way of managing initial investment costs and enabling the program to continue, by keeping the program within cost thresholds, that decision may push costs out of the developmental and production phases and into the sustainment and disposal phases of a program’s lifecycle.

¹ Guidance on Life-Cycle Management, 10 U.S.C. § 2337a.

² Office of the Secretary of Defense – Cost Assessment and Program Evaluation, *Operating and Support Cost-Estimating Guide*, March 2014, 2-3, accessed September 10, 2018, https://www.cape.osd.mil/files/OS_Guide_v9_March_2014.pdf.

³ Frank Kendall, “Better Buying Power Principles: What Are They?”, *Defense AT&L*, January-February 2016, Principle 4, accessed November 6, 2018, <http://www.dtic.mil/dtic/tr/fulltext/u2/1016057.pdf>.

⁴ *Nunn–McCurdy breach* refers to 10 U.S.C. §§ 2433 and 2433a, which specify that if a program’s unit costs exceed certain thresholds, the program in question must be terminated unless the Secretary of Defense certifies that it is essential to national security.

⁵ Percentage growth thresholds are based on both cost definition and time period in which projections were made.

Literature on Lifecycle Cost

Several organizations have published documents assessing the possibility of making total lifecycle costs—particularly sustainment costs—a greater factor in program decision making. MDAPs are already required to provide a *full lifecycle cost analysis* in their Selected Acquisition Reports to Congress, but this analysis does not factor into Nunn–McCurdy cost breaches.⁶

GAO last updated its *Cost Estimating and Assessment Guide* in 2009, so its conclusions may be somewhat outdated. The document notes that:

*“DOD starts more weapons programs than it can afford, creating competition for funding that encourages low-cost estimating and optimistic scheduling, overpromising, suppressing bad news, and for space programs, forsaking the opportunity to identify and assess potentially better alternatives. Programs focus on advocacy at the expense of realism and sound management.”*⁷

A 2011 paper from the Software Engineering Institute decried the problems with accurately projecting the O&S costs of weapons systems. The paper noted that “the difficulty of accurate cost estimation is compounded by the fact that estimates are now prepared much earlier in the acquisition lifecycle, well before there is concrete technical information available.”⁸

A 2014 MIT paper by an Air Force program manager showed that historically, actual lifecycle cost estimates for MDAPs exceeded their initially projected lifecycle costs by 20 to 506 percent. The paper’s “Recommendations” section appeared to suggest incentives for analysts to adopt the rosiest-possible assumptions to justify low cost projections: “Department-wide assumptions should be set above the DoD Component level to ensure fairness in quantifying systemic cost risk for MDAPs.”⁹

In 2014, DoD’s CAPE office published a detailed analysis of the cost elements and estimation methodologies for program O&S costs. The analysis emphasized the difficulty of projecting O&S costs in their entirety, noting that for items such as indirect support and depot maintenance it was “difficult, if not impossible, to compare these costs to available funding.”¹⁰

Lifecycle Cost Data

Past analyses suggest that for most major types of MDAP, O&S costs make up a large percentage of the lifecycle cost. According the 2014 CAPE analysis, space systems are the only exception (see Figure 2-18).

⁶ Selected Acquisition Reports, 10 U.S.C. § 2432(c)(3).

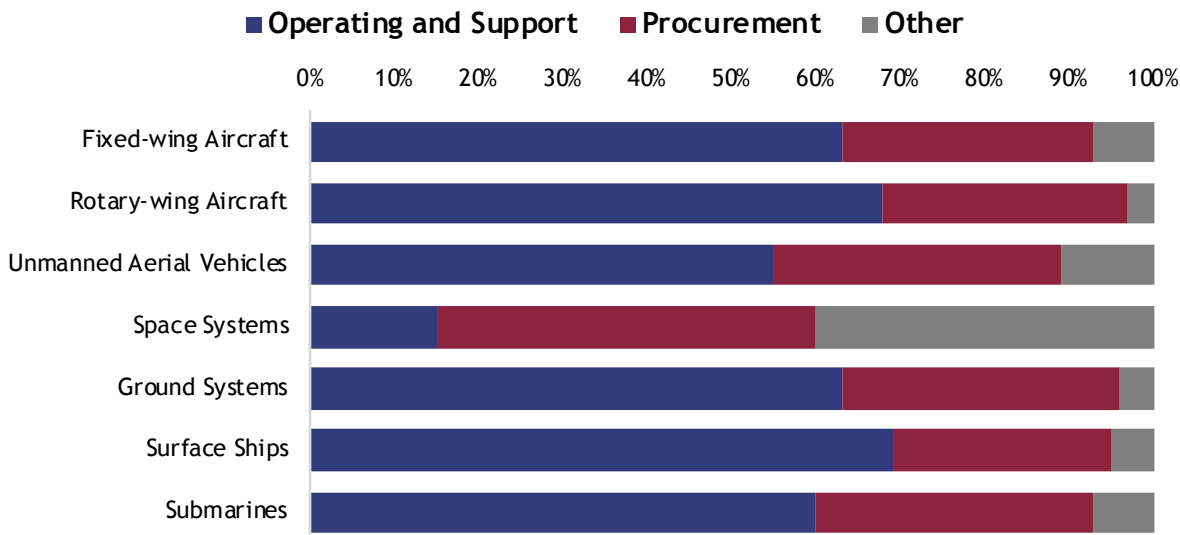
⁷ GAO, *GAO Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Capital Program Costs*, GAO-09-3SP, March 2009, 42, accessed June 29, 2017, <http://www.gao.gov/assets/80/77175.pdf>.

⁸ Robert Ferguson et al., *Quantifying Uncertainty in Early Lifecycle Cost Estimation (QUELCE)*, Software Engineering Institute, December 2011, accessed November 5, 2018, https://resources.sei.cmu.edu/asset_files/TechnicalReport/2011_005_001_15419.pdf.

⁹ David Petrucci, *Improved Affordability in DoD Acquisitions through Strategic Management of Systemic Cost Risk*, Massachusetts Institute of Technology, February 2014, 90, accessed June 29, 2017, http://seari.mit.edu/documents/theses/SDM_PETRUCCI.pdf.

¹⁰ Office of the Secretary of Defense – Cost Assessment and Program Evaluation, *Operating and Support Cost-Estimating Guide*, March 2014, accessed September 10, 2018, https://www.cape.osd.mil/files/OS_Guide_v9_March_2014.pdf.

Figure 2-18. Percentage of Program Lifecycle Cost Average for MDAP Categories¹¹



For individual programs, O&S as a share of total costs can be even higher. According to an independent analysis prepared for the Marine Corps Deputy Commandant for Aviation, O&S accounted for roughly 80 percent of total H-1 helicopter upgrade program costs.¹² The high O&S costs associated with major programs suggest that if Congress and DoD wish to apply useful metrics to program review, those metrics must incorporate sustainment in some way.

Programs may also benefit from making the same stakeholders responsible for decisions and costs throughout each phase of a program’s lifecycle. If a program office is responsible for initial acquisition costs but not sustainment costs, the office may face disincentives to increase up-front investment as a way of reducing long-term costs. DoD programs do not generally have a single stakeholder responsible for managing all O&S costs. There is no single source of O&S funding; this authority is fragmented among multiple organizations and appropriation line items.

Discussion

DoD spends billions of dollars annually to operate and sustain weapon systems. With the amount of dollars at stake, DoD has placed more attention on controlling total lifecycle costs with initiatives aimed at ensuring that weapon systems are not only affordable but effective over the long term. These costs include, among other things, repair parts, maintenance, and personnel. They have historically accounted for about 70 percent of total weapon system costs.¹³

¹¹ Ibid, 2-3. “Other” category consists of RDT&E and Military Construction funding.

¹² Joseph Dyer and Peter Williams, “Marine Light Attack Helicopter Independent Readiness Review,” April 12, 2017, provided to Section 809 Panel.

¹³ O&S costs are estimated to make up as much as 70 percent of the total lifecycle cost of DoD’s major weapon systems. FY 2012 NDAA, Report 112-26 to accompany S. 1253, June 22, 2011.

Sustainment Programming, Planning and Budgeting

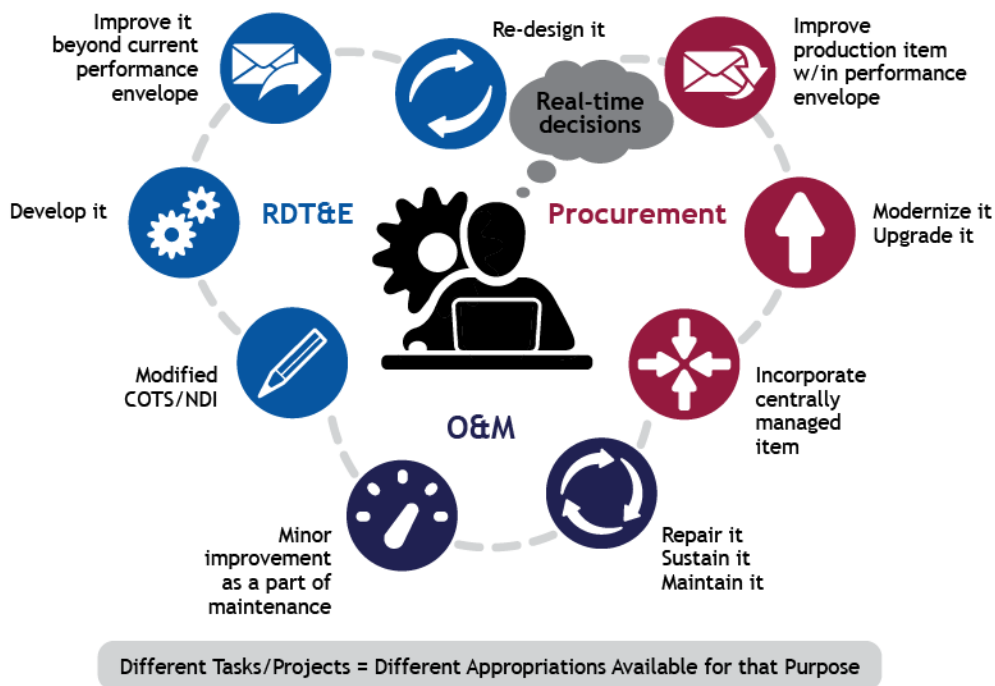
At present, programs do not always have sufficient funding flexibility for sustainment. Estimating sustainment costs frequently, budgeting for sustainment within appropriations will help address recurring sustainment issues. Sustainment requires a combination of RDT&E, procurement, and O&M funding to successfully execute the full range of lifecycle sustainment actions. Stable funding is key to successful execution and having funding of the correct type in place at the right time requires program offices to forecast, program, and budget accurately for sustainment.

Establishing an SPB, aligned with the APB, will enable the level of planning, programming, budgeting, and cost estimation necessary to enable DoD prioritization for funding. The sustainment cost estimate should be as definitive as possible, based on the information available at the time that it is made, and should be regularly refined and improved as more and better information becomes available. An SPB initiated during program development and matured and reviewed prior to each milestone decision would provide for the necessary forecast and oversight of sustainment funds, and also provide valuable insight into the effects on lifecycle costs of decisions made at the program, portfolio, and Military Service or operational employment level. Transparency of budget allocations would also allow program offices to establish long-term relationships with both commercial and organic depot facilities, enabling more efficient planning/execution of depot work and should lead to lower sustainment costs. These long-term relationships with suppliers will provide benefits to warfighters and the DoD.

Unclear Guidance on Appropriation Funding

Programming and budgeting for sustainment activities are further inhibited by issues with funding types, procurement restrictions and obligation expiration periods (commonly called *color of money* issues). Uncertainty about funding rules can inhibit programs by not adequately projecting funding requirements. There are three types of sustainment activities: product improvements, technical refresh and DMSMS, which includes obsolescence that have resource implications that affect what type of appropriation is used, driven by a determination of whether the cost is an expense or an investment. The DoD FMR describes several conditional circumstances on whether or not a cost is an expense or an investment. To further complicate the resource decision, an expense can be funded with O&M or RDT&E appropriations and an investment can be funded with Procurement, MILCON or RDT&E appropriations. Expense/investment thresholds also affect this determination. As depicted in Figure 2-19, the resource decision criteria described in the FMR leads to much confusion which impacts proper programming, budgeting and execution of sustainment activities.

Figure 2-19. Complexity of Product Support Strategy Funding¹⁴



Realizing the confusion depicted in the graphic above and the product improvement graphic below, the Section 809 Panel reached out to DAU to use the Hacking for Defense methodology with a team of students to “develop a way for product support managers and program managers to budget and plan for obsolescence of parts and components of a weapon system.”¹⁵ “Through their discovery interviews and hypothesis testing, the team reframed the problem to be: “There is no clear DoD guidance on obsolescence.”¹⁶ The team specifically found that program managers and financial managers are misinterpreting the FMR with regard to obsolescence. Figure 2-20 was presented by DAU and has been used as a guideline by resource managers to help clarify FMR product improvement appropriation selection criteria, but has been applied for obsolescence and tech refresh requirements, too. The research team found situations in which a required component had gone out of production and a replacement component was available but also happened to provide a capability enhancement. In such cases, program managers and financial managers were asserting that the capability enhancement required RDT&E funding to finance the replacement component. This assertion may be a misinterpretation of the FMR. The misinterpretation causes program managers and financial managers to perform unnecessary workarounds to obtain RDT&E funding that the program has not been appropriated and could cause delays in delivering capability to warfighters. These costs and delays

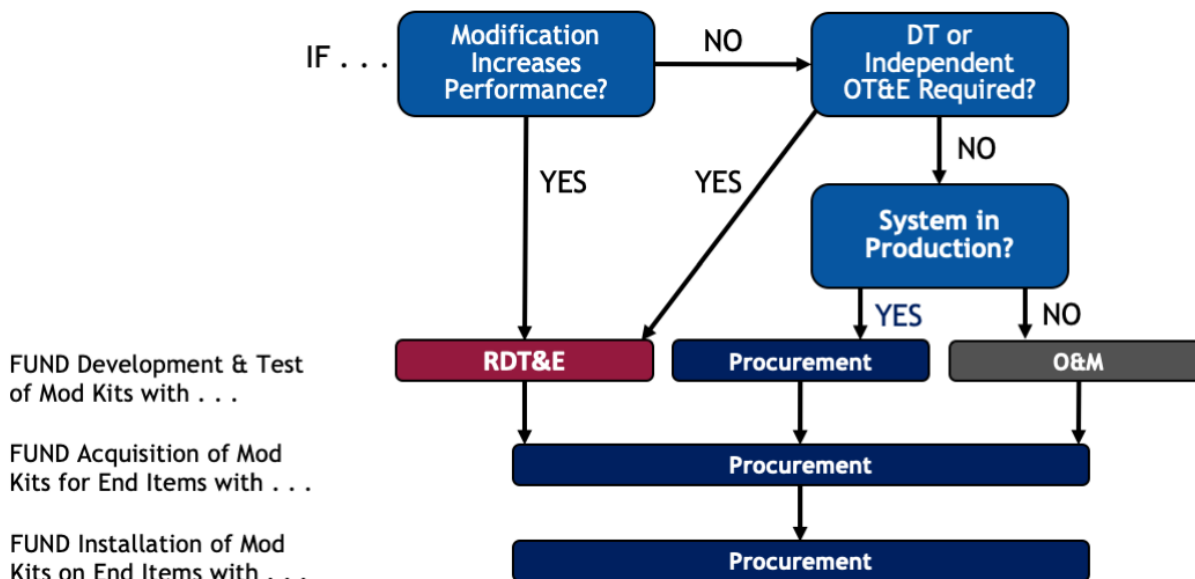
¹⁴ Figure adapted from “Department of Defense Product Support Manager Guidebook,” release 2011, DAU, figure 12, accessed September 12, 2018, <https://www.dau.mil/guidebooks/Shared%20Documents%20HTML/PSM%20Guidebook.aspx>.

¹⁵ David L. Gallop, PhD, *Defense Acquisition University (DAU) Hacking for Defense/Leading Innovation (H4D/LI) Pilot-2 Info Paper*, May 21, 2018, provided to Section 809 Panel, September 20, 2018. David L. Gallop, PhD, “In Innovation Insurgency: Hacking for Defense at DAU,” *Defense AT&L Magazine*, May-June 2018, 2-7, accessed September 12, 2018, <https://www.dau.mil/library/defense-atl/DATLFiles/May-Jun2018/DATL%20MayJune2018b.pdf>.

¹⁶ David L. Gallop, PhD, *Defense Acquisition University (DAU) Hacking for Defense/Leading Innovation (H4D/LI) Pilot-2 Info Paper*, May 21, 2018, provided to Section 809 Panel, September 20, 2018.

could be avoided with clarifying language in the FMR.¹⁷ The team proposed that clarifying language be added to the FMR and job aides be developed for the PM and business communities.

Figure 2-20. Current Product Improvement Funding Policy¹⁸



Funding for spare parts serves as another example of why confusion frequently arises. Spare parts may be funded differently based on whether they are considered provisioning spares, replenishment spares, depot level repairs, or obsolescence. The FMR states that initial spares (provisioning spares) and repair parts will be procured along with procurement of the end item and funding will be budgeted based on a first-year obligation rate of 92 percent. The O&M accounts will finance the purchase of depot-level reparable and consumable repair parts, primarily through the Defense Working Capital Fund, for maintenance of all Class IX equipment (excluding medical-peculiar repair parts). Each of these examples may be funded by a different appropriation type and each funding source may face a different year of expiration.

The DoD FMR can often be confusing and subject to interpretation, as in the obsolescence and spares examples above. This confusion results in delayed decision making and lack of agile support to warfighters. The resource decision criteria require simplification, and solutions such as the one depicted in Figure 2-21 need to replace the product-improvement funding policy depicted in the graphic above. Three of the sustainment activities—product improvement, technical refresh, and DMSMS should follow one decision flow chart called product investment because ultimately all of these activities are an investment in the end item.

- The RDT&E appropriation should be applied for the analytical nonrecurring cost to find a solution for obsolescence or product improvements. When there is an emergent, unexpected

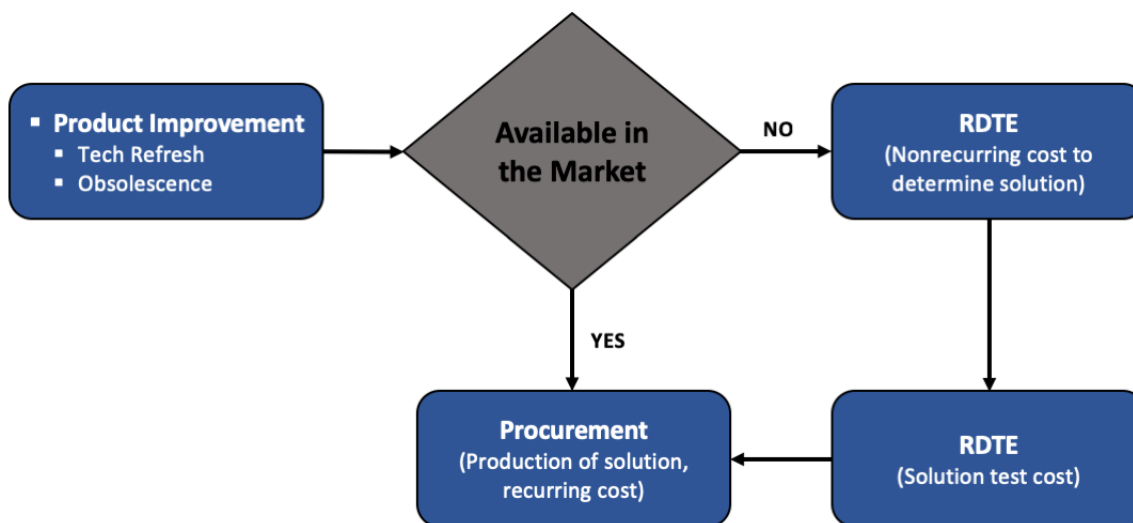
¹⁷ Ibid.

¹⁸ Figure adapted from presentation by Dana Stewart, *Color of Money: Funding Policies and Fiscal Law*, May 20, 2015, Defense Acquisition University, 19, accessed September 12, 2018 http://ndiatvc.org/images/downloads/DAU_Training/dau_color_of_money.pdf.

obsolescence or DMS, the program office can pursue reprogramming or use of O&M (form, fit, function item replacement), whichever addresses the situation most appropriately.

- The procurement appropriation should be applied for the recurring cost of the investment of the end item, such as scheduled tech refresh and modification kits. This concept still meets the original intent of the FMR that all costs are either an investment or an expense.

Figure 2-21. Proposed Product Investment Decision Tree



Most importantly, it is critical for PMs to recognize that the SPB is dynamic and forecast risk when establishing the SPB cost estimate and plan for RDT&E and procurement postproduction requirements. The investments (Procurement and RDT&E appropriations) are the costs that result in the acquisition of, or addition to, end items. These costs benefit future periods and generally are long term.¹⁹ The O&M appropriation is an expense, and expenses are the costs incurred to operate and maintain the organization and system. That is why an investment account and an expense account should be used for sustainment activities. Because investment accounts will be used for the three types of sustainment activities—product improvements, technical refresh, and DMSMS—these activities can be tied to budget line numbers (BLINs) and PEs. This connection offers more traceability and transparency of costs for these sustainment activities, as well as the total capital investment. Being able to trace program trades of funding for sustainment requirements can be further expanded by establishing separate budget projects and cost categories within the PEs and BLINs. Having this traceability also offers the cost estimating community historical data to improve on and address the sustainment cost estimating weakness described by CAPE.

Sustainment Underfunded/Emergent Requirements Affect Resources Available

Sustainment requirements can be underfunded for a variety of reasons. Too many categories of appropriations accounts, as just described, can lead to situations in which sustainment professionals are unsure which appropriation account to use to cover a given type of cost. Competing requirements among different stakeholders can also lead to chronic underfunding. During the year of execution,

¹⁹ DoD Financial Management Regulation, Volume 2A, Chapter 1, Section 01021 - Funding Policies.

situations can occur as mishaps, material shortages, and emergent requirements such as operational contingencies that affect both needed and available resources.

Acquisition program funding flows from Congress to the Military Services through a variety of appropriations and is channeled to organizations that will ultimately support the product. Examples of program funding include manpower, training, spares, engineering, depot repair, and support equipment. Sustainment funding has often served as the program manager's *bill payer* to meet unplanned program issues during development and production. This results in inaccurate program and budget estimates for sustainment requirements leading to underfunding in the year of execution. The establishment of the SPB should help establish an improved cost estimate and give accountability from the PM through the PAE to report any budget variances to the baseline.

Conclusions

It is critical to establish financial enablers that reduce budgetary uncertainty, increase funding flexibility, enhance the ability to effectively execute sustainment plans, and address emergent sustainment requirements.

DoD should establish an SPB in conjunction with the APB to monitor system requirements through acquisition and O&S. Currently, after IOC there are no formal milestones or events to measure system sustainment/readiness goals tied to the PEO/PM. Currently, sustainment trades are being made without clearly understanding or communicating the overall effect to system readiness and the lifecycle cost of the program. This issue can be mitigated with improved cost estimating methodologies and models for programming and budgeting sustainment funding. PMs should program for system sustainment risk and always establish an RDT&E line for postproduction analytical requirements and program for procurement to address possible obsolescence and product improvements. Doing so will allow PMs to establish long-term strategies to improve sustainment performance or incentivize lifecycle cost reductions.

Planning and investments for sustainment activities are often complicated by complex and ambiguous guidance on funding types. DoD can remedy this problem by clarifying statutes, regulations, and policies regarding funding, and redefining appropriation criteria in the FMR to provide more flexibility. As described above, sustainment planning should be aligned to maximize use of RDT&E and procurement appropriations. O&M may be used for maintenance, repair, and operations.

Once the program enters the execution year, the PEO (or under the proposed portfolio management structure PAE) and PMs need the financial agility to rapidly address emergent sustainment requirements. As described in *Volume 3*, Section 4, budget flexibility can be achieved by the following:

- Increasing the Procurement and RDT&E BTR thresholds, which will permit leadership to more easily move funding as needed within appropriations accounts.
- Delegating BTR authority to the lowest practical level (PEO/PM) with the most knowledge of the program.

Requiring programs to budget for the postproduction phases of their lifecycles will enable leadership to more accurately forecast required future resources via the SPB, reducing the degree to which expanded reprogramming authorities are needed.

Moving some of the sustainment activities to the investment accounts versus annual funding allows PMs to negotiate long-term supplier agreements that can reap savings on contractor supported systems, or performance-based logistics contracts. Although, for those activities still funded by O&M, the PM needs the increased flexibility to fund those requirements affected by continuing resolutions and O&M appropriations accounts should be allowed a 1-year, 5 percent carryover authority.

Extending the period of availability for sustainment funding with the carryover proposal, will reduce pressure to spend money for the sake of spending money driven by obligation end-period spending. In addition to addressing the effects of continuing resolutions, it could also eliminate the pressure driven by appropriation execution performance metrics. This carryover authority in the O&M appropriation accounts would give the sustainment community more time to acquire needed capabilities in years when funding is released late and permit sustainment acquisition professionals to smooth out the end-period surges in contract spending that occur each year.

As described, these recommended financial enablers should provide improved planning, programming, and execution of sustainment activities, which would improve the development, implementation, and tracking of the overall lifecycle cost of a program.

Implementation

Legislative Branch

- Congressional changes to implement sustainment funding recommendations are included in the Section 809 Panel's *Volume 3, Recommendations 46 through 49*.
 - Recommendations 46 through 48 includes a recommendation that FMR rules be modified to allow for more flexible reprogramming of funds at the portfolio level. These modifications would have to be approved by the congressional defense committees. This would allow for more efficient management of acquisition portfolios in general.
 - Recommendation 49 includes a recommendation that defense O&M appropriations accounts be granted a 1-year, 5 percent carryover authority. This would allow for a smoothing across time periods in the funding for many of DoD's sustainment needs.

Executive Branch

- Clarify the definitions of appropriations account categories in the FMR to provide more flexibility for sustainment activities. In particular, clarify the distinction between expenses and investments.
 - Update FMR Volume 2A, Chapter 1, Section 010201(B)(1) to allow O&M appropriations to be used to purchase supplies, services, or solutions that are necessary to address these

expense needs. Expenses are the costs incurred to operate and maintain the organization and systems, such as services, supplies, and utilities.

- Update FMR Volume 2A, Chapter 1, Section 010201(B)(2) to make the R&D investment cost category provide new and innovative technologies and allow Procurement appropriations and RDT&E appropriations to be used for purchasing supplies, services, or solutions necessary to address these nonrecurrent investment needs. Investments are the costs that result in the acquisition of, modification or addition to, end items. These costs benefit future periods and generally are of a long-term character such as real property and personal property.
- Other Executive Branch changes to implement sustainment funding recommendations are included in the Section 809 Panel's *Volume 3* Recommendations 41 and 46 through 49.
 - Recommendation 41 includes a recommendation to establish a Sustainment Program Baseline (SPB) in conjunction with the APB to report system requirements through acquisition and O&S. APBs and SPBs would together constitute cost estimates for the total lifecycle cost of programs. This change would provide a more transparent and accurate assessment of the true costs of program sustainment.
 - Recommendations 46 through 48 include a recommendation that portfolio managers be given approval to make decisions on below-threshold reprogramming actions in cases for which a viable funding offset has been identified within the same portfolio. This flow down of decision authority should be accompanied by increased reprogramming thresholds and adjustment of the 20 percent rule for reprogramming within Procurement or RDT&E appropriations accounts, allowing for more efficient management of acquisition portfolios in general.
 - Recommendation 49 includes a recommendation that defense O&M appropriations accounts be granted a 1-year, 5 percent carryover authority, to be implemented by the DoD Comptroller and other comptroller authorities in DoD. This carryover authority would allow for a smoothing across time periods in the funding for many of DoD's sustainment needs.

Implications for Other Agencies

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